

A Historical Journey of  
**Diabetes Mellitus:**  
From Ancient Descriptions to  
the Discovery of Insulin

Md Anzar Alam  
Asim Ali Khan

Khalid Eqbal  
Ghulamuddin Sofi



BlueRoseONE.com  
Stories Matter  
New Delhi • London

**BLUEROSE PUBLISHERS**

U.K.

Copyright © Md Anzar Alam, Khalid Eqbal, Asim Ali Khan, Ghulamuddin Sofi 2025

All rights reserved by author. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior permission of the author. Although every precaution has been taken to verify the accuracy of the information contained herein, the publisher assumes no responsibility for any errors or omissions. No liability is assumed for damages that may result from the use of information contained within.

BlueRose Publishers takes no responsibility for any damages, losses, or liabilities that may arise from the use or misuse of the information, products, or services provided in this publication.



For permissions requests or inquiries regarding this publication,  
please contact:

BLUEROSE PUBLISHERS  
[www.BlueRoseONE.com](http://www.BlueRoseONE.com)  
[info@bluerosepublishers.com](mailto:info@bluerosepublishers.com)  
+4407342408967

ISBN: 978-93-7310-913-8

Cover design: Daksh  
Typesetting: Tanya Raj Upadhyay

First Edition: October 2025

# About Authors

**Md Anzar Alam**, MD (Unani Medicine), MBA (Hospital Management), Ph.D (Unani Medicine), is a distinguished clinician, academician, and researcher in the field of Unani medicine. Renowned for his dedication to integrating traditional healing systems with modern scientific advancements, he has emerged as a leading voice in holistic and evidence-based healthcare.

With over a decade of experience in clinical practice, teaching, and research, Alam has significantly contributed to the understanding and practical application of Unani principles in addressing modern-day health challenges. His academic credentials reflect a unique synthesis of clinical excellence and managerial insight, having earned his MD and Ph.D from the National Institute of Unani Medicine (NIUM), Bengaluru, and an MBA in Hospital Management from Annamalai University, Chennai.

Notably, he secured First Rank among 324 applicants in the NIUM Postgraduate Entrance Examination (Bengaluru), testament to his academic brilliance and commitment to excellence in the field.

Alam currently serves as an Assistant Professor in the Department of Moalajat, School of Unani Medical Education and Research (SUMER), Jamia Hamdard, New Delhi, one of India's premier institutions in Unani medical education and research.

His core areas of specialization include **pulse diagnosis (*Nabz Shanasi*)** and Unani approaches to managing diabetes mellitus, cancer, hepatitis, chronic kidney disease (CKD), hypothyroidism, and other chronic disorders. His work exemplifies a strong commitment to patient-centered care, rooted in traditional diagnostics and natural therapeutics. He has also contributed extensively to the advancement

of preventive healthcare, herbal pharmacology, and integrative treatment models.

A prolific academic and thought leader, Alam has authored and co-authored numerous peer-reviewed research papers, review articles, and book chapters, with a strong focus on chronic disease management and the modernization of Unani therapeutics. His contributions have been recognized with several honors, including the prestigious **Best Research Award** conferred by **CCRUM under the Ministry of AYUSH, Government of India**, acknowledging his excellence in research and innovation.

He has served as a resource person and invited speaker, delivering expert lectures at national and international forums, and has presented numerous research papers at conferences and seminars across India and abroad, contributing actively to scholarly discourse and promoting global awareness of the Unani system of medicine.

Alam continues to inspire students, researchers, and healthcare professionals through his visionary and integrative approach, forging a bridge between time-tested Unani wisdom and contemporary scientific knowledge to promote holistic health and well-being worldwide.

**Khalid Eqbal**, MD (Unani Medicine), is a dedicated clinician, academician, and researcher in the field of Unani medicine. He completed his postgraduation from Luqman Unani Medical College, Bijapur, Karnataka. Currently, he serves as Associate Professor in the Department of Moalajat at Sufia Unani Medical College, East Champaran, Bihar. Eqbal is actively engaged in teaching, clinical practice, and research. He has published several review and research articles in reputed journals like PubMed and Scopus. His work reflects a deep understanding of Unani principles applied to modern healthcare challenges. He also holds the position of Secretary (Administration) of AUP Bihar and is a member of Jan Jan Unani. Respected for his mentorship and leadership, Eqbal continues to inspire students and peers in the Unani medical community.

**Asim Ali Khan** is a Professor of Unani Medicine at School of Unani Medical Education & Research, Chief Medical Superintendent of Majeedia Hospital and Co-Director of Centre of Excellence at Jamia Hamdard (University), New Delhi. He is coordinating academic and research activities at Department of Unani Medicine (Moalajat) as Head of the Department and is also directing / supervising the clinical activities at the attached 100 bedded Majeedia Unani Hospital. He is the Chairperson of Scientific Advisory Committee of Central Council of Research in Unani Medicine, Ministry of Ayush, Govt. of India; Chairperson of AYD-04 at Bureau of Indian Standards; Member of Ayush Advisory Committee at Bureau of Indian Standards and Chairperson of Institutional Ethics Committee of National Institute of Unani Medicine, Ministry of Ayush, Govt. of India, Ghaziabad.

He is the former Director General of Central Council for Research in Unani Medicine, Ministry of AYUSH, Government of India, (till March 2023) a leading institution of scientific research into various fundamental and applied aspects of unani medicine with its 23 institutes spread across India.

He is the former member of National Commission for Indian System of Medicine (NCISM), Governing Board, where he was responsible for Policy making, Planning, implementation and Governance of Quality Education, Training and Researches in Ayurveda, Unani & Sidha Sciences through educational institutions in India.

He is also the Former Dean, School of Unani Medical Education & Research, Jamia Hamdard (till July 2025). During his tenure as Director General, CCRUM, he was also holding the additional charge of Advisor Unani to Ministry of Ayush, Govt. of India.

In the last few years he has played an active role with World Health Organization (WHO) team in developing the 'Benchmarks for Education' & 'Benchmark for Practice' in Unani medicine and Standard Unani Terminology Document. He is also involved in

developing the Traditional Medicine Chapter for ICD-11 Classification with WHO team of experts.

He has authored and edited many books and has more than 150 research papers to his credit.

He has received more than 26 appreciations/ awards from various organizations as an appreciation for the services he rendered on various occasions. Recently he has been awarded with 'Sheikh Zayed Internationasl Award' by Shiekh Zayed Foundation, Abudhabi, UAE for his contributions in Unani Medicine Academics.

**Ghulamuddin Sofi** is a Professor in the Ilmul Advia (Unani pharmacology) department at the National Institute of Unani Medicine (NIUM) in Bengaluru. In addition to his academic position, he has contributed to several research publications in the field of Unani medicine, exploring topics such as anti-hyperglycemic therapies, shelf life of herbal medicines, and anxiety-relief properties of traditional plants like *Lactuca sativa* and *Nymphaea alba*. His research spans formulation development, physicochemical optimization, and experimental validation of Unani drug preparations, underscoring his role in bridging traditional Unani principles with contemporary scientific investigation.

In summary, Sofi is a key faculty member at NIUM Bengaluru, contributing both as an educator in Unani pharmacology and a researcher focused on scientifically validating traditional therapeutic substances.

आरिफ मोहम्मद खां  
Arif Mohammed Khan



राज्यपाल, बिहार  
GOVERNOR OF BIHAR

राज भवन  
पटना-800022  
RAJ BHAVAN  
PATNA-800022

### Foreword

The book "*A Historical Journey of Diabetes Mellitus: From Ancient Descriptions to the Discovery of Insulin*" offers a profound exploration of one of the most pressing health challenges of our age. The story of diabetes, traced from early recognition in ancient civilizations to the groundbreaking discovery of insulin in the 20<sup>th</sup> century, is not merely a scientific chronicle, but also a testament to humanity's unyielding pursuit of alleviating suffering and improving quality of life.

This book is remarkable for its integration of historical perspective with clinical understanding. Particularly noteworthy is its emphasis on the Unani system of medicine, an age-old healing tradition renowned for its holistic philosophy and time-tested principles. The author *Dr. Md. Anzar Alam*, through well-structured chapters, presents the philosophical foundations of Unani medicine alongside modern strategies for managing diabetes, covering its etiology, clinical features, complications and preventive measures.

The thoughtful discussion of temperament-based management, herbal formulations, plant-based therapies and preventive regimens illustrates the continuing relevance of traditional wisdom in addressing contemporary health concerns. Of special significance is the attention given to frequently overlooked issues such as diabetic ulcers and diabetes-related sexual health, reflecting a humane and comprehensive vision of healthcare.

I am confident this book will be an invaluable resource for students, researchers and healthcare professionals. It will inspire exploration of the intersection between tradition and modernity in medical science, fostering integrative approaches for public health. I sincerely *Dr. Md. Anzar Alam* for this commendable contribution in the fight against diabetes.

(Arif Mohammed Khan)



# Preface

Diabetes mellitus remains a significant global health concern, calling for a comprehensive and integrative approach to its understanding and treatment. This book uniquely combines the time-honored principles of the Unani system of medicine with modern scientific perspectives to provide an all-encompassing view of diabetes.

The book begins with **Chapter 1: What is Unani system of medicine?** which introduces readers to the foundational philosophies and principles of this ancient holistic medical tradition. This foundation sets the stage for **Chapter 2: Introduction to diabetes** and **Chapter 3: Historical background of diabetes**, providing essential insights into the disease's nature and historical evolution.

In **Chapter 4: Diabetes Mellitus: From antiquity to insulin**, the narrative traces the development of diabetes knowledge, connecting ancient understanding with modern medical breakthroughs. This is followed by **Chapter 5: Concept of diabetes** and **Chapter 6: Etiology of diabetes in Unani medicine**, which explore the disease's conceptual framework and causes from a Unani perspective.

Clinical aspects are addressed in **Chapter 7: Clinical features of diabetes**, while **Chapters 8: Risk factors for diabetes** and **Chapter 9: Complications of diabetes** emphasize the importance of recognizing contributing factors and potential health challenges.

Accurate diagnosis, a cornerstone of effective treatment, is thoroughly discussed in **Chapter 10: Diagnosis of diabetes**, followed by comprehensive management strategies outlined in **Chapter 11: Management of diabetes**. Highlighting personalized care, **Chapter 12: Integrating temperament in diabetes management to enhance glycemic control** explores how tailoring treatment based on individual temperaments can improve outcomes.

The wider context of chronic diseases is considered in **Chapter 13: Non-communicable diseases**, situating diabetes within broader health concerns. The therapeutic potential of Unani medicine is showcased in **Chapter 14: Unani prescription for diabetes and clinical experience**, with **Chapter 15: How Unani drugs act as antidiabetic agents?** Explaining the pharmacological mechanisms behind herbal remedies.

Traditional formulations are examined in **Chapter 16: Traditional Unani formulations and their antidiabetic effects**, while **Chapter 17: Unani approaches for non-healing diabetic ulcers** addresses complex diabetic complications. The important but often neglected topic of diabetes and sexual health is thoughtfully explored in **Chapter 18: Diabetes and sexual problems and their management in Unani medicine - A burning issue**.

Practical guidance continues with **Chapter 19: Regimens for diabetes** and an emphasis on natural therapies in **Chapter 20: Plant-based therapeutics for diabetes: A Unani perspective**. Preventive care, rooted in holistic principles, is discussed in **Chapter 21: Preventive approach to diabetes**.

This compilation aims to be an essential resource for students, healthcare professionals, and researchers interested in integrating traditional Unani wisdom with contemporary diabetes care. It aspires to enhance knowledge and improve clinical outcomes for this widespread and challenging condition, presenting a holistic framework.

# Table of Contents

|                                                                                                          |     |
|----------------------------------------------------------------------------------------------------------|-----|
| What is the Unani System of Medicine?.....                                                               | 1   |
| Introduction to Diabetes .....                                                                           | 19  |
| Historical Background of Diabetes .....                                                                  | 27  |
| A Historical Journey of Diabetes Mellitus: From Ancient Descriptions<br>to the Discovery of Insulin..... | 36  |
| Concept of Diabetes .....                                                                                | 48  |
| Etiology of Diabetes in Unani Medicine .....                                                             | 56  |
| Clinical Features of Diabetes .....                                                                      | 64  |
| Risk Factors for Diabetes.....                                                                           | 73  |
| Complications of Diabetes.....                                                                           | 80  |
| Diagnosis of Diabetes.....                                                                               | 89  |
| Management of Diabetes .....                                                                             | 97  |
| Integrating Temperament in Diabetes Management to Enhance<br>Glycemic Control.....                       | 104 |
| Non-Communicable Diseases .....                                                                          | 112 |
| Unani Prescription for Diabetes and Clinical Experience .....                                            | 127 |
| How do Unani Drugs act as antidiabetics? .....                                                           | 136 |
| Traditional Unani Formulations and Their Antidiabetic Effects.....                                       | 144 |
| Unani Approaches for Non- Healing Diabetic Ulcers.....                                                   | 159 |
| Diabetes and Sexual Problems, and their management in Unani<br>Medicine Burning Issue.....               | 170 |
| Regimes for Diabetes .....                                                                               | 179 |
| Plant-Based Therapeutics for Diabetes: A Unani Perspective .....                                         | 191 |
| Preventive Approach to Diabetes .....                                                                    | 203 |
| Acknowledgement.....                                                                                     | 219 |



# What is the Unani System of Medicine?

## Abstract

This chapter presents a comprehensive exploration of the Unani system of medicine, a time-honored tradition rooted in classical Greek medical teachings and refined during the Islamic Golden Age. Tracing its evolution from the foundational works of *Hippocrates* and *Galen* to the sophisticated contributions of scholars such as *Al-Razi* and *Ibn Sina*, the chapter elucidates the integration of Greek philosophies with indigenous practices, particularly as they developed in the Indian subcontinent. At its core, Unani medicine emphasizes the balance of four humors-blood, phlegm, yellow bile, and black bile-and the concept of *Mizaj*, or temperament, as essential determinants of health and disease. Detailed discussions on diagnostic methodologies, including pulse examination and excretory analysis, underscore a holistic approach that incorporates observational techniques with personalized treatment strategies. Therapeutic modalities are examined through regimenal, medicinal, and dietary interventions, highlighting the use of herbal formulations, mineral compounds, and lifestyle modifications to restore humoral equilibrium. The chapter also reviews traditional methods of drug preparation and modern efforts toward standardization and quality control, underscoring the system's evolving nature. Recent scientific evaluations reveal promising antioxidant, anti-inflammatory, and metabolic benefits of Unani remedies, supporting their integration with contemporary healthcare. This interdisciplinary review bridges ancient wisdom and modern practice, urging rigorous scientific validation, standardization, and collaborative research to effectively integrate Unani methodologies into evidence-based, holistic healthcare frameworks worldwide. By synthesizing historical insights with clinical trials, the chapter

reaffirms the relevance of traditional Unani practices and highlights strategies for future integration and research, fostering dialogue between ancient wisdom and modern medical paradigms.

## **1. Introduction**

The Unani system of medicine is a time-honored tradition that finds its roots in the classical medical teachings of ancient Greece and was further refined and developed in the Islamic world. Also known as Greco-Arabic medicine, Unani medicine integrates philosophy, natural sciences, and clinical practices to offer a holistic approach to health and disease management. Emphasizing the balance of natural humors and the maintenance of a harmonious temperament, the Unani system offers unique insights into preventive, diagnostic, and therapeutic strategies. This chapter provides an in-depth review of the historical evolution, underlying principles, diagnostic techniques, therapeutic interventions, and the modern relevance of Unani medicine.

## **2. Historical background**

### **2.1.Origins and evolution**

Unani medicine finds its intellectual origins in the ancient medical teachings of Hippocrates and Galen. The Greek physician Hippocrates (c. 460 - c. 370 BC) laid the groundwork with his concept of the four humors-blood, phlegm, yellow bile, and black bile-each associated with particular temperaments and bodily functions. *Galenic medicine* later refined these ideas, establishing a framework that would endure for centuries. As the Greek texts were translated into Arabic during the early medieval period, these concepts were absorbed, expanded, and systematized by scholars in the Islamic world.

### **2.2.The Islamic golden age and integration of Greek medicine**

Between the 8th and 14th centuries, the Islamic Golden Age became a vibrant center for learning. Physicians and scholars such as *Al-Razi* (Rhazes) and *Ibn Sina* (Avicenna) not only translated Greek medical texts into Arabic but also added their own clinical observations and

philosophical insights. Avicenna’s seminal work, the *Canon of Medicine*, served as a comprehensive encyclopedia of medical knowledge and became a standard reference in both the Islamic world and later in Europe. Unani medicine during this era was characterized by its emphasis on observation, clinical reasoning, and the integration of both natural philosophy and empirical data.

**2.3.Development in the Indian subcontinent**

The arrival of Unani medicine in the Indian subcontinent marked another significant phase in its evolution. Introduced by Muslim rulers and scholars, the Unani system gradually fused with local traditions, including Ayurveda. In regions like North India, Pakistan, and Bangladesh, Unani medicine took on distinctive regional features while retaining its classical humoral framework. Numerous Unani academies and research centers were established, further systematizing the practice and promoting research. This cross-cultural interaction enriched the pharmacopoeia and the therapeutic approaches, allowing the system to adapt to the diverse climatic and cultural milieu of the region.

**3. Philosophical and theoretical foundations**

**3.1.The Humoral theory**

At the core of Unani medicine lies the humoral theory. According to this paradigm, human health depends on the balance of four primary humors. Below is a table summarizing the four primary humors in Unani medicine, highlighting their Unani terms, inherent qualities, associated temperaments, and general roles in the human body:

| Humor | Unani Term | Inherent Qualities | Associated Temperament | General functions/Implications                                                                         |
|-------|------------|--------------------|------------------------|--------------------------------------------------------------------------------------------------------|
| Blood | <i>Dam</i> | Hot and moist      | Sanguine (hot & moist) | Supports vitality, nourishment, and circulatory functions; excess may lead to inflammatory conditions. |

|             |                |                |                           |                                                                                                                    |
|-------------|----------------|----------------|---------------------------|--------------------------------------------------------------------------------------------------------------------|
| Phlegm      | <i>Balgham</i> | Cold and moist | Phlegmatic (cold & moist) | Provides cooling and lubrication; surplus can result in sluggishness and dampness in the body.                     |
| Yellow Bile | <i>Safra</i>   | Hot and dry    | Choleric (hot & dry)      | Aids in digestion and metabolic processes; imbalance may trigger irritability and hyperactivity.                   |
| Black Bile  | <i>Sauda</i>   | Cold and dry   | Melancholic (cold & dry)  | Contributes to bodily structure and stability; excessive amounts are linked to rigidity and depressive tendencies. |

This table encapsulates the core aspects of the humoral theory as applied in Unani medicine, where maintaining the balance among these humors is considered essential for health. Each humor is associated with specific qualities, such as hot, cold, moist, or dry. Disease is understood as an imbalance or disturbance in the proportions of these humors, and restoring equilibrium is the fundamental goal of therapy.

### 3.2.The concept of temperaments

The concept of temperament extends the humoral theory by categorizing individuals according to their predominant humor. A person's temperament is believed to influence not only their physical constitution but also their mental, emotional, and behavioral characteristics. For instance, an individual with a "hot and dry" temperament may be predisposed to conditions associated with an excess of *Safra* (yellow bile), while a "cold and moist" temperament might correlate with an abundance of *Balgham* (phlegm). Therapeutic interventions are thus tailored to correct the specific imbalance in temperament, ensuring that both preventive and curative measures are personalized.

### **3.3.The role of the elements and qualities**

Unani philosophy is also rooted in the classical elements-earth, water, air, and fire. These elements correspond to the qualities found in the humors and are used to explain the dynamic nature of health and disease. In this view, food, environmental factors, and even emotional states are seen as influences that can modify the balance of the humors. For example, consumption of certain foods can increase the “hot” quality in the body, exacerbating conditions linked to excess bile. Thus, dietary recommendations and lifestyle adjustments form an integral part of Unani practice.

## **4. Diagnostic principles and methodologies**

### **4.1.Pulse diagnosis (*Nabz*)**

Pulse examination is one of the most distinctive diagnostic tools in Unani medicine. Practitioners assess the pulse (*Nabz*) not only for its rhythm and rate but also for qualities such as strength, volume, and the character of the beats. Detailed knowledge of pulse patterns allows Unani physicians to infer the state of the humors and the overall temperament of the patient. Variations in the pulse can suggest imbalances, such as a “rapid” pulse in conditions of excess heat or a “thready” pulse indicating deficiency.

### **4.2.Urine and other excretory analysis**

In addition to pulse diagnosis, traditional Unani practitioners examine other bodily excretions. Urine, known as *Baul*, is carefully observed for its color, consistency, odor, and taste. Historically, a sweet taste in urine was a critical diagnostic clue, especially in conditions like *Madhumeha* (diabetes mellitus), where the presence of sugar was a defining feature. Similarly, analysis of stool (*Braz*) and even sweat or saliva may provide further insights into the internal balance of humors. These observations are integrated with the overall clinical picture to arrive at a diagnosis.

### 4.3.Observational techniques and comprehensive evaluation

Unani diagnostic methodology is inherently holistic. Beyond pulse and excretory analysis, physicians observe the patient's general appearance, skin quality, and behavioral traits. The practitioner may inquire about sleep patterns, appetite, bowel habits, and even the patient's voice. A comprehensive evaluation is conducted by correlating these diverse clinical findings with the principles of temperament and humoral imbalance. This multi-faceted approach ensures that diagnosis is not limited to isolated symptoms but reflects the patient's overall health status.

## 5. Therapeutic approaches and treatment modalities

### 5.1.Regimenal therapy

Regimenal therapy constitutes the non-pharmacological aspect of Unani treatment. It includes various lifestyle modifications aimed at restoring the natural balance of the humors. These measures are known collectively as *Ilaj-Bil-Tadbeer*. Below is a table summarizing the regimenal therapy modalities from Unani medicine, outlining each intervention along with its description and the intended benefits. Below is an expanded table that now includes the additional therapeutic modalities along with their descriptions and intended outcomes/benefits:

| Therapeutic modalities | Description                                                                                          | Intended Outcomes/Benefits                                                                         |
|------------------------|------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| Dietary Regulation     | Adjusting the quantity and quality of food to align with and harmonize the individual's temperament. | Promotes a balanced humoral state and supports overall health through tailored nutrition.          |
| Physical Exercise      | Encouraging regular physical activity to boost metabolism and maintain humoral balance.              | Enhances metabolic functions, improves circulation, and supports the equilibrium of bodily humors. |

|                                 |                                                                                                                                                   |                                                                                                                                        |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| Lifestyle Modifications         | Implementing recommendations on sleep, stress management, and controlling environmental exposures.                                                | Improves rest quality, reduces stress, and creates an environment conducive to balanced health.                                        |
| Hydrotherapy                    | The use of water in various forms (immersion, baths, and compresses) to stimulate healing processes and balance bodily functions.                 | Promotes improved circulation, relaxation of muscles, reduced inflammation, and aids in restoring humoral equilibrium.                 |
| <i>Fasd</i> (Venesection)       | A traditional bloodletting technique used to remove a controlled amount of blood to reduce excess or stagnant humors.                             | Helps detoxify the body, restore humoral balance, and improve circulation by eliminating accumulated impurities.                       |
| <i>Hijama</i> (Cupping Therapy) | A procedure where suction cups are applied to the skin to draw blood to the surface, facilitating the removal of toxins and improving blood flow. | Enhances circulation, alleviates pain, and reduces inflammation by removing stagnant blood and promoting detoxification.               |
| <i>Taleeqe</i> (Leech Therapy)  | The application of medicinal leeches to extract blood in a controlled manner, utilizing enzymes in the leeches' saliva to aid healing.            | Promotes improved blood flow, reduces venous congestion, and supports the removal of toxins, contributing to a balanced humoral state. |

This table provides a structured view of each modality, enabling comparison of how they contribute to restoring and maintaining a balanced humoral state through various therapeutic approaches.

## 5.2. Pharmacotherapy

Medicinal therapy in Unani medicine focuses on the use of natural substances to correct humoral imbalances. Referred to as *Ilaj-Bil-Dawa*, this approach involves:

| Components                  | Description                                                                                                                              | Examples/Ingredients & preparation methods                                                                                                         |
|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| Herbal Medicines            | Use of a wide variety of plants, roots, and barks tailored to the patient's specific temperament.                                        | Bitter herbs (to counteract excess bile) and other botanicals are commonly prepared as decoctions, infusions, or powders.                          |
| Mineral and Animal Products | Incorporation of specific mineral compounds and animal derivatives based on their perceived qualities and effects on the body's balance. | Examples include mineral compounds (e.g., zinc oxide) and animal derivatives (e.g., honey, milk), processed and purified before use.               |
| Customized Formulations     | Personalized prescriptions that combine several ingredients to achieve synergistic therapeutic effects.                                  | Blends of herbal, mineral, and animal products; prepared using methods such as decoctions, tinctures, or powders to optimize medicinal properties. |

**Note:** This table summarizes the core aspects of Unani medicinal preparation, highlighting how traditional remedies are tailored to balance the body's humors and address individual temperaments.

### 5.3.Diet and nutrition

Nutrition occupies a central role in the Unani therapeutic framework. Known as *Ilaj-Bil-Ghiza*, dietary management is predicated on the idea that food is medicine. The guidelines include:

| Aspects                              | Description                                                                                                                                          |
|--------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| Balancing the Humors                 | Foods are classified according to their inherent qualities (hot, cold, moist, or dry). Dietary adjustments are recommended to neutralize imbalances. |
| Seasonal and Regional Considerations | Dietary advice is tailored to the seasons and the patient's local environment, reflecting the dynamic nature of humoral balance.                     |

|                         |                                                                                                                                             |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| Personalized Meal Plans | Individualized meal plans are developed based on the patient's temperament and condition to promote health and prevent disease progression. |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|

## 5.4. Behavioral and lifestyle counseling

In addition to physical therapies, Unani medicine emphasizes the importance of mental and emotional well-being.

| Aspects                          | Description                                                                                                                                                               | Intended Outcomes/Benefits                                                                                  |
|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
| Stress Reduction Techniques      | Meditation, breathing exercises, and other relaxation techniques are recommended to reduce emotional disturbances that may upset the balance of the humors.               | Reduces emotional disturbances and helps maintain a balanced humoral state.                                 |
| Sleep and Rest                   | Adequate rest is considered essential for the body's restorative processes. An Unani physician's advice on proper sleep hygiene tailored to the individual's temperament. | Enhances restorative processes, improves sleep quality, and supports overall humoral balance.               |
| Social and Environmental Factors | Attention is given to the patient's overall lifestyle, including work habits, family relationships, and environmental exposures, all of which can influence health.       | Promotes holistic well-being by addressing lifestyle factors that influence health and humoral equilibrium. |

## 6. Pharmacology in Unani medicine

### 6.1. Traditional herbal formulations and natural remedies

Herbal medicine is perhaps the most recognized component of Unani therapeutics. The Unani pharmacopoeia is vast, with hundreds of plants documented for their medicinal properties. Each herb is characterized

by its intrinsic qualities and its ability to modify the humoral balance. For example:

| Common name | Botanical name                                                                                                       | Parts used            | Family                                                                                                                 | Mechanism of action                                                                                                                                      | Therapeutic uses                                                                                             |
|-------------|----------------------------------------------------------------------------------------------------------------------|-----------------------|------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|
| Triphala    | <i>Embllica officinalis</i> (Amalaki), <i>Terminalia bellirica</i> (Bibhitaki), <i>Terminalia chebula</i> (Haritaki) | Fruits                | <i>Embllica officinalis</i> : Phyllanthaceae<br><i>Terminalia bellirica</i> & <i>Terminalia chebula</i> : Combretaceae | The combined fruits work synergistically as a digestive stimulant and antioxidant. They help regulate gastrointestinal motility and detoxify the system. | Balances digestion, detoxifies the body, acts as a mild laxative, and supports immune health.                |
| Guggul      | <i>Commiphora mukul</i>                                                                                              | Resin (Oleogum-resin) | Burseraceae                                                                                                            | Active compounds such as guggulsterones modulate lipid metabolism and exert anti-inflammatory effects by regulating inflammatory mediators.              | Treats metabolic disorders (e.g., hyperlipidemia, obesity) and inflammatory conditions, including arthritis. |
| Aloe Vera   | <i>Aloe barbadensis</i> Miller                                                                                       | Leaves (Gel)          | Asphodelaceae                                                                                                          | Contains bioactive compounds that provide anti-inflammatory, antioxidant,                                                                                | Soothes and heals skin (e.g., burns, wounds), aids digestion, acts as a moisturizer,                         |

|  |  |  |  |                                                                                    |                           |
|--|--|--|--|------------------------------------------------------------------------------------|---------------------------|
|  |  |  |  | and wound-healing properties. They promote skin regeneration and soothing effects. | and reduces inflammation. |
|--|--|--|--|------------------------------------------------------------------------------------|---------------------------|

## 6.2.Mineral and animal-derived products

Alongside botanical remedies, Unani medicine employs minerals and animal products. These ingredients are believed to possess unique qualities that complement herbal medicines. For instance:

**Table: Mineral derived products in Unani medicine**

| Category        | Substance                   | Source/Type      | Traditional uses in unani medicine                                                  |
|-----------------|-----------------------------|------------------|-------------------------------------------------------------------------------------|
| Mineral-derived | <i>Kushta Qalai</i>         | Tin calx         | Used for diabetes, male infertility, and as a tonic for general debility            |
|                 | <i>Kushta Sadaif</i>        | Pearl calx       | Strengthens the brain and heart, used in anxiety, palpitations, and sexual debility |
|                 | <i>Kushta Marjan</i>        | Coral calx       | Used in heart diseases, acidity, liver disorders, and general debility              |
|                 | <i>Shilajit (Asphaltum)</i> | Mineral exudate  | Acts as a rejuvenator; used in urinary issues, diabetes, and general weakness       |
|                 | <i>Sang-e-Maryam</i>        | Silicate mineral | Used for kidney stones, dysuria, and urinary retention                              |
|                 | <i>Hajrul Yahoood</i>       | Siliceous stone  | Dissolves urinary and gall stones, used in dysuria and renal colic                  |

|  |                                                  |                        |                                                                     |
|--|--------------------------------------------------|------------------------|---------------------------------------------------------------------|
|  | <i>Nushaadar</i><br>( <i>Ammonium chloride</i> ) | Natural mineral salt   | Expectorant, digestive, and used for cough and inflammation         |
|  | <i>Qalmi Shora</i>                               | Potassium nitrate      | Cooling agent; used in urinary complaints, inflammation, and fevers |
|  | <i>Sang-e-Surma</i>                              | Antimony-based mineral | Used in eye diseases; has antibacterial and cooling effects         |

**Table: Animal-derived products in Unani medicine**

| Category       | Substance                           | Source/Type                 | Traditional uses in unani medicine                                               |
|----------------|-------------------------------------|-----------------------------|----------------------------------------------------------------------------------|
| Animal-derived | Honey ( <i>Asal</i> )               | Bee secretion               | Used as a carrier in medicines, antibacterial, digestive, and wound healing.     |
|                | Mahiya (Fish oil)                   | Extracted from fish         | Strengthens brain and nerves; useful in rheumatism and joint disorders           |
|                | <i>Kharateen Musaffa</i>            | Purified earthworms         | Used in epilepsy, paralysis, and as a nerve tonic                                |
|                | <i>Samandar Khushk</i>              | Dried salamander            | Rarely used; employed in aphrodisiac preparations                                |
|                | Ambergris ( <i>Ambar-e-Ashhab</i> ) | Sperm whale secretion       | Rare aphrodisiac, nervine tonic, and used in elite Unani tonics                  |
|                | Oyster Shell ( <i>Sadaf</i> )       | Marine mollusk shell        | Used in <i>Kushta</i> form; cardiac and sexual tonic                             |
|                | Deer's Musk ( <i>Mushk</i> )        | Glandular secretion of deer | Used in nervous disorders, as an aphrodisiac and stimulant                       |
|                | Silk Cocoon ( <i>Abresham</i> )     | Silkworm cocoon             | Cardiotonic; used in Unani cardiac formulations like <i>Dawa-ul-Misk Motadil</i> |

**Note:** These ingredients are meticulously processed and purified before use, adhering to traditional protocols that have been refined over centuries.

### **6.3.Methods of drug preparation and standardization**

Preparation methods in Unani pharmacology are considered an art as much as a science. Techniques such as decoction, distillation, and powdering are used to extract and concentrate the active ingredients. While classical texts provide detailed instructions, contemporary practitioners and researchers have worked toward standardizing these methods to ensure consistency and quality. Modern quality control measures, when integrated with traditional practices, help in validating the safety and efficacy of Unani formulations.

## **7. Contemporary research and integration**

### **7.1.Modern scientific evaluations of unani remedies**

In recent decades, there has been increasing scientific interest in evaluating the pharmacological properties of Unani remedies. Research studies have investigated. For Example.

| <b>Category</b>                           | <b>Description</b>                                                                                        | <b>Examples/Applications</b>                                                                                    |
|-------------------------------------------|-----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| Antioxidant and Anti-inflammatory Effects | Unani herbs exhibit significant antioxidant properties, helping reduce inflammation and oxidative stress. | Useful in managing chronic diseases like arthritis, cardiovascular conditions, and neurodegenerative disorders. |
| Metabolic Modulation                      | Herbal formulations impact lipid profiles, blood glucose levels, and insulin sensitivity.                 | Supports traditional use in diabetes, obesity, and metabolic syndrome management.                               |
| Clinical Trials                           | Small-scale clinical studies validate the efficacy of Unani                                               | Arthritis, gastrointestinal disorders, diabetes, and respiratory ailments.                                      |

|                            |                                                                                                     |                                                                                       |
|----------------------------|-----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|                            | remedies in various conditions.                                                                     |                                                                                       |
| Immunomodulatory Activity  | Certain Unani herbs enhance or regulate the immune response, aiding disease resistance.             | Potential use in infections, autoimmune diseases, and immunodeficiency conditions.    |
| Antimicrobial Effects      | Some Unani remedies demonstrate antibacterial, antiviral, and antifungal activities in lab studies. | Useful in managing infectious diseases and wound healing.                             |
| Neuroprotective Properties | Herbs showing protective effects against neuronal damage and cognitive decline.                     | Possible applications in neurodegenerative diseases like Alzheimer's and Parkinson's. |
| Hepatoprotective Effects   | Remedies that protect liver cells from damage and improve liver function.                           | Used traditionally for liver disorders, supported by experimental evidence.           |
| Safety and Toxicology      | Studies evaluating the safety profile and toxicity levels of Unani formulations.                    | Ensures safe integration of Unani remedies with modern medicine.                      |

**Note:** These efforts have not only validated traditional knowledge but have also paved the way for the assimilation of the Unani principles into complementary and integrative healthcare models.

## **7.2.Integration with modern healthcare**

The integration of Unani medicine with modern healthcare is an evolving process. Many practitioners today advocate a

complementary approach where conventional medical treatments are enhanced by Unani therapies.

| Aspects                    | Description                                                                                                                                                                                    |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Preventive Health          | Unani regimens emphasize proper diet, exercise, and lifestyle modifications, which align well with modern preventive medicine strategies aimed at reducing the risk of disease.                |
| Chronic Disease Management | For chronic conditions such as diabetes, hypertension, and arthritis, Unani treatments may offer additional benefits-particularly in symptom management and improving overall quality of life. |
| Holistic Approach          | The Unani system's focus on the mind-body connection complements the biopsychosocial model of modern medicine, promoting a comprehensive approach to patient care.                             |

### 7.3.Challenges and future directions

Despite its long history and widespread use, Unani medicine faces several challenges:

| Challenges              | Description                                                                                                                                              |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Scientific Validation   | There is a continuing need for rigorous clinical trials and pharmacological studies to confirm the efficacy and safety of traditional remedies.          |
| Standardization         | Variability in drug preparation and a lack of uniform quality control standards can hinder the integration of Unani products into mainstream healthcare. |
| Regulatory Issues       | In many countries, Unani medicine exists in a regulatory gray area, complicating efforts to standardize practices and ensure patient safety.             |
| Educational Integration | Bridging the gap between traditional Unani education and modern biomedical sciences remains a significant task for institutions promoting this system.   |

Future research, coupled with government and institutional support, is essential for overcoming these challenges. The incorporation of modern technologies in drug standardization, along with interdisciplinary collaborations, holds promise for the continued evolution and global acceptance of Unani medicine.

## **Conclusion**

The Unani system of medicine embodies a rich heritage that seamlessly fuses ancient Greek medical principles with the advanced practices of the Islamic Golden Age. Rooted in humoral theory and balanced temperaments, it emphasizes the dynamic interplay between body, mind, and environment. Its distinctive diagnostic methods—from pulse examination to detailed analysis of bodily excretions—paired with regimenal, medicinal, and dietary therapies, provide a comprehensive, holistic approach to health. In today's era, where integrative healthcare is increasingly valued, Unani medicine offers both enduring wisdom and practical strategies that complement modern treatments. Despite ongoing challenges in scientific validation and standardization, continuous research and collaboration between traditional practitioners and biomedical experts are strengthening its role. Unani medicine's focus on individualized care, preventive measures, and holistic treatment remains relevant for addressing chronic health issues and promises enhanced credibility and global integration in future healthcare practices. This enduring system continues to inspire innovative modern integrative medicine.

## **Bibliography:**

1. Ahmad W, Sofi G, Alam MA, Zulkifle M, Ahmad B. Understanding Holism in the light of principles underlying the practice of Unani Medicine. *Rev Environ Health*. 2021 May 13;37(2):189-199. doi: 10.1515/reveh-2021-0009.
2. Rhazi Z. *Al-Hawi Fit Tib*. Vol 10. Central Council for Research in Unani Medicine, New Delhi. Ministry of Health & Family Welfare, Govt. Of India; 2002:181-187.

3. Kirmani NBA. Kuliyat-E-Nafeesi. Urdu Translation by Hkm. Kabeeruddin. Idara Kitabus Shifa, New Delhi. YNM;
4. Arzani HA. Tibbe Akbar. Urdu Translation by Hkm. Mohd. Husain. Faisal Publication Deoband UP; YNM: 525-526.
5. Qurshi MH. Jam-Ul-Hikmat. Idara Kitab Us Shifa New Delhi; 2011; 864-873.
6. Majusi AIA. Kamil Al-San't. Vol 2, Part II. Central Council for Research in Unani Medicine, New Delhi. Ministry of Health & Family Welfare, Govt. Of India: 2010:192-193
7. Sina I. Al-Qanoon Fit Tib. Vol 3. Urdu Translation by G. Kantoori. Published By Idara Kitab Us Shifa, New Delhi; 2010:1031-1033.
8. Jurjani I. Zakhira Kharzam Shahi. Vol 6. Urdu Translation by Hkm. Hadi Husain. Published By Idara Kitab Us Shifa, New Delhi; 2010:540-541.
9. Zuhr I. Kitab Al-Taiseer. Central Council for Research in Unani Medicine, New Delhi. Ministry of Health & Family Welfare, Govt. of India; 1986:160-163.
10. Baghdadi IH. Kitab Al Mukhtaratfit-Tibb. Vol 3. Central Council for Research in Unani Medicine, New Delhi. Ministry of Health & Family Welfare, Govt. of India; 2004:326-328.
11. Khan MA. Akseer-E-Azam. Urdu Translation by Hkm. Kabeeruddin. Idara Kitab Us Shifa New Delhi; 2011:705-709.
12. Nazamuddin M, Wadud A, Ansari AH, Alam T, Perveen A, Iqbal N. Concept of diabetes in the unani system of medicine: An overview. Medical Journal of the Islamic World Academy of Sciences. 2014 Jul;109(1567):1-6.
13. Anzar MA, Shamim A, Nafis H, Tanwir MA. Drugs Indicated for The Management of Ziabetus Shakri (Diabetes Mellitus in Unani

Medicine Overview. International Journal of Pharmamedix India 2013;1(3):460-74.

14. Alam A, Quamri S, Fatima S, Roqaiya M, Ahmad Z. Efficacy of Spirulina (Tahlab) in Patients of Type 2 Diabetes Mellitus (Ziabetus Shakri)-A Randomized Controlled Trial. Journal of diabetes & metabolism. ISSN, J Diabetes Metab. 2016 Oct 1;7(10):6155-6.
15. Eqbal K, Alam MA, Quamri MA, Sofi G, Ahmad Bhat MD. Efficacy of *Qurs-e-Gulnar* in Ziabetus (type 2 Diabetes Mellitus): a single blind randomized controlled trial. J Complement Integr Med. 2020 Jun 18;18(1):147-153.
16. Quamri MA, Begum S, Siddiqui MA, Alam MA. Efficacy of Kanduri (*Coccinia indica*) in diabetes associated dyslipidemia randomized single-blind standard controlled study. Age (Mean $\pm$ SD): 43(7.845):44-9.
17. Azami AA. Development of Unani medicine during the Mughal period. Bull Indian Inst Hist Med Hyderabad. 1994 Jan;24(1):29-39.

# Introduction to Diabetes

## Abstract

Diabetes mellitus is a chronic metabolic disorder characterized by elevated blood glucose levels due to impaired insulin secretion, action, or both. It is a major global health concern, affecting millions worldwide and leading to severe complications if left unmanaged. This chapter provides an introduction to diabetes, exploring its fundamental aspects, classification, and significance in modern medicine. The historical perspective of diabetes dates back to ancient civilizations, with early descriptions found in Egyptian, Indian, and Greek medical texts. The term “diabetes” was first coined by the Greek physician Aretaeus of Cappadocia, while “mellitus” was later added by Thomas Willis in the 17th century to describe the sweet nature of diabetic urine. Over centuries, the understanding of diabetes evolved, from being a mysterious wasting disease to a well-characterized metabolic disorder. Landmark discoveries, including the identification of insulin by Banting and Best in 1921, revolutionized diabetes management, transforming it from a fatal condition to a manageable one. This chapter also highlights key milestones in diabetes research, from early diagnostic methods to advancements in treatment and prevention strategies. By tracing the historical journey of diabetes, we gain a deeper appreciation of how scientific progress has shaped current medical approaches. Understanding diabetes from both a contemporary and historical perspective is crucial for addressing its growing burden and developing innovative therapeutic solutions.

## Introduction

Diabetes was first reported in approximately 1500 BC. The term ‘mellitus’ is the Latin word for honey and refers to the sweetness of urine. Early treatment consisted of high-fat diets and high-protein diets. Opium was used to alleviate suffering. Gustave Laguesse, a French

physician, named the islets of Langerhans. Frederick Banting and John Macleod were awarded the Nobel Prize in 1923 for discovering insulin. Diabetes is a chronic metabolic disease characterized by elevated levels of blood glucose (or blood sugar), which leads over time to serious damage to the heart, blood vessels, eyes, kidneys, and nerves. The most common type is type 2 diabetes, usually in adults, which occurs when the body becomes resistant to insulin or doesn't make enough insulin. In the past three decades, the prevalence of type 2 diabetes has risen dramatically in countries of all income levels. Type 1 diabetes, once known as juvenile diabetes or insulin-dependent diabetes, is a chronic condition in which the pancreas produces little or no insulin by itself. For people living with diabetes, access to affordable treatment, including insulin, is critical to their survival. Both the number of cases and the prevalence of diabetes have been steadily increasing over the past few decades. International Diabetes Federation has declared that now a day Diabetes is one of the biggest global health issues of the 21<sup>st</sup> century for both physicians and patients. Most individuals are vulnerable to this disorder each year, which can lead to life-threatening complications. Long-term effects of diabetes can lead to damage and dysfunction of various vital organs. Deadly glycemic control may lead to microvascular (diabetic retinopathy, nephropathy, and neuropathy) and macrovascular (ischemic heart disease, peripheral vascular diseases, and cerebrovascular disease) complications with risk of diabetic foot ulcer, amputation, Charcot joints, and features of autonomic dysfunction, including sexual dysfunction. People with diabetes are at increased risk of cardiovascular, peripheral vascular, and cerebrovascular diseases.

The number of people with diabetes is rising in every country. Half of the people with diabetes don't know they have it, 80 % people with diabetes live in low and middle-income countries, and half of the people who die from diabetes are under the age of 60. Every six seconds, a person dies from diabetes or diabetes associated comorbid disease. Currently, the cost of diabetes care is high and is escalating

worldwide. This dreadful disease is more common among peoples who resides in urban areas.

The history of diabetes has its beginnings in antiquity. This disease has seemed to that outbreak around for man since a long time. The script from the earliest culture (i.e., Egypt, Asia Minor, China, and India) consigns to boils, infections, polydipsia, loss of weight, and excessive honey-sweet urine, which frequently drew ants and flies. There is a source to the diabetic status dating back to 1500 BC in the *Ebers Papyrus* and revealed by the Egyptologist *Georg Ebers* in Thebes in 1872. This suggested that a person afflicted with this malady should go on a diet of beer, fruits, grains, and honey, which diet that was reputed to choke the polyuria. Indian script from the same era assigned the disease to over-tolerance of food and drink. Later on *Hearst* and *Berlin* medical *papyrus* also provides recipes against polyuria. The first known clinical explanation regarding diabetes emerge to have been made by Aulus Cornelius Celsus (c.30 BC – 50 AD); but it was also explained by Aretaeus of Cappadocia (81-133AD) who afford a complete and accurate picture and introduced the name “diabetes” from the Greek word for “siphon,” which means run through.

**Galen** (119-200 AD) records the diverse, descriptive names for diabetes: dropsy into the pot, diarrhoea of the urine, and the thirsty disease. He also mentioned the polydipsia, and the patients passed in the urine as much liquid as they had drunk in terms of polyuria. Galen stresses that the site of action was in the kidneys because of a weakness in their retentive faculties and not in the stomach. The treatment of diabetes during ancient times, if indeed there was one, did not contribute to improving the quality of life. **Aetius Amidinus** during the 6<sup>th</sup> century AD prescribed a cooling temperament diet, diluted wine, and a cooling appliance to the loins as a treatment for diabetes, and lastly, he also used opiates and mandragors.

**Paul of Aegina** (c.650 AD) evaluated the diagnosis of “*dypsacus*” (causing thirst), linked with the fault of the kidneys and an overload of moisture from the body, leading to dehydration of fluids. He prescribed

a therapy of pot-herbs, endive, lettuce, rock-fishes, juices of knotgrass, elecampane in dark coloured wine, and decoctions of dates and myrtle to drink in the first stage of the ailment, followed by cataplasms to the hypochondrium over the kidneys consisting of *Sirka* (vinegar), *Roghan Gul* (rose oil), and navel-wort. He apprised against the use of *mudirrat* (diuretics), but *Fas'd* (venesection) was permitted.

**Avicenna** (980-1037), who depicted in his Canon of Medicine about *Ziabetus* as “*Al-dulab (Dulabiyya)*” or wheel of water and “*Zalaqul kulya*” or diarrhoea of the kidneys, *Mu‘attisha*, *Dawwariyya*, *Parkariyya*, and complications of diabetes, impotence (sexual problem), gangrene (*Ghangharana*), and furunculosis.

In the present scenario, due to the resemblance in clinical features of the disease, *Ziabetus Shakri* has been correlated with diabetes mellitus. Diabetes is a group of metabolic diseases characterized by hyperglycaemia resulting from defects in insulin secretion, insulin action, or both. The chronic condition of diabetes is linked with organ dysfunction.

There are four types of diabetes, such as Type-1 (IDDM), Type-2 (NIDDM), other specific & gestational diabetes mellitus. Type-2 DM is the most common form of diabetes, affecting 90-95 % cases in which the body does not produce enough insulin or properly use it in the body.

Diabetes Mellitus is usually linked with progressive ageing, high-fat diet, obesity, lack of physical activity, or sedentary lifestyle. It is characterized by impaired insulin secretion, peripheral insulin resistance, and excessive hepatic glucose production. Diabetes Mellitus leads to complications like blindness, renal failure, coronary artery disease, gangrene, and coma. Due to these dreadful complications, Diabetes has become a global problem despite tremendous advances in modern science. Diabetes remains a challenge for treating physicians today despite all the advances in pharmacotherapy and treating devices and the increasing emphasis on preventive measures. Owing to awful complications of Diabetes Mellitus and lack of quite safe and effective

drugs for its management, seeking better and secure curative agents becomes a thrust area for research, in every field of medical science.

In the Unani system of medicine, Diabetes Mellitus has been treated since the Greco-Arab period. Unani physicians depicted many safe and effective drugs as mentioned in their classical text and standard pharmacopeia, but most of the medicaments have not been evaluated based on surrogate markers. However, lifestyle changing measures may be inadequate or patient fulfillment, difficult, and providing conventional drug therapies may be necessary in many patients. As an alternative approach, Unani drugs, either single or compound prescriptions with hypoglycemic activities, are increasingly sought by diabetic patients and physicians. These medications should have an equal degree of value without the worrying side effects associated with these treatments. Hence, Alternative therapy for diabetes has become increasingly popular globally over the last few years. Presently, there is rising awareness towards herbal medicine, due to the harmful effects associated with the oral anti-hyperglycemic agents (Biguanides, and Sulphonylureas) for the management of diabetes mellitus. So the alternative herbal remedies, especially Unani medicines, which are obtained mainly from plants, play an important role in the management of diabetes mellitus.

Numerous drugs such as sulfonylureas, biguanides, and DPP-4 inhibitors are being approved to reduce blood sugar levels. But these drugs develop some serious side effects and are quite expensive; therefore, long-term use of these drugs is not possible. In Unani literature especially in *Al-Qanoon fil Tib*, *Kamil us Sana*, *Zakheera Khwarzm Shahi*, *Al-Mukhtarat Fit Tibb*, *Sharahe Asbab wal Alamat*, there are enough evidence regarding the effective use of various plant-based therapies that have been shown in some studies to have anti-diabetic properties include: *Post Kachna*, *Gurmar Booti*, *Tukhm Hayat*, *Tukhm Karela*, *Chiraita*, *Sibr*, *Spirulina*, *Maghz Jamun*, *Tukhm Hulba*, *Darchini*, *Zanjabeel*, *Darhald*, *Gilo*, *Turbud*, *Halela Zard*, *Halela Kabli*, *Halela Siyah*, *Barge Sana*, *Habbul Aas*, *Asgand*, *Jadwar* etc,

whereas some famous compound formulation along with lifestyle modification (i.e. maintains the *Asbab-e-Sitta Zarooriya*) are highly effective for the management of diabetes and diabetes associated complications with the help of pharmacotherapy approach like: *Qurs Ziabetus*, *Zulal Ziabetus*, *Qurs Gulnar*, *Qurs Kafoor*, *Qurs Tabasheer*, *Habbe Asgand*, *Safoof Gilo*, *Safoof Hindi*, *Habbe Jadwar* etc.

## **Conclusion**

Diabetes mellitus stands as a formidable global health challenge, characterized by persistently high blood glucose levels resulting from deficient insulin secretion, impaired insulin action, or both. This chapter has provided an essential overview of diabetes, detailing its fundamental aspects, classifications, and its profound impact on modern medicine. Tracing the evolution of our understanding of diabetes from ancient civilizations to the present reveals a remarkable journey. Early descriptions in Egyptian, Indian, and Greek texts laid the groundwork, while the naming by Aretaeus of Cappadocia and later refinement by Thomas Willis highlighted its distinct metabolic nature. The groundbreaking discovery of insulin by Banting and Best in 1921 marked a turning point, transforming a once fatal disease into one that can be managed effectively. Alongside the development of diagnostic tools and therapeutic interventions, these historical milestones have paved the way for current prevention and treatment strategies. Understanding the historical context of diabetes not only deepens our appreciation of past scientific progress but also underscores the need for continuous innovation in combating the disease. As the global burden of diabetes continues to rise, integrating both historical insights and contemporary research is imperative for developing novel, effective therapeutic solutions and preventive measures that can alleviate the extensive complications associated with this chronic metabolic disorder.

## **Bibliography:**

1. American Diabetes Association. 2. Classification and diagnosis of diabetes. *Diabetes care*. 2015 Jan 1;38(Supplement 1): S8-16.
2. American Diabetes Association. 2. Classification and diagnosis of diabetes: standards of medical care in diabetes—2018. *Diabetes care*. 2018 Jan 1;41(Supplement 1): S13-27.
3. American Diabetes Association. 2. Classification and diagnosis of diabetes: standards of medical care in diabetes—2019. *Diabetes care*. 2019 Jan 1;42(Supplement 1): S13-28.
4. Shah SN. *API Textbook of Medicine*. 9<sup>th</sup> Edition; Jaypee Brothers. New Delhi; 2012: 321-323.
5. Loriaux DL. Diabetes and the Ebers Papyrus: 1552 BC. *The Endocrinologist*. 2006 Mar 1;16(2):55-6.
6. King KM, Rubin G. A history of diabetes: from antiquity to discovering insulin. *British journal of nursing*. 2003 Oct 9;12(18):1091-5.
7. Ahmed AM. History of diabetes mellitus. *Saudi medical journal*. 2002 Apr 1;23(4):373-8.
8. Lakhtakia R. The history of diabetes mellitus. *Sultan Qaboos University Medical Journal*. 2013 Aug;13(3):368-370.
9. Karamanou M, Protogerou A, Tsoucalas G, Androutsos G, Poulakou-Rebelakou E. Milestones in the history of diabetes mellitus: The main contributors. *World journal of diabetes*. 2016 Jan 10;7(1):1.
10. Zajac J, Shrestha A, Patel P, Poretsky L. The main events in the history of diabetes mellitus. In *Principles of diabetes mellitus 2010* (pp. 3-16). Springer, Boston, MA.
11. Tattersall RB. The history of diabetes mellitus. *Textbook of diabetes*. 2017 Jan 23:1-22.
12. Sina I. *Kulliyate Qanoon*. by Hkm. Kabeeruddin) part 2. Shaikh Md. Basheer and Sons, Lahore. 2006:258-97.
13. Kirmani NBA. *Kulliyat-E-Nafeesi*. Urdu Translation by Hkm. Kabeeruddin. Idara Kitab Us Shifa, New Delhi. YNM;

14. Khan MA. Akseer-E-Azam. Urdu Translation by Hkm. Kabeeruddin. Idara Kitab Us Shifa New Delhi; 2011:705-709.
15. Qutubuddin. Clinical Study of *Ziabetes Shakri* (Diabetes Mellitus-II) and Evaluation of Efficacy of a Unani Formulation and Its Management. Dissertation. Rajiv Gandhi University of Health Sciences, Karnataka 2012.
16. Khan HA. Hazique. Jaseem Book Depot, New Delhi; 1983:387-390.
17. Qurshi MH. Jam-Ul-Hikmat. Idara Kitab Us Shifa New Delhi; 2011; 864-873.
18. Jurjani I. Zakhira Kharzam Shahi. Vol 6. Urdu Translation by Hkm. Hadi Husain. Published By Idara Kitab Us Shifa, New Delhi; 2010:540-541.
19. Zuhr I. Kitab Al-Taiseer. Central Council for Research in Unani Medicine, New Delhi. Ministry of Health & Family Welfare, Govt. of India; 1986:160-163.
20. Baghdadi IH. Kitab Al Mukhtaratfit-Tibb. Vol 3. Central Council for Research in Unani Medicine, New Delhi. Ministry of Health & Family Welfare, Govt. of India; 2004:326-328.
21. Arzani HA. Tibbe Akbar. Urdu Translation by Hkm. Mohd. Husain. Faisal Publication Deoband UP; YNM: 525-526.
22. Rhazi Z. Al-Hawi Fit Tib. Vol 10. Central Council for Research in Unani Medicine, New Delhi. Ministry of Health & Family Welfare, Govt. Of India; 2002:181-187.

# Historical Background of Diabetes

## Abstract

Diabetes mellitus, a chronic metabolic disorder, has been recognized for thousands of years, with its earliest descriptions dating back to ancient civilizations. Historical records from Egyptian, Indian, and Greek texts document symptoms of excessive thirst, frequent urination, and unexplained weight loss, characteristic of the disease. The term *diabetes* was first coined by the Greek physician Aretaeus of Cappadocia in the 2nd century CE, while the addition of *mellitus* (meaning “honey-sweet”) was introduced by Thomas Willis in the 17th century after observing the sweet taste of diabetic urine. In ancient times, diabetes was often considered a fatal wasting disease with no effective treatment. The medieval and Renaissance periods saw little progress in understanding its causes, though physicians began differentiating between types of diabetes. A breakthrough came in the 19th and early 20th centuries with the discovery of the pancreas’s role in glucose metabolism. This culminated in the groundbreaking isolation of insulin by Banting and Best in 1921, revolutionizing diabetes management. The historical trajectory of diabetes reflects a journey from mystical interpretations to scientific discoveries that have transformed its prognosis from a fatal condition to a manageable chronic disease. This chapter explores key historical milestones, from early descriptions to the advent of insulin therapy, highlighting the evolution of medical understanding and treatment approaches. By tracing the historical background of diabetes, we gain insight into the scientific advancements that continue to shape modern therapeutic strategies for this global health challenge.

## Introduction

This chapter, provides a historical account of diabetes events dating back to ancient times and its first documentation in the *Ebers Papyrus*,

an Egyptian text dating from about 1500 BC., and described below in different section as ancient period; Diabetes- A Disease of the Kidney; Diagnostic period; Diabetes- A Disease of the Pancreas; and Insulin Era. History and philosophy act as raw material for the generation of hypotheses and provide direction for research. History always plays a crucial role model for the development of ideas and applies to theories.

### **Ancient Period:**

Clinical aspects similar to diabetes mellitus were explained 3000 years ago by the ancient Egyptians. In Egypt, the first written documents describing diabetes were found in the *Ebers papyrus* by **George Ebers**, dated back to 1550 BC, as polyuria, which is similar to diabetes. Although the Greek physician **Hippocrates** (460 BC), the father of medicine, did not specifically mention diabetes in his writings, there are elucidate in the Hippocratic writings that are consistent with the signs and symptoms of diabetes. There are sources of excessive urinary flow with wasting of the body. The first entire clinical explanation of diabetes is said to have been made by **Aulus Cornelius Celsus** (30BC-50 AD). Often called “Cicero medicorum” for his elegant Latin, Celsus included the explanation of diabetes in his monumental eight-volume work entitled *De medicina*. The term “diabetes” (Greek-Siphon or ‘*diabainein*’) was first coined by **Araetus of Cappadocia** (81-133AD) and dramatically stated, “no essential part of the drink is absorbed by the body while great masses of the flesh are limbs (liquefied into urine.” **Galen** (129 CE - c. 216 CE), a Roman physician, observed that diabetes was a rare ailment as he had seen only two cases during their clinical observation. He mentioned the development of diabetes is due to weakness of the kidney and gave it a name, “*diarrhea of the urine*” (*diarrhea urinosa*), and the thirsty disease (*dipsakos*). Chinese (**Chang Chung-Ching** in 229 AD) and Japanese (**Li Hsuan**) literature explained a disease with sweet urine, which attracted dogs and insects. Such patients were more prone to develop boils and tuberculosis. Ancient Indian physicians **Susruta**, **Charaka**, and **Vaghbata** described during the 5<sup>th</sup> and 6<sup>th</sup> A.D, the sweet taste of urine in polyuric younger

patients and named it as “*Madhumeha* (honey urine)” and were able to identify two types of diabetes, later to be named Type-I and Type-II diabetes.

Ibn Sina (980-1037) was a great Persian physician wrote famous medical text “Canon of Medicine”, who termed the disease “*Al-Dulab*” (wheel of water) and “*Zalqul Kulliya*” (diarrhea of the kidneys), these terms used by *Jalinoos* and others Unani scholars, to the complications of the disease as those of mental troubles, impotence, gangrene and furunculosis. *Ibn Sina* was the first to write differentiating feature of diabetes associated with emaciation from other causes of polyuria.

### **Diabetes- A Disease of the Kidney:**

The first paradigm shift in the conceptual evolution of diabetes comes from the studies of Paracelsus (1493-1541), who describes it as a constitutional disease that “irritates the kidneys” and provokes excessive urination. Having evaporated the urine from a diabetic patient, Paracelsus reported an excessive residue, which he called “salts,” and described diabetes as an affection of the blood, being involved with salt particles, do run forth through the most open passages of the Reins (kidneys).

### **Diagnostic period:**

In 1675 AD, **Thomas Willis** added the word ‘mellitus’ (from the Latin for honey) to refer to the sweet taste of urine. In 1776 AD, **Matthew Dobson** confirmed that sugar was present in both the urine and blood of diabetic individuals. Early 18<sup>th</sup> Claude Bernard hypothesised that glycogen was stored by the liver and secreted as a sugary substance into the blood. Overproduction of glucose was considered to be the cause of diabetes.

### **Diabetes- A Disease of the Pancreas:**

In 1788 AD, **Thomas Cawley** discovered a correlation between shrunken pancreas and diabetic individuals. In 1889 AD **Joseph von Mering** and **Oscar Minkowski** discovered that the removal of a pancreas from a dog led to diabetes. In 1893 AD **Gustave Edouard Laguesse** suggested that pancreatic islet cells were involved in

diabetes and named them the Islets of Langerhans. In 1894 A.D., **Moses Barron** linked damaged Islets of Langerhans to the cause of diabetes, and surmised that the substance from these cells was the diabetes treatment. The specific role of the pancreas was further refined after **Paul Langerhans** (1849-1888) described in 1869 the unique morphologic features of the pancreatic islands that were subsequently named after him. In 1909, **Eugene L. Opie** (1873-1971) reported hyaline degeneration of the islands in diabetic patients, a finding subsequently confirmed in a series of experimental studies that led **Edward Sharpey-Schafer** to suggest in 1916 that the islands of Langerhans produced a glucose-regulating hormone that he termed insulin. The race for isolating the hypothesized hormone was now on. **Frederick Banting** (1891- 1941) and **Charles Best** (1892-1978) finally did so in 1922. They wanted to call it isletin, but J.J.R. **Macleod** (1876-1935), in whose laboratory their work was done, insisted on using insulin. The endocrine nature of diabetes was now clearly established. The stage of diabetes as a disease of the kidneys was over.

#### **Insulin Era:**

The Term insulin (derived from the Latin word insula or island) was given by **Jean de Mayer**, a Belgian physician, in 1909 to the glucose-lowering hormone. **De Mayer** postulated that this hormone was produced by the islet tissues. In December 1921, **Banting** and **Macleod** succeeded in isolating insulin, a milestone event. On 11<sup>th</sup> Jan 1922, 14 year 14-year-old diabetic boy named **Leonard Thomson** was treated with insulin first time. They were awarded the Nobel Prize for that in 1923. In 1923, **Eli Lilly** began commercial production of insulin (Isletin Insulin). In 1925, Home testing for sugar in urine through Benedict's solution was introduced. In 1926, **John Jacob Abel** purified insulin, isolated its crystalline structure, and hence chemically identified it. In 1927, an oral medication "*horment*" or "*gluko horment*" was developed as a replacement for insulin, but it dropped out due to its side effects. In 1928, **Winter Steiner** and his colleagues described insulin as a protein composed of amino acids. In the 1930s, Insulin was further refined to Protamine zinc insulin, a long-acting

insulin. Insulin therapy soon became the backbone of management that enabled individuals affected by this disease to live an almost-normal life. It soon became apparent that insulin did not cure diabetes. As people began to live longer, they experienced complications that had not previously been seen. In 1936, **Himsworth** proposed two types of diabetes, as insulin sensitive and insulin insensitive, the former being due to insulin deficiency. This observation laid the foundation for the concept of impaired insulin action, which is now known to be a crucial factor in the pathogenesis of type 2 diabetes. In 1923, **Collip** found that onion has a hypoglycemic effect in fasting and depancreatized animals. The first oral hypoglycemic agent, sulfonylurea, was discovered in 1942 by **M.J. Janbon. Franke** and **Fuchs** in Berlin applied it clinically. In 1980, the first human insulin was manufactured by Graham Bell. In 1982, the first biosynthetic insulin (*Humulin*) was developed. Syringes appeared in 1961 but, being made of glass, brought with them the attendant hazards of infections until they were replaced with disposable plastic ones. It was only 15 years later that the introduction of the first needle-free insulin delivery system by **Derata** in 1979 provided relatively pain-free, metered doses.

#### **Historical era of diabetes in brief:**

A timeline-style table summarizing the historical background of diabetes—from its earliest observations in ancient times through modern scientific breakthroughs. Note that the table highlights major eras, key observations or discoveries, and the notable figures or texts associated with those milestones. This overview integrates information from both traditional accounts and modern historical analyses.

| <b>Era / Period</b> | <b>Period</b> | <b>Observations / Developments</b>                                                                                                          | <b>Notable figures / texts</b>                      |
|---------------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| Ancient Egypt       | c. 1550 BC    | The earliest recorded description of a condition with “excessive urination” in the Ebers Papyrus hints at polyuria and possible glycosuria. | Ebers Papyrus; Ancient Egyptian medical manuscripts |

|                                     |                                 |                                                                                                                                                                                     |                                                                                         |
|-------------------------------------|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| Ancient India (Ayurveda)            | 5th–6th century BC (and later)  | Description of “madhumeha” (honey urine), noting that diabetic urine was sweet and attracted ants; early recognition of two forms of the condition.                                 | Sushruta and Charaka (as reflected in Ayurvedic texts)                                  |
| Ancient China                       | 475 BC–8 AD                     | Recognition of “xiāo kě” (wasting-thirst) with symptoms of excessive thirst, hunger, and urination; early classifications and treatment guidelines in traditional Chinese medicine. | Huangdi Neijing; Zhang Zhongjing’s treatises (e.g., Shānghán Zábìng Lùn, Jīngui Yàoliè) |
| Classical Antiquity (Greek & Roman) | 1st century BC – 2nd century AD | Coining of the term “diabetes” (meaning “to pass through”); detailed clinical descriptions of excessive urine output; early theories linking the condition to kidney function.      | Aretaeus of Cappadocia (first detailed description); Galen; Celsus                      |
| Medieval Islamic World              | 9th–13th century AD             | Systematization of ancient knowledge; detailed clinical descriptions that include the sweet taste of urine and other systemic features; refinement of diagnostic criteria.          | Avicenna (Canon of Medicine), Rhazes, Maimonides, Abd al-Latif al-Baghdadi              |
| Modern Europe                       | 16th–18th centuries             | Revival and translation of classical texts; Thomas Willis (1674) emphasizes the sweet taste of urine and introduces “mellitus” to distinguish diabetes; early                       | Thomas Willis; Johann Peter Frank (differentiating diabetes insipidus from mellitus)    |

|                         |                       |                                                                                                                                                                                                                                                                                              |                                                                                                                                                           |
|-------------------------|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
|                         |                       | autopsy studies link the pancreas with the disease.                                                                                                                                                                                                                                          |                                                                                                                                                           |
| 19th Century            | 1800s                 | Advances in pathology and physiology; Claude Bernard studies liver glycogen and metabolism; von Mering and Minkowski (1889) demonstrate that removal of the pancreas induces diabetes.                                                                                                       | Claude Bernard; Oskar Minkowski; Joseph von Mering; Thomas Cawley                                                                                         |
| 20th Century to Present | Early 1900s – Present | Landmark discovery of insulin (1921–1922) transforming diabetes from a fatal disease to a manageable condition; evolution of blood glucose monitoring, oral antidiabetic agents, and modern insulin therapies; ongoing research into genetics, autoimmunity, and novel treatment modalities. | Frederick Banting, Charles Best, John Macleod, and James Collip; later innovations include biosynthetic human insulin, glucose meters, and insulin pumps. |

## Summary

This timeline illustrates how the understanding of diabetes evolved from early symptomatic descriptions in ancient civilizations to the scientific breakthroughs of the modern era. Early practitioners from Egypt, India, and China noted distinctive symptoms (such as polyuria and sweet urine) that led to traditional classifications and treatments. The term “diabetes” was refined during classical antiquity and later reinterpreted in medieval Islamic medicine. In modern Europe and the 19th century, systematic autopsy and experimental studies linked the pancreas to diabetes, culminating in the life-saving discovery of insulin in the early 20th century. Ongoing advances in diagnostic technologies

and treatment options continue to shape the management of diabetes today.

## **Conclusion**

The historical journey of diabetes mellitus reflects a remarkable evolution from ancient mystery to modern medical triumph. Early civilizations, including the Egyptians, Indians, and Greeks, first documented their classic symptoms-excessive thirst, frequent urination, and unexplained weight loss-laying the foundation for understanding this complex disorder. The term “diabetes” was introduced by Aretaeus of Cappadocia in the 2nd century CE, and later, Thomas Willis added “mellitus” in the 17th century after observing the sweet taste of diabetic urine. For many centuries, diabetes was perceived as an invariably fatal wasting disease with no effective treatment, and progress remained stagnant through the medieval and Renaissance periods despite emerging clinical observations. A major turning point occurred in the 19th and early 20th centuries with the identification of the pancreas’s role in glucose metabolism, culminating in the groundbreaking isolation of insulin by Banting and Best in 1921. This discovery revolutionized diabetes management, transforming the prognosis from a fatal condition to one that is manageable. Ultimately, tracing the historical milestones of diabetes not only highlights significant scientific advancements but also serves as a testament to the relentless pursuit of knowledge that continues to shape modern therapeutic strategies, inspiring ongoing research and innovation in the fight against this global health challenge.

## **Bibliography:**

1. Loriaux DL. Diabetes and the Ebers Papyrus: 1552 BC. *The Endocrinologist*. 2006 Mar 1;16(2):55-6.
2. King KM, Rubin G. A history of diabetes: from antiquity to discovering insulin. *British journal of nursing*. 2003 Oct 9;12(18):1091-5.
3. Ahmed AM. History of diabetes mellitus. *Saudi medical journal*. 2002 Apr 1;23(4):373-8.

4. Lakhtakia R. The history of diabetes mellitus. Sultan Qaboos University Medical Journal. 2013 Aug;13(3):368-370.
5. Karamanou M, Protogerou A, Tsoucalas G, Androutsos G, Poulakou-Rebelakou E. Milestones in the history of diabetes mellitus: The main contributors. World journal of diabetes. 2016 Jan 10;7(1):1.
6. Zajac J, Shrestha A, Patel P, Poretsky L. The main events in the history of diabetes mellitus. In Principles of diabetes mellitus 2010 (pp. 3-16). Springer, Boston, MA.
7. Tattersall RB. The history of diabetes mellitus. Textbook of diabetes. 2017 Jan 23:1-22.
8. Eknayan G, Nagy J. A history of diabetes mellitus or how a disease of the kidneys evolved into a kidney disease. Advances in chronic kidney disease. 2005 Apr 1;12(2):223-9.
9. Bliss M. The history of insulin. Diabetes Care. 1993 Dec 1;16(Supplement 3):4-7.
10. Stapley L. The history of diabetes mellitus. Trends in Endocrinology & Metabolism. 2001 Aug 1;12(6):277.
11. Vecchio I, Tornali C, Bragazzi NL, Martini M. The discovery of insulin: an important milestone in the history of medicine. Frontiers in endocrinology. 2018 Oct 23; 9:613.
12. Banting FG. The history of insulin. Edinburgh Medical Journal. 1929 Jan;36(1):1.
13. Nazamuddin M, Wadud A, Ansari AH, Alam T, Perveen A, Iqbal N. Concept of diabetes in the unani system of medicine: An overview. Medical Journal of the Islamic World Academy of Sciences. 2014 Jul;109(1567):1-6.
14. Anzar MA, Shamim A, Nafis H, Tanwir MA. Drugs Indicated for The Management of Ziabetus Shakri (Diabetes Mellitus in Unani Medicine Overview. International Journal of Pharmamedix India 2013;1(3):460-74.

# **A Historical Journey of Diabetes Mellitus: From Ancient Descriptions to the Discovery of Insulin**

## **Abstract**

Diabetes mellitus is a complex and chronic metabolic disorder that has challenged medical understanding for thousands of years. From the earliest documented references in ancient Egyptian and Indian civilizations to the groundbreaking discovery of insulin in the 20th century, the history of diabetes reflects the evolving knowledge and scientific progress in medicine. In early descriptions, diabetes was known through symptoms such as excessive urination and sweet-tasting urine. Over time, scholars and physicians across cultures made efforts to observe, define, and treat the disease through various approaches, laying the groundwork for modern therapeutic strategies. This chapter presents a comprehensive historical overview of diabetes mellitus, tracing its path from ancient observations, through medieval and Renaissance developments, to the critical milestones that led to the isolation and therapeutic use of insulin. The objective is to offer readers a rich understanding of how humanity's perception and management of diabetes have transformed across centuries.

## **Introduction**

Diabetes mellitus is one of the most extensively studied chronic illnesses in modern medicine. Characterized by persistent hyperglycemia due to defects in insulin production, insulin action, or both, it affects millions globally and is associated with serious long-term complications, including cardiovascular disease, neuropathy, nephropathy, and retinopathy. While diabetes is now well understood, it was once a mysterious and fatal condition. Ancient physicians noted its hallmark symptoms, such as frequent urination and unexplained

weight loss, but lacked the physiological knowledge to explain its cause. The journey toward understanding and treating diabetes has been long and multifaceted. In different historical periods and cultural contexts, physicians and scholars attempted to define the disease, observe its manifestations, and manage it through diet, herbs, and later, scientific inquiry. These efforts culminated in the discovery of insulin in the early 20th century—a discovery that revolutionized diabetes care and dramatically improved life expectancy for patients. This chapter aims to trace the historical trajectory of diabetes mellitus, from the earliest records in ancient medicine to the scientific breakthroughs that led to the development of insulin therapy. By reviewing key contributions from civilizations such as Egypt, India, Greece, and Islamic scholars, as well as major European milestones in anatomy and biochemistry, the chapter reveals how human curiosity and persistence transformed an incurable condition into a manageable disease.

## **1. Diabetes in ancient civilizations**

### **1.1 Egyptian civilization**

The earliest written evidence of diabetes-like symptoms appears in the *Ebers Papyrus*, an Egyptian medical document dated around 1550 BCE. It describes conditions involving excessive urination, possibly indicating diabetes. However, the understanding of the disease's internal causes was nonexistent. Egyptian physicians treated symptoms based on observable phenomena without linking them to internal metabolic processes.

### **1.2 Ancient India**

In **Ayurvedic medicine**, diabetes was recognized by the term *Madhumeha*, which means “honey urine.” The condition was noted for the sweet taste of urine, attracting ants and insects. Ancient Indian physicians such as *Charaka* and *Sushruta* described two types of Madhumeha—one affecting the lean and the other affecting the obese—early recognition of what we now call Type 1 and Type 2 diabetes.

Their management included a combination of dietary restriction, physical exercise, and herbal medications.

### **1.3 Traditional Chinese medicine**

In ancient Chinese texts, diabetes was referred to as “*Xiaoke*,” meaning “wasting and thirsting disease.” Chinese scholars identified symptoms such as excessive thirst, frequent urination, and weight loss. The management was focused on rebalancing the body’s internal energy (*Qi*) using dietary regulation and medicinal herbs like ginseng (*Panax ginseng*) and rehmannia (*Rehmannia glutinosa*).

## **2. Greek and Roman perspectives**

### **2.1 Aretaeus of Cappadocia**

The term *diabetes* (Greek: “to pass through”) was first used by *Aretaeus of Cappadocia* in the 2nd century CE. He vividly described the condition as one where “life flows away in a torrent,” referencing the extreme fluid loss seen in untreated diabetes. Although he recognized the symptoms, he could not explain the cause and viewed it as a rare and fatal disease.

### **2.2 Galen and later Roman thinkers**

Galen, one of the most influential Roman physicians, did not extensively discuss diabetes, possibly due to its rarity at the time. However, the Roman emphasis on humoral theory dominated medical thinking for centuries, classifying diseases based on imbalances in bodily fluids. Diabetes was loosely associated with an imbalance of phlegm and considered incurable.

## **3. Contributions of Islamic physicians**

During the Islamic Golden Age (8th to 14th centuries), Muslim scholars translated and preserved classical Greek and Roman medical texts while adding their observations and treatments.

### **3.1 Al-Razi (Rhazes)**

**Al-Razi** (865-925 CE) emphasized the importance of clinical observation and urine examination. He noted the wasting nature of the disease and proposed treatments aimed at strengthening the body and managing symptoms. Though limited by the medical knowledge of his time, his approach laid the foundation for later empirical methods.

### **3.2 Avicenna (Ibn Sina)**

**Avicenna** (980-1037 CE), a Persian polymath, discussed diabetes in his seminal work *Canon of Medicine*. He described symptoms such as abnormal thirst, excessive urination, emaciation, and sweet-tasting urine. He also recommended dietary management and herbal remedies like fenugreek, which modern research has shown to have blood sugar-lowering effects.

## **4. Renaissance and early modern era**

The Renaissance period marked a revival of scientific inquiry, which also influenced the understanding of diabetes.

### **4.1 Thomas Willis**

In the 17th century, Thomas Willis, an English physician, observed that diabetic urine was “wonderfully sweet.” He introduced the term *diabetes mellitus*, with “mellitus” derived from the Latin word for honey. Willis speculated on the involvement of the kidneys but still lacked an understanding of the pancreas or insulin.

### **4.2 Matthew Dobson**

In the late 18th century, Matthew Dobson confirmed that the sweet taste of diabetic urine was due to sugar. He also showed that sugar was present in the blood, suggesting a systemic problem rather than just a renal issue. This was a pivotal shift in understanding the metabolic nature of the disease.

## **5. Advances in the 19th Century**

The 19th century saw major progress in physiology and biochemistry that brought scientists closer to understanding diabetes.

### **5.1 Claude Bernard**

**Claude Bernard** discovered that the liver stored sugar as glycogen and played a role in regulating blood glucose levels. This insight helped shape the modern understanding of glucose metabolism and its disruption in diabetes.

### **5.2 Paul Langerhans**

In 1869, Paul Langerhans, a German medical student, identified distinct cell clusters in the pancreas, later named the *Islets of Langerhans*. Their function was unknown at the time, but they would later be linked to insulin production.

### **5.3 Oskar Minkowski and Joseph von Mering**

In 1889, German scientists Oskar Minkowski and Joseph von Mering performed a groundbreaking experiment. They removed the pancreas from a dog, which subsequently developed diabetes. This conclusively linked the pancreas to blood sugar regulation and laid the foundation for the discovery of insulin.

## **6. The Discovery of Insulin**

The most critical breakthrough in the history of diabetes occurred in the early 20th century with the discovery of insulin.

### **6.1 Frederick Banting and Charles Best**

In 1921, Canadian surgeon Frederick Banting and medical student Charles Best began experiments to isolate a pancreatic secretion they believed could control diabetes. Working in the lab of **John Macleod** at the University of Toronto, they succeeded in extracting a substance from the pancreas of dogs that lowered blood glucose levels in diabetic animals.

## **6.2 First Human trial**

In 1922, the purified extract was tested on Leonard Thompson, a 14-year-old boy with severe diabetes. The initial injection caused an allergic reaction, but a second, more refined dose dramatically improved his condition. For the first time in history, a person with diabetes had a treatment that could extend life.

## **6.3 Recognition and impact**

Banting and Macleod were awarded the Nobel Prize in Physiology or Medicine in 1923. Banting shared his prize with Best, and Macleod shared his with James Collip, the chemist who helped purify insulin. This discovery turned diabetes from a death sentence into a manageable condition and ushered in a new era in endocrinology.

## **7. Reflections on the historical journey**

The historical development of diabetes mellitus—from a poorly understood condition marked by sweet urine and wasting to a precisely defined disorder with effective treatment—demonstrates the evolution of medical thought and scientific progress. While ancient physicians relied on observation and symptom-based management, modern science allowed for the isolation of insulin, offering patients a new chance at life.

The journey is not only a tribute to scientific advancement but also a reminder of the critical role played by cultural exchange. From ancient India and Greece to Islamic scholars and European pioneers, each civilization contributed layers of understanding that ultimately led to the breakthrough of insulin therapy.

## **8. The Post-Insulin Era: Expanding horizons**

The discovery of insulin in the early 20th century marked a new era in diabetes treatment. However, it was only the beginning. The following decades witnessed continued research aimed at improving insulin formulations, delivery methods, diagnosis, and overall patient care.

## 8.1 Development of Insulin preparations

The initial form of insulin was derived from animal sources, primarily the pancreas of cows and pigs. While effective, these forms could sometimes trigger allergic reactions due to their difference from human insulin.

- In the **1950s and 60s**, long-acting insulin formulations such as **NPH (Neutral Protamine Hagedorn)** and **Lente insulin** were developed. These provided more stable glucose control throughout the day.
- In **1982**, scientists developed **recombinant human insulin** using genetic engineering. This landmark achievement by Genentech and Eli Lilly introduced synthetic human insulin produced in bacteria, reducing the risk of allergic reactions and making insulin production more scalable.

## 8.2 Advancements in Insulin delivery

As understanding of insulin improved, so did the methods of administering it. Early insulin therapy required multiple painful injections, and there was limited understanding of blood glucose levels.

- The **insulin syringe** was the standard for many years.
- In the **1980s**, **insulin pens** were introduced, offering more convenient and accurate dosing.
- The **21st century** saw the rise of **insulin pumps**, which provide continuous subcutaneous insulin delivery and mimic the body's natural insulin secretion more closely.
- **Smart insulin delivery systems**, such as patch pumps and automated insulin delivery devices, continue to evolve.

## 9. Glucose monitoring and self-care revolution

Another major challenge in diabetes care was the lack of real-time glucose monitoring, which is crucial for adjusting insulin doses and dietary intake.

- In the **1970s**, the first **portable glucometer** allowed patients to check blood glucose levels at home, empowering them to take control of their condition.
- Later, **Continuous Glucose Monitoring (CGM)** systems were developed, enabling real-time, round-the-clock glucose tracking through sensors worn on the skin.
- Today, **smartphones and wearable devices** integrate with CGMs and insulin pumps to offer data-driven and personalized diabetes management.
- These innovations dramatically improved both the safety and quality of life for people living with diabetes.

## **10. Evolution of diabetes classification and understanding**

As medical knowledge advanced, scientists recognized that diabetes was not a single disease but a group of disorders characterized by hyperglycemia. This led to refined classifications:

- **Type 1 Diabetes:** Caused by autoimmune destruction of insulin-producing beta cells in the pancreas. It usually appears in childhood or adolescence.
- **Type 2 Diabetes:** Linked to insulin resistance and often associated with lifestyle factors such as obesity and physical inactivity. It is more common in adults, but is now increasingly seen in younger populations.
- **Gestational Diabetes:** Occurs during pregnancy and poses risks to both mother and baby.
- **Other Specific Types:** Including monogenic diabetes (e.g., MODY), secondary diabetes due to pancreatitis, or endocrine disorders.
- These distinctions allowed for more targeted treatments and improved public health strategies.

## 11. Education, prevention, and public health movements

Over time, it became clear that diabetes was not only a medical issue but also a public health challenge. As urban lifestyles became more sedentary and diets changed, especially in developing countries, the prevalence of **Type 2 diabetes** began to rise.

- **Public health campaigns** promoted early diagnosis, awareness, and lifestyle modification.
- International observances like **World Diabetes Day** (November 14th, in honor of Frederick Banting's birthday) aim to educate the public about prevention and care.
- **Organizations** such as the **International Diabetes Federation (IDF)** and **American Diabetes Association (ADA)** play key roles in setting global standards, issuing guidelines, and promoting research.

## 12. Current and future directions in diabetes research

Modern diabetes care continues to evolve at a rapid pace. Several promising directions are reshaping how the disease is managed and potentially cured:

### 12.1 Artificial pancreas and closed-loop systems

Artificial pancreas systems, combining CGMs and insulin pumps with algorithms, automatically adjust insulin delivery in real time. These **closed-loop systems** have already shown promise in improving glucose control and reducing complications.

### 12.2 Islet Cell transplantation and regenerative medicine

Research in **stem cells** and **islet transplantation** is exploring ways to restore the body's natural insulin production. Though still experimental, these approaches hold hope for long-term remission or even a cure.

### 12.3 Smart insulin and oral insulin

Efforts are underway to develop **smart insulin** that activates only when blood sugar rises, reducing the risk of hypoglycemia. **Oral insulin formulations** are also in development to offer more convenient alternatives to injections.

### 12.4 Genetic and precision medicine

Genomic research is identifying individual risk factors for diabetes, allowing **personalized medicine** approaches based on genetics, lifestyle, and environmental factors.

## 13. Challenges in the modern world

Despite significant progress, diabetes remains a global health crisis:

- According to the **World Health Organization (WHO)** and **IDF**, more than **500 million people** worldwide are living with diabetes, and the number is expected to rise.
- Diabetes is now a leading cause of **blindness, kidney failure, heart attacks, and lower-limb amputations**.
- The disease places enormous burdens on families, healthcare systems, and economies, especially in low- and middle-income countries.
- Inequality in access to diagnosis, insulin, and education continues to hinder global diabetes control. Addressing these disparities is a key concern for policymakers and healthcare providers.

## Conclusion

The historical journey of diabetes mellitus is a remarkable story of human curiosity, resilience, and scientific progress. From the early recognition of “honey urine” in ancient Indian and Egyptian texts to the revolutionary discovery of insulin and modern technologies like

artificial pancreas systems, our understanding of diabetes has evolved tremendously. Each period in history contributed valuable insights-whether through traditional herbal practices, early scientific observations, or cutting-edge biomedical research. The development of insulin in the 20th century remains one of the greatest medical achievements, transforming diabetes from a death sentence into a manageable condition. Yet, the story is far from over. As the global burden of diabetes grows, continued innovation, education, prevention, and equitable healthcare delivery are more critical than ever. This journey reminds us that knowledge is not static-it is a living, evolving force that shapes the future of medicine and human well-being.

## References

1. Nazamuddin M, Wadud A, Ansari AH, Alam T, Perveen A, Iqbal N. Concept of diabetes in the unani system of medicine: An overview. *Medical Journal of the Islamic World Academy of Sciences*. 2014 Jul;109(1567):1-6.
2. Ahmed AM. History of diabetes mellitus. *Saudi Med J*. 2002;23(4):373-378.
3. Tattersall R. *Diabetes: The Biography*. Oxford University Press; 2009.
4. Papaspyros NS. The history of diabetes mellitus. *Postgrad Med J*. 1922;1(6):1-8.
5. Miraclin A, Kumar M. Diabetes mellitus in ancient and medieval Indian medicine: a historical review. *J Res Med Sci*. 2016;21(1):1-4. doi:10.4103/1735-1995.174365
6. Long RA. Aretaeus of Cappadocia and the first to describe diabetes. *Am J Nephrol*. 2019;50(6):455-457. doi:10.1159/000504121
7. Al-Dabbagh SA. Avicenna's contribution to the understanding and treatment of diabetes mellitus. *Heart Views*. 2014;15(2):57-60. doi:10.4103/1995-705X.137490

8. Bliss M. *The Discovery of Insulin*. University of Chicago Press; 1982.
9. Sloop GD, Garber CC. The history of hemoglobin A1c as a marker for glycemic control. *Clin Lab Sci*. 2009;22(3):130-135.
10. World Health Organization. Diabetes. Published 2023. Accessed July 29, 2025. <https://www.who.int/news-room/fact-sheets/detail/diabetes>
11. International Diabetes Federation. *IDF Diabetes Atlas*. 10th ed. Brussels, Belgium: IDF; 2023. Accessed July 29, 2025. <https://diabetesatlas.org>
12. Banting FG, Best CH, Collip JB, Campbell WR, Fletcher AA. Pancreatic extracts in the treatment of diabetes mellitus. *Can Med Assoc J*. 1922;12(3):141-146.
13. Langerhans P. Beiträge zur mikroskopischen Anatomie der Bauchspeicheldrüse [Doctoral thesis]. Berlin, Germany; 1869.
14. Dobson M. Experiments and observations on the urine in diabetes. *Med Observ Inq*. 1776;5:298-316.
15. Minkowski O, von Mering J. Diabetes mellitus nach Pankreasexstirpation. *Arch Exp Pathol Pharmacol*. 1889;26(5-6):371-387.

# Concept of Diabetes

## Abstract

Diabetes mellitus, known as *Ziabetus*, *Moattasha*, *Atsha*, *Intesae Anmas*, *Zalaqul kulliya*, *Dolab*, *Dawwarah*, *Barkar*, *Barkarya*, *Qaramees*, etc., in Unani medicine, has been recognized for centuries as a chronic metabolic disorder characterized by excessive urination (*Kasrat-e-Baul*) and thirst (*Shiddat-e-Atsam*). Unani scholars, including Hippocrates, Galen, and Avicenna, have extensively described its etiology, pathophysiology, and management. According to Unani principles, diabetes results from an imbalance in *Akhlat* (humors), or excessive heat in the liver and kidneys, leading to impaired metabolism of bodily fluids and sugars. Unani medicine classifies diabetes into two types: one associated with excessive thirst and weight loss, resembling modern type 1 diabetes, and another linked to obesity and metabolic disturbances, akin to type 2 diabetes. The treatment approach focuses on restoring humoral balance through dietary modifications, herbal remedies, and lifestyle interventions, including physical activity. Important medicinal plants like *Gurmar* (*Gymnema sylvestre*), *Jamun* (*Syzygium cumini*), *Methi* (*Trigonella foenum-graecum*), *Paneer Phool* (*Withania coagulans*), *Karela* (*Momordica charantia*), etc., are widely used for glycemic control. This chapter explores the historical perspectives, diagnostic principles, and therapeutic approaches to diabetes in Unani medicine, emphasizing its holistic management through natural and lifestyle-based interventions. Integrating Unani principles with modern scientific research can provide valuable insights into complementary diabetes care, offering a sustainable and personalized approach to disease prevention and treatment.

## Introduction

The term “Diabetes” is derived from the Greek word “*diabainein*,” which means “passing through” or “to run through” or “Siphon.” It is characterized by excessive thirst, excessive urination, the presence of sugar in urine, increased appetite, and gradual loss of body weight etc. *Ziabetus* is described in almost all of the Unani texts like *Al-Hawi*, *Kamilul Sana’ah*, *Al-Qanoon*, *Zakheera Khwarzam shahi*, *Al-Mukhtarat Fit Tib*, *Kiab Al-Taisir*, etc. Unani physicians mentioned that *Ziabetus* is a disease of the kidneys. Unani and Arabic Scholars had described *Ziabetus* by numerous other terms, viz, *Moattasha*, *Atsha*, *Intesae Anmas*, *Zalaqul kulliya*, *Dolab*, *Dawwarah*, *Barkar*, *Barkarya*, *Qaramees*, etc.

Based on a survey of Unani Classical literature, *diabetes* is a disease of the kidneys in which the consumed water is passed through the kidneys immediately after drinking by the patient. It is similar to *Zalqul Meda wal Ama*, in which the food passes quickly through the stomach and intestine, lacking proper digestion. In this condition patient has excessive thirst (polydipsia) and takes plenty of water and passes all the water he consumes without any metabolic change.

In this disease, the temperament of the kidneys becomes hot, so they absorb water from the blood and send it to the urinary bladder immediately due to weakness in retentive power. It has also been described that the kidneys attract the watery substance of blood, but the urinary bladder does not attract anything. So kidneys attract the water from the circulation, liver, stomach, and intestines because the patient has excessive thirst (polydipsia).

## Classification of diabetes:

According to the presence or absence of sugar in the urine, *Diabetes* is divided into two types:-

| Type of diabetes | Also known as                              | Characteristics                                           | Presence of sugar in urine |
|------------------|--------------------------------------------|-----------------------------------------------------------|----------------------------|
| Ziabetes Sada    | Diabetes Insipidus / Ziabetes Ghair Shakri | Excessive thirst and excessive urination                  | Absent                     |
| Ziabetes Shakri  | Diabetes Mellitus                          | Excessive thirst, excessive urination, and sugar in urine | Present                    |

According to *Khiffat* and *Shiddat* (intensity) of the sign and symptom, it is also divided into two types:

| Type of diabetes | Description                  | Main symptoms                                                                                         | Cause/Condition                                                                      |
|------------------|------------------------------|-------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| Ziabetes Haar    | Acute form with abrupt onset | Excessive thirst (polydipsia), increased urination (polyuria), heat sensation in flanks, body dryness | Due to <i>Sue Mizaj Haar</i> (hot temperament) causing excessive heat in the kidneys |
| Ziabetes Barid   | Chronic or less intense form | Thirst and frequency of urination are comparatively less severe                                       | Related to <i>Sue Mizaj Barid</i> (cold temperament), resulting in milder symptoms   |

## Pathophysiology of diabetes:

The perception of faculty or power (*Quwa*) is unique in Unani Medicine. The *Quwa* is a possession of the body with which the fact of life is manifested. The *Quwa* affords the basis for the different bodily functions. Every organ is endowed with a power, *Quwat* (power) is one through which specific physiological functions are achieved by that particular organ. These *Quwa* are specific for a particular tissue or

organ on which the specific functions of that organ depend. The organ is the bench of *Quwa*, and *Quwa* gives rise to functions.

There are three major divisions of the *Quwa* (faculties) of the body, i.e., *Al Quwa at Tabi'yah* (Natural faculties), *Al Quwa an Nafsanayah* (Psychic or mental faculties), and *Al Quwa al Haywaniyah* (Vital faculties). *Al Quwa at Tabi'yah* are those which are responsible for ingestion, digestion, absorption, transformation (metabolism), assimilation of *ghiza* (food) and excretion of waste products, and preservation of the race also. According to the function *Quwa at Tabi'yah* has been divided by *Ali Ibn Abbas Majoosi* into three faculties: *Quwate Ghaziyah* (nutritive faculty), *Quwate Murabbiyah* (growth faculty), and *Quwate Muwallida* (reproductive faculty).

*Quwate ghaziyah* (nutritive faculty) is that which is responsible for ingestion, digestion, absorption, transformation (metabolism), and assimilation of *ghiza* (food) and excretion of waste products. According to the function, this faculty is divided into four *Quwa*: *Quwate Jazibah*, *Quwate Masika*, *Quwate Hazimah* or *Quwate mughayirah* (power of digestion and transformation), and *Quwate dafi'ah* (power of propulsion and excretion).

***Quwate Jaziba:*** This is the power that absorbs the *Akhlat* and runs into the cells with the help of various enzymes, hormones, or simply through natural forces.

***Quwate Masika:*** This is the power that retains the *Akhlat* inside the cells for their *Istahalah* (metabolism).

***Quwate Mughayirah:*** This is the power that transforms the materials, such as the phosphorylation of glucose after entering the cells.

***Quwate Dafi'ah:*** The power which helps the cells and tissues to expel the waste products produced in the course of *Istahalah* (metabolism).

Every organ is furnished with a *Quwat* (power), as previously discussed, through which specific physiological functions are performed. The vital organs which is responsible for the *Quwate*

*Hazima* include with *Banqaras* (pancreas) along with the oral cavity, salivary glands, esophagus, stomach, intestines, liver, and spleen. The liver is considered the main centre of *Quwate Tabi'yah*.

According to *Abu Sehl Masihi*, each of the above four *Quwa* is in two folds, one is found in the gastrointestinal tract and liver, other in all the cells of the body. So the *Quwa* of all the cells of the body absorb the food materials and *Ruh* and metabolize and transform them into various compounds and replace the wear and tear by producing the *Quwat* (energy) for the proper functioning of the body.

The above description of *Quwa* and its function described in *Umoore Tabi'yah*, especially in the context of digestion and absorption of food materials from the GIT and transportation of it toward the tissues, absorption and retention of materials by the help of different *Quwa* into the cells can clearly be understood. *Attibbae Qadeem* (Ancient physicians) had not described the exact physiology due to a lack of advancement in the sciences, as today's physicians can. Today pathophysiology of diabetes is almost stabilized; the role of the pancreas and insulin and its peripheral resistance are revealed in the context of the development of the disease, along with other causes to a lesser extent.

**Aetiology and pathogenesis:** Unani physicians *Rhazi*, *Majoosi*, *Ibn Sina*, *Ismail Jurjani*, *Ibn Zohr*, *Ibn Hubal Baghdadi*, *Samarqandi*, and *Hkm. Azam Khan* described some underlying aetiopathogenesis in detail. It was supposed that the disease was related to the kidneys.

**Here is a table summarizing the etiological factors mentioned in Unani medicine:**

| Etiological factor                      | Description                                                                                                        |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| <i>Zofe Kuliya</i> (Weakness of Kidney) | The kidney's retentive faculty ( <i>Quwate Masika</i> ) is weak, preventing proper water retention and metabolism. |

|                                                                                    |                                                                                                                                                    |
|------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Ittesae Kuliya wa Majrae Bole</i> (Dilatation of Kidney and Tubule)             | Due to dilation of the kidney and urinary tubules, water is not retained for the required time, leading to polyuria (excessive urination).         |
| <i>Baroodate Badan, Jigar wa Kuliya</i> (Cold Exposure of Body, Liver, and Kidney) | Excessive cold exposure affects the body, liver, or kidney, causing a cold derangement in temperament (Sue Mizaj Barid) that can lead to diabetes. |
| <i>Su-e- Mizaj Haar Kuliya</i> (Hot Derangement in Temperament of Kidney)          | Excessive heat causes the kidneys to absorb too much water, leading to frequent urination (polyuria) and excessive thirst (polydipsia).            |
| <i>Su-e-Mizaj-e-Barid Kuliya</i> (Cold in the Temperament of the Kidney)           | Extreme cold exposure affects the kidneys, potentially leading to a mild form of diabetes.                                                         |

## Conclusion

Diabetes mellitus, known as Ziabetus in Unani medicine, has long been recognized as a chronic metabolic disorder characterized by symptoms such as excessive urination and intense thirst. Early Unani scholars, including Hippocrates, Galen, and Avicenna, laid the foundation for understanding this condition by describing its etiology and pathophysiology in terms of imbalances in the humors. In Unani thought, abnormal heat in the liver and kidneys disrupts the proper metabolism of sugars and bodily fluids, leading to diabetes. Unani medicine classifies the disease into two types: one marked by severe thirst and weight loss, similar to modern type 1 diabetes, and another associated with obesity and metabolic disturbances, akin to type 2 diabetes. Treatment strategies focus on restoring humoral balance through dietary modifications, herbal remedies, and lifestyle interventions such as Massage, Running /physical exercise, steam bath, etc. By incorporating important medicinal plants like *Gurmar*, *Jamun*, *Methi*, *Karela*, etc, for glycemic control, Unani medicine offers a holistic and natural approach. Integrating these time-honored principles with modern research promises a sustainable, personalized,

and complementary strategy for diabetes prevention and management. Ultimately, this integration ensures wellness.

### **Bibliography:**

1. Sina I. Kulliyate Qanoon (by Hkm. Kabeeruddin) part 2. Shaikh Md. Basheer and Sons, Lahore. 2006:258-97.
2. Kirmani NBA. Kulliyat-E-Nafeesi. Urdu Translation by Hkm. Kabeeruddin. Idara Kitab Us Shifa, New Delhi. YNM;
3. Khan MA. Akseer-E-Azam. Urdu Translation by Hkm. Kabeeruddin. Idara Kitab Us Shifa New Delhi; 2011:705-709.
4. Qutubuddin. Clinical Study of *Ziabetus Shakri* (Diabetes Mellitus-II) and Evaluation of Efficacy of a Unani Formulation and Its Management. Dissertation. Rajiv Gandhi University of Health Sciences, Karnataka 2012.
5. Khan HA. Hazique. Jaseem Book Depot, New Delhi; 1983:387-390.
6. Qurshi MH. Jam-Ul-Hikmat. Idara Kitab Us Shifa New Delhi; 2011; 864-873.
7. Alam A, Quamri S, Fatima S, Roqaiya M, Ahmad Z. Efficacy of Spirulina (Tahlab) in Patients of Type 2 Diabetes Mellitus (*Ziabetus Shakri*)-A Randomized Controlled Trial. Journal of diabetes & metabolism. ISSN, J Diabetes Metab. 2016 Oct 1;7(10):6155-6.
8. Eqbal K, Alam MA, Quamri MA, Sofi G, Ahmad Bhat MD. Efficacy of *Qurs-e-Gulnar* in *Ziabetus* (type 2 Diabetes Mellitus): a single blind randomized controlled trial. J Complement Integr Med. 2020 Jun 18;18(1):147-153.
9. Quamri MA, Begum S, Siddiqui MA, Alam MA. Efficacy of Kanduri (*Coccinia indica*) in diabetes associated dyslipidemia randomized, single blind, standard controlled study. Age (Mean $\pm$ SD): 43(7.845):44-9.

10. Majusi AIA. Kamil Al-San't. Vol 2, Part II. Central Council for Research in Unani Medicine, New Delhi. Ministry of Health & Family Welfare, Govt. Of India: 2010:192-193
11. Sina I. Al-Qanoon Fit Tib. Vol. 3. Urdu Translation by G. Kantoori. Published By Idara Kitab Us Shifa, New Delhi; 2010:1031-1033.
12. Jurjani I. Zakhira Kharzam Shahi. Vol 6. Urdu Translation by Hkm. Hadi Husain. Published By Idara Kitab Us Shifa, New Delhi; 2010:540-541.
13. Zuhr I. Kitab Al-Taiseer. Central Council for Research in Unani Medicine, New Delhi. Ministry of Health & Family Welfare, Govt. of India; 1986:160-163.
14. Baghdadi IH. Kitab Al Mukhtaratfit-Tibb. Vol 3. Central Council for Research in Unani Medicine, New Delhi. Ministry of Health & Family Welfare, Govt. of India; 2004:326-328.
15. Arzani HA. Tibbe Akbar. Urdu Translation by Hkm. Mohd. Husain. Faisal Publication Deoband UP; YNM: 525-526.
16. Rhazi Z. Al-Hawi Fit Tib. Vol 10. Central Council for Research in Unani Medicine, New Delhi. Ministry of Health & Family Welfare, Govt. Of India; 2002:181-187.
17. Nazamuddin M, Wadud A, Ansari AH, Alam T, Perveen A, Iqbal N. Concept of diabetes in the unani system of medicine: An overview. Medical Journal of the Islamic World Academy of Sciences. 2014 Jul;109(1567):1-6.
18. Anzar MA, Shamim A, Nafis H, Tanwir MA. Drugs Indicated for The Management of Ziabetus Shakri (Diabetes Mellitus in Unani Medicine Overview. International Journal of Pharmamedix India 2013;1(3):460-74.

# Etiology of Diabetes in Unani Medicine

## Abstract:

Diabetes mellitus, known as *Ziabetus* in Unani medicine, is a metabolic disorder characterized by excessive urination (*Kasrat-e-Baul*) and elevated blood sugar levels. Unani scholars, including *Hippocrates*, *Galen*, *Rhazes*, and Avicenna, have extensively discussed its causes, pathophysiology, and management. According to Unani principles, diabetes results from an imbalance in the humors (*Akhlat*), particularly an excess of *Sauda* (black bile) or an abnormality in *Balgham* (phlegm) affecting the liver and kidneys. Unani medicine attributes diabetes to multiple factors, including *Mizaj* (temperament) disturbances, dietary excesses, genetic predisposition, and an unhealthy lifestyle. Excessive consumption of sugary, cold, and moist foods is believed to weaken digestive and metabolic faculties, leading to inefficient sugar metabolism. Additionally, weakness of *Quwwat-e-Mudabbira* (regulative faculty) of the liver and kidneys results in excessive sugar excretion in urine. Psychological stress, excessive physical exertion, and sedentary habits also contribute to diabetes by disrupting humoral balance and metabolic processes. Unani scholars also emphasize the role of obstruction in the pathways of nutrients, impairing the absorption and distribution of glucose. Furthermore, derangements in *Ruh* (vital spirit) and *Hararat-e-Ghariziya* (innate heat) are believed to play a significant role in disease progression. Understanding diabetes through Unani concepts provides a holistic perspective that integrates diet, lifestyle, and natural remedies for prevention and management. This chapter explores these classical perspectives, shedding light on the traditional etiological framework of diabetes and its implications for modern healthcare.

## Introduction

Diabetes, known as *Ziabetus* or *Dhiq-ul-Baul* in Unani medicine, is a chronic disorder characterized by excessive urination (polyuria) and excessive thirst (polydipsia). Unani scholars such as *Zakariya Razi*, *Ibn Sina* (Avicenna), and *Jurjani* have described diabetes as a disease primarily affecting the kidneys, liver, and metabolism, leading to an imbalance in body fluids and humors (*Akhlat*).

According to Unani philosophy, the human body is governed by four humors: *Dam* (blood), *Balgham* (phlegm), *Safra* (yellow bile), and *Sauda* (black bile). An imbalance in these humors, especially excess phlegm (*Balgham*) or excessive heat in the kidneys, contributes to diabetes. Other factors such as weakness of kidney function (*Zofe Kuliya*), dilation of kidney tubules (*Ittesae Kuliya wa Majrae Bole*), and temperature imbalances (*Sue Mizaj Barid* or *Haar*) are also considered major causes.

Environmental and lifestyle factors like cold exposure, dietary habits, and genetic predisposition further contribute to the disease. Unani treatment aims to restore balance in the humors, strengthen kidney function, and regulate metabolism using herbal medicines, dietary modifications, and regimens (*Ilaj bil Ghiza wa Ilaj bil Dawa*). Understanding the etiology of diabetes in Unani medicine helps in developing a holistic and natural approach to managing this condition.

### 1. Dysfunction of the kidney

The kidneys play a vital role in retaining and metabolizing water. When they become weak, they lose their ability to properly absorb and retain fluids, leading to excessive urination (polyuria). This dysfunction may arise due to:

- Weakness in the retentive faculty (*Quwate Masika*) of the kidney.
- An inability to metabolize water received from the liver.
- Loss of urinary control, causing frequent urination.

## **2. Dilatation of kidney and tubules**

If the kidneys and urinary tubules become dilated, they lose the ability to hold urine for a sufficient time, causing excessive urination. This condition may be triggered by:

- An abnormal expansion of kidney tubules.
- The inability of the bladder to hold urine.
- A continuous loss of water, leading to dehydration and excessive thirst (polydipsia).

## **3. Cold exposure**

Cold exposure affects the whole body, liver, or kidneys, leading to a cold derangement in temperament (*Sue Mizaj Barid*). This condition may contribute to diabetes due to:

- A reduction in body heat slows down metabolism.
- Weakening of kidney function due to cold exposure, affecting water retention.
- Imbalance in bodily humors, leading to excessive urination.

## **4. Hot Derangement in the temperament of the kidney**

Excessive heat or hot temperament in the kidneys leads to:

- Over absorption of water from circulation.
- An inability to retain water, causing excessive urination (polyuria).
- Excessive thirst (polydipsia) leads the patient to consume more water.
- Increased fluid loss, further aggravating dehydration.

## **5. Cold temperament of kidney**

- Extreme exposure to cold temperatures affects kidney function.

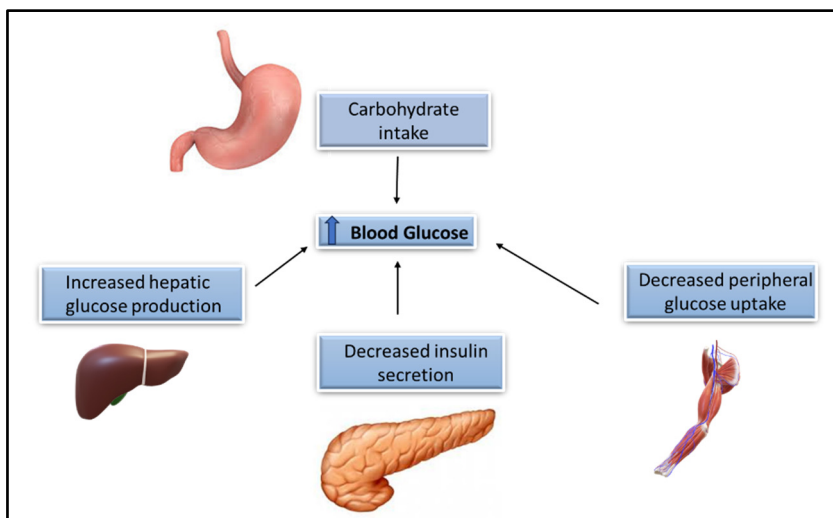
- This may cause mild diabetes by impairing fluid metabolism.
- Leads to frequent urination and an imbalance in the body's fluids.

## 6. Imbalance in humors

**Unani medicine believes that diabetes is related to the imbalance of bodily humors (particularly:**

- **Excess of phlegm:** Leads to cold derangement affecting kidney function.
- **Excess of yellow bile:** Causes heat imbalance leading to excessive thirst and urination.
- **Deficiency of blood or black bile:** Affects metabolism and kidney function.

### Causes of Diabetes



**Figure.** Causes of Diabetes

Table summarizing the main causes of diabetes across various types. Note that while modern medicine diagnoses diabetes through laboratory tests (e.g., blood glucose, A1C), understanding its

underlying causes is essential for tailoring management and prevention strategies.

| <b>Diabetes Type</b>            | <b>Underlying mechanism/Causes</b>                                                                                                                                                                                                                                                                                     | <b>Major risk factors/triggers</b>                                                                                                         |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| Type 1 Diabetes                 | Autoimmune destruction of pancreatic $\beta$ -cells leads to an absolute insulin deficiency.                                                                                                                                                                                                                           | Genetic predisposition (e.g., certain HLA genotypes), environmental triggers (e.g., viral infections), and family history of autoimmunity. |
| Type 2 Diabetes                 | A combination of insulin resistance and progressive $\beta$ -cell dysfunction. The body initially produces normal or increased insulin levels, but cells become resistant to its effects.                                                                                                                              | Overweight/obesity, sedentary lifestyle, poor diet, older age, genetic predisposition, metabolic syndrome.                                 |
| Gestational Diabetes            | Hormonal changes during pregnancy (from placental hormones) lead to increased insulin resistance. If $\beta$ -cell compensation is insufficient, blood glucose levels rise.                                                                                                                                            | Overweight/obesity, prior gestational diabetes, family history, advanced maternal age, and polycystic ovary syndrome (PCOS).               |
| Monogenic Diabetes (e.g., MODY) | Caused by a single gene mutation affecting $\beta$ -cell development or function, resulting in impaired insulin secretion.                                                                                                                                                                                             | Autosomal dominant inheritance; typically presents at a young age with mild hyperglycemia that may be misdiagnosed.                        |
| Secondary Diabetes              | Diabetes secondary to other medical conditions or treatments. This includes: • Pancreatic damage (from chronic pancreatitis, pancreatic surgery, cystic fibrosis) • Endocrine disorders (e.g., Cushing's syndrome, acromegaly) • Drug-induced causes (e.g., long-term use of glucocorticoids, atypical antipsychotics) | Underlying pancreatic or endocrine disease, prolonged use of specific medications, or conditions such as hemochromatosis.                  |

## Additional notes

- **Modern diagnosis vs. underlying causes:** While the diagnosis of diabetes today is based on quantitative laboratory tests (such as fasting plasma glucose, oral glucose tolerance tests, and A1C), this table focuses on the pathophysiologic causes that explain why different forms of diabetes occur.
- **Interplay of factors:** In Type 2 diabetes, for instance, both genetic predisposition and lifestyle factors (such as physical inactivity and poor diet) contribute to insulin resistance and eventual  $\beta$ -cell failure.
- **Complexity and overlap:** Some individuals may have overlapping features (for example, adults with latent autoimmune diabetes in adults, or LADA) where elements of both autoimmune destruction and insulin resistance can be present.

## Conclusion

Unani approach to diabetes mellitus, referred to as *Ziabetus Shakri*, presents a holistic framework that contrasts yet complements modern biomedical perspectives. Unani scholars, from Hippocrates to Avicenna, emphasized that diabetes is not merely a disorder of sugar metabolism but a systemic imbalance resulting from disturbances in the humors. This imbalance, particularly when it affects the liver and kidneys, disrupts normal metabolic processes, leading to the characteristic symptoms of polyuria and hyperglycemia. According to Unani principles, various factors contribute to this condition: dietary excesses such as the overconsumption of sugary, cold, and moist foods weaken digestive and metabolic faculties; genetic predisposition and unhealthy lifestyles further exacerbate the situation; and disturbances in the body's natural temperament and the regulative functions of the liver and kidneys hinder proper water retention and nutrient absorption. Additionally, factors like psychological stress, excessive physical exertion, and sedentary behavior disrupt the balance of the vital spirit

and innate heat, promoting the disease process. Thus, Unani medicine advocates a comprehensive preventive and management strategy that integrates diet, lifestyle modifications, and natural remedies, offering valuable insights for modern healthcare in addressing the multifaceted nature of diabetes.

### **Bibliography:**

1. Rhazi Z. Al-Hawi Fit Tib. Vol 10. Central Council for Research in Unani Medicine, New Delhi. Ministry of Health & Family Welfare, Govt. Of India; 2002:181-187.
2. Majusi AIA. Kamil Al-San't. Vol 2, Part II. Central Council for Research in Unani Medicine, New Delhi. Ministry of Health & Family Welfare, Govt. Of India; 2010:192-193
3. Sina I. Kulliyate Qanoon. by Hkm. Kabeeruddin) Part–2. Shaikh Md. Basheer and Sons, Lahore. 2006:258-97.
4. Jurjani I. Zakhira Kharzam Shahi. Vol 6. Urdu Translation by Hkm. Hadi Husain. Published By Idara Kitab Us Shifa, New Delhi; 2010:540-541.
5. Zuhr I. Kitab Al-Taiseer. Central Council for Research in Unani Medicine, New Delhi. Ministry of Health & Family Welfare, Govt. of India; 1986:160-163.
6. Baghdadi IH. Kitab Al Mukhtaratfit-Tibb. Vol 3. Central Council for Research in Unani Medicine, New Delhi. Ministry of Health & Family Welfare, Govt. of India; 2004:326-328.
7. Arzani HA. Tibbe Akbar. Urdu Translation by Hkm. Mohd. Husain. Faisal Publication Deoband UP; YNM: 525-526.
8. Kirmani NBA. Kulliyat-E-Nafeesi. Urdu Translation by Hkm. Kabeeruddin. Idara Kitab Us Shifa, New Delhi. YNM;
9. Khan MA. Akseer-E-Azam. Urdu Translation by Hkm. Kabeeruddin. Idara Kitab Us Shifa New Delhi; 2011:705-709.

10. Qutubuddin. Clinical Study of *Ziabetus Shakri* (Diabetes Mellitus-II) and Evaluation of Efficacy of a Unani Formulation and Its Management. Dissertation. Rajiv Gandhi University of Health Sciences, Karnataka, 2012.
11. Khan HA. Hazique.Jaseem Book Depot, New Delhi; 1983:387-390.
12. Qurshi MH. Jam-Ul-Hikmat.Idara Kitab Us Shifa New Delhi; 2011; 864-873.
13. Shah SN. API Textbook of Medicine. 9<sup>th</sup> Edition; Jaypee Brothers. New Delhi; 2012: 321-323.
14. Loriaux DL. Diabetes and the Ebers Papyrus: 1552 BC. The Endocrinologist. 2006 Mar 1;16(2):55-6.
15. King KM, Rubin G. A history of diabetes: from antiquity to discovering insulin. British journal of nursing. 2003 Oct 9;12(18):1091-5.
16. Ahmed AM. History of diabetes mellitus. Saudi medical journal. 2002 Apr 1;23(4):373-8.
17. Lakhtakia R. The history of diabetes mellitus. Sultan Qaboos University Medical Journal. 2013 Aug;13(3):368-370.
18. Karamanou M, Protogerou A, Tsoucalas G, Androutsos G, Poulakou-Rebelakou E. Milestones in the history of diabetes mellitus: The main contributors. World journal of diabetes. 2016 Jan 10;7(1):1.
19. Zajac J, Shrestha A, Patel P, Poretsky L. The main events in the history of diabetes mellitus. In Principles of diabetes mellitus 2010 (pp. 3-16). Springer, Boston, MA.
20. Tattersall RB. The history of diabetes mellitus. Textbook of diabetes. 2017 Jan 23:1-22.

# Clinical Features of Diabetes

## Abstract

Diabetes mellitus is a chronic metabolic disorder characterized by hyperglycemia due to defects in insulin secretion, insulin action, or both. It encompasses several types, primarily type 1 diabetes (T1D), type 2 diabetes (T2D), and gestational diabetes mellitus (GDM), each presenting distinct clinical features. T1D is an autoimmune condition marked by abrupt onset, polyuria, polydipsia, weight loss, and ketoacidosis. In contrast, T2D, the most prevalent form, typically develops insidiously and may remain asymptomatic for years, with symptoms such as fatigue, blurred vision, recurrent infections, and neuropathy often manifesting later. GDM, occurring during pregnancy, presents with transient hyperglycemia but increases the risk of future T2D. Chronic hyperglycemia in diabetes leads to both microvascular (retinopathy, nephropathy, and neuropathy) and macrovascular (cardiovascular disease, stroke, and peripheral artery disease) complications. The disease course is influenced by genetic, environmental, and lifestyle factors. Early recognition of clinical symptoms is crucial for timely diagnosis and intervention. Advances in diagnostic criteria, including fasting plasma glucose, HbA1c, and glucose tolerance tests, facilitate early detection and management. A comprehensive understanding of the clinical presentation of diabetes is essential for optimizing patient care and reducing long-term complications.

## Introduction

Diabetes mellitus is a serious metabolic disease, affecting people of all geographic, ethnic, or racial origins, and its prevalence is increasing globally. Burden from this costly disease is high in the low and middle-income countries (LMIC), where the impacts of modernization and urbanization have caused marked adverse changes in lifestyle

parameters. The following symptoms of diabetes are typical. However, some people with diabetes have symptoms so mild that they go unnoticed. In people with type 1 diabetes, the onset of symptoms can be very sudden, while in type 2 diabetes, they tend to come about more gradually, and sometimes there are no signs at all. Symptoms sometimes occur after a viral illness. In some cases, a person may reach the point of diabetic ketoacidosis (DKA) before a type 1 diagnosis is made. DKA occurs when blood glucose is dangerously high and the body can't get nutrients into the cells because of the absence of insulin. The body then breaks down muscle and fat for energy, causing an accumulation of ketones in the blood and urine. Symptoms of DKA include a fruity odour on the breath, heavy, taxed breathing, and vomiting. If left untreated, DKA can result in stupor, unconsciousness, and even death. People who have symptoms of type 1 or of DKA should contact their health care provider immediately for an accurate diagnosis. Keep in mind that these symptoms could signal other problems, too. Some people with type 1 have a “*honeymoon*” period, a brief remission of symptoms while the pancreas is still secreting some insulin. The honeymoon phase usually occurs after someone has started taking insulin. A honeymoon can last as little as a week or even up to a year. But it's important to know that the absence of symptoms doesn't mean the diabetes is gone. The pancreas will eventually be unable to secrete insulin, and, if untreated, the symptoms will return. The signs and symptoms of diabetes are disregarded by many because of the chronic progression of the disease. People do not consider this a serious problem because, unlike many other diseases, the consequences of hyperglycaemia are not manifested immediately. People are not aware that damage can start several years before symptoms become noticeable. This is unfortunate because recognition of early symptoms can help to get the disease under control immediately and prevent vascular complications.

**Table: Common symptoms of diabetes (Type I and Type II):**

| Symptom                         | Description                                                                     | More Common In         |
|---------------------------------|---------------------------------------------------------------------------------|------------------------|
| Polyuria                        | Frequent urination due to excess glucose in urine                               | Type I & Type II       |
| Polydipsia                      | Excessive thirst as a result of fluid loss from urination                       | Type I & Type II       |
| Polyphagia                      | Increased hunger despite regular eating                                         | Type I & Type II       |
| Tiredness/Fatigue               | Persistent low energy and exhaustion                                            | Type I & Type II       |
| Blurry Vision                   | Temporary vision issues due to fluctuating blood sugar                          | Type I & Type II       |
| Unexplained Weight Loss         | Sudden loss of weight despite normal or increased food intake                   | More common in Type I  |
| Irritability/Behavioral Changes | Emotional disturbances or mood swings                                           | Type I & Type II       |
| Tingling, Numbness, or Pain     | Sensory issues in hands or feet due to nerve damage                             | More common in Type II |
| Frequent Infections             | Repeated infections (skin, urinary, genital, oral)                              | Type I & Type II       |
| Delayed Wound Healing           | Slow recovery from cuts or injuries                                             | Type I & Type II       |
| Dry Mouth & Stomatitis          | Dryness of the mouth and inflammation                                           | Type I & Type II       |
| Genital Itching                 | Itching around the private parts due to infections                              | Type I & Type II       |
| Reactive Hypoglycemia           | Sudden drops in blood sugar after meals                                         | Type I & Type II       |
| Palpitations & Sweating         | Rapid heartbeat and excessive sweating                                          | Type I & Type II       |
| Acanthosis Nigricans            | Dark, velvety skin patches (neck, armpits, groin); a sign of insulin resistance | More common in Type II |

|                                  |                                                                           |                        |
|----------------------------------|---------------------------------------------------------------------------|------------------------|
| Reduced Sexual Stamina           | Lowered sexual performance or interest                                    | Type I & Type II       |
| Erectile Dysfunction (Males)     | Difficulty in achieving or maintaining an erection                        | More common in Type II |
| Dyspareunia (Females)            | Painful intercourse                                                       | Type I & Type II       |
| Impotence, Stress, Social Stigma | Psychological and social challenges related to sexual health and diabetes | Type I & Type II       |

**Table. Summarizing the clinical manifestations seen in Type 1 and Type 2 diabetes.**

| <b>Clinical features</b>      | <b>Type 1 Diabetes</b>                                                                                   | <b>Type 2 Diabetes</b>                                                                                                 |
|-------------------------------|----------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|
| Onset                         | Abrupt and rapid symptoms develop over days to a few weeks                                               | Gradual and insidious- symptoms may develop slowly over months or years                                                |
| Typical Age at Presentation   | Most often diagnosed in children, adolescents, or young adults (but can occur at any age)                | More common in adults (especially middle-aged and older), though increasingly seen in younger individuals with obesity |
| Body Weight                   | Often present in lean individuals, with notable unintentional weight loss despite an increased appetite. | Frequently associated with overweight or obesity; may have weight gain before diagnosis.                               |
| Polyuria (Frequent Urination) | Marked polyuria is common due to high blood glucose levels                                               | Also common; may be less dramatic initially but worsens as hyperglycemia progresses                                    |
| Polydipsia (Excessive Thirst) | Pronounced and sudden; patients often report extreme thirst                                              | Present as a symptom; patients may experience increased thirst over time                                               |
| Polyphagia (Increased Hunger) | Increased appetite despite weight loss is typical                                                        | May occur; sometimes less severe or masked by other metabolic issues                                                   |

|                             |                                                                                                                    |                                                                                                                            |
|-----------------------------|--------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| Fatigue and Weakness        | Often severe due to rapid loss of energy from unutilized glucose                                                   | Common and can be compounded by obesity, inactivity, and coexisting metabolic conditions                                   |
| Blurred Vision              | May develop quickly with sudden hyperglycemia                                                                      | Gradually appears as blood sugar remains elevated                                                                          |
| Diabetic Ketoacidosis (DKA) | A common, sometimes initial presentation (especially in younger patients) because of near-total insulin deficiency | Rare in early stages; may occur under significant stress or during acute illness when insulin production becomes very low. |
| Infections & Wound Healing  | Not a primary early feature, though hyperglycemia predisposes to complications over time                           | More frequently observed due to chronic hyperglycemia, leading to impaired immune function and slower wound healing.       |
| Skin Changes                | Less common early on; may be seen later due to chronic, uncontrolled blood sugars.                                 | Acanthosis nigricans (dark, velvety patches), skin infections, and poor wound healing are more common.                     |

## Explanation

- **Onset and age:** Type 1 diabetes typically has a rapid, abrupt onset (often in childhood or young adulthood) because of autoimmune destruction of the pancreatic beta cells. In contrast, Type 2 diabetes develops slowly, usually in adults, and is closely linked to lifestyle factors and insulin resistance.
- **Body weight:** Weight loss in Type 1 is due to the inability to utilize glucose (despite high appetite), while Type 2 diabetes is often seen in the context of overweight or obesity.
- **Acute complications:** Diabetic ketoacidosis is a frequent acute complication in Type 1 diabetes, whereas Type 2 diabetes patients usually do not develop DKA unless under extreme stress or with long-standing severe beta-cell failure.

- **Chronic complications:** Both types can eventually lead to complications (such as blurred vision, neuropathy, and poor wound healing) if blood sugar levels remain uncontrolled, though these are often discovered later in Type 2 diabetes.

## Conclusion

Recognizing the clinical features of diabetes mellitus is critical for timely diagnosis and effective management. While both Type 1 and Type 2 diabetes share core symptoms such as polyuria, polydipsia, polyphagia, fatigue, and blurred vision, their onset, progression, and associated features vary significantly. Type 1 diabetes often presents abruptly in younger individuals, with sudden symptoms and a high risk of diabetic ketoacidosis due to total insulin deficiency. In contrast, Type 2 diabetes develops insidiously, often remaining undiagnosed for years, and is typically associated with obesity, insulin resistance, and complications like recurrent infections, poor wound healing, and *acanthosis nigricans*. Early identification of these signs—especially in asymptomatic or mildly symptomatic individuals—can help prevent long-term complications such as neuropathy, retinopathy, and cardiovascular disease. Additionally, understanding the variation in presentation across age groups and types is vital for clinicians to tailor treatment appropriately. Public awareness about early symptoms and routine screening in high-risk populations is an essential strategy to curb the rising diabetes burden. Ultimately, clinical vigilance, coupled with patient education and lifestyle interventions, plays a pivotal role in reducing morbidity and improving quality of life for individuals with diabetes.

## Bibliography:

1. Basics D. Symptoms: American Diabetes Association. <https://www.diabetes.org/diabetes/type-1/symptoms>. Accessed on 10-10-2020.
2. Kahanovitz L, Sluss PM, Russell SJ. Type 1 diabetes—a clinical perspective. *Point of care*. 2017 Mar;16(1):37-40.

3. Oswal KS, Sivaraj RR, Stavrou P, Murray PI. Clinical features of patients with diabetes mellitus presenting with their first episode of uveitis. *Ocular immunology and inflammation*. 2009 Dec 1;17(6):390-3.
4. Suzuki S, Oka Y, Kadowaki T, Kanatsuka A, Kuzuya T, Kobayashi M, Sanke T, Seino Y, Nanjo K. Clinical features of diabetes mellitus with the mitochondrial DNA 3243 (A–G) mutation in Japanese: maternal inheritance and mitochondria-related complications. *Diabetes research and clinical practice*. 2003 Mar 1;59(3):207-17.
5. Mayega RW, Rutebemberwa E. Clinical presentation of newly diagnosed diabetes patients in a rural district hospital in Eastern Uganda. *African Health Sciences*. 2018;18(3):707-19.
6. Shah SN. *API Textbook of Medicine*. 9<sup>th</sup> Edition; Jaypee Brothers. New Delhi; 2012: 321-323.
7. American Diabetes Association. Diagnosis and classification of diabetes mellitus. *Diabetes care*. 2010 Jan 1;33(Supplement 1):S62-S69.
8. Ramachandran A. Know the signs and symptoms of diabetes. *The Indian journal of medical research*. 2014 Nov;140(5):579-581.
9. Drivsholm T, de Fine Olivarius N, Nielsen AB, Siersma V. Symptoms, signs and complications in newly diagnosed type 2 diabetic patients, and their relationship to glycaemia, blood pressure and weight. *Diabetologia*. 2005 Feb 1;48(2):210-4.
10. Clark NG, Fox KM, Grandy S. Symptoms of diabetes and their association with the risk and presence of diabetes: findings from the Study to Help Improve Early evaluation and management of risk factors Leading to Diabetes (SHIELD). *Diabetes Care*. 2007 Nov 1;30(11):2868-73.
11. Wang CY, Neil DL, Home P. 2020 vision—An overview of prospects for diabetes management and prevention in the next decade. *Diabetes research and clinical practice*. 2018 Sep 1; 143:101-12.

12. American Diabetes Association. 15. Diabetes Care in the Hospital: Standards of Medical Care in Diabetes—2020. Diabetes Care. 2020 Jan 1;43(Supplement 1):S193-202.
13. American Diabetes Association. 10. Cardiovascular disease and risk management: Standards of Medical Care in Diabetes—2020. Diabetes Care. 2020 Jan 1;43(Supplement 1):S111-34.
14. American Diabetes Association. 11. Microvascular Complications and Foot Care: Standards of Medical Care in Diabetes— 2020. Diabetes Care. 2020 Jan 1;43(Supplement 1):S135-51.
15. American Diabetes Association. 4. Comprehensive Medical Evaluation and Assessment of Comorbidities: Standards of Medical Care in Diabetes-2020. Diabetes care. 2020 Jan;43(Suppl 1):S37.
16. Khan MA. Akseer-E-Azam. Urdu Translation by Hkm. Kabeeruddin. Idara Kitab Us Shifa New Delhi; 2011:705-709.
17. Qutubuddin. Clinical Study of *Ziabetus Shakri* (Diabetes Mellitus-II) and Evaluation of Efficacy of a Unani Formulation and Its Management. Dissertation. Rajiv Gandhi University of Health Sciences, Karnataka 2012.
18. Khan HA. Hazique. Jaseem Book Depot, New Delhi; 1983:387-390.
19. Qurshi MH. Jam-UI-Hikmat. Idara Kitab Us Shifa New Delhi; 2011; 864-873.
20. Jurjani I. Zakhira Kharzam Shahi. Vol 6. Urdu Translation by Hkm. Hadi Husain. Published By Idara Kitab Us Shifa, New Delhi; 2010:540-541.
21. Zuhr I. Kitab Al-Taiseer. Central Council for Research in Unani Medicine, New Delhi. Ministry of Health & Family Welfare, Govt. of India; 1986:160-163.
22. Baghdadi IH. Kitab Al Mukhtaratfit-Tibb. Vol 3. Central Council for Research in Unani Medicine, New Delhi. Ministry of Health & Family Welfare, Govt. of India; 2004:326-328.
23. Arzani HA. Tibbe Akbar. Urdu Translation by Hkm. Mohd. Husain. Faisal Publication Deoband UP; YNM: 525-526.

24. Rhazi Z. Al-Hawi Fit Tib. Vol 10. Central Council for Research in Unani Medicine, New Delhi. Ministry of Health & Family Welfare, Govt. Of India; 2002:181-187.
25. Sina I. Kulliyate Qanoon. by Hkm. Kabeeruddin) part 2. Shaikh Md. Basheer and Sons, Lahore. 2006:258-97.

# Risk Factors for Diabetes

## Abstract

Diabetes mellitus is a chronic metabolic disorder characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both. The prevalence of diabetes is increasing globally, driven by a complex interplay of genetic, environmental, and lifestyle factors. This chapter explores the key risk factors for diabetes, focusing on both modifiable and non-modifiable determinants. Non-modifiable risk factors include genetic predisposition, family history, ethnicity, and aging, which contribute to an individual's susceptibility. In contrast, modifiable risk factors such as obesity, physical inactivity, poor dietary habits, and chronic stress play a significant role in disease onset and progression. Additionally, emerging evidence highlights the impact of environmental pollutants, gut microbiota imbalances, and socioeconomic factors on diabetes risk. The chapter also examines the role of prediabetes as an intermediate state, emphasizing the importance of early detection and intervention. Understanding these risk factors is crucial for developing targeted prevention strategies, promoting lifestyle modifications, and implementing public health policies to curb the diabetes epidemic. By addressing modifiable risk factors and raising awareness, the burden of diabetes can be significantly reduced, improving overall health outcomes and quality of life.

## Introduction

A risk factor is something that increases your chance of getting a disease. There are various risk factors that are responsible for Diabetes. The development of early onset T2DM represents a complex interplay between Genetic, environmental, and metabolic risk factors. A strong family history of diabetes mellitus, age, obesity, and physical inactivity identify those individuals at the highest risk and contribute to insulin

resistance. Women with a history of gestational diabetes, as well as their children, are at greater risk of progressing to type 2 diabetes mellitus. Insulin resistance increases a person's risk for developing impaired glucose tolerance and type 2 diabetes. Individuals who have insulin resistance share many of the same risk factors as those with type 2 diabetes.

### **Risk factors for type 2 diabetes mellitus:**

Basically, there are two types of risk factors for Diabetes, i.e., modifiable and non-modifiable risk factors.

- a. Modifiable:** Modifiable risk factors are those which can be changed and which are under own control of a person.

#### **1. Obesity:**

Although overweight or obesity is a major risk factor for the development of type 2 diabetes mellitus, there is increasing evidence that overweight or obese patients with type 2 diabetes mellitus experience lower mortality compared with patients of normal weight, but the mechanisms for this association are poorly understood. The vast majority of those with early onset T2DM are obese (80-92%) compared with only 56% of older adults, with an inverse linear relationship between BMI and the age at diagnosis of T2DM. Obesity and Type 2 Diabetes are nowadays summarized as “*diabesity*”. That is because obesity frequently precedes and is the most important risk factor in the increase of Type 2 Diabetes. Achievable reductions in the risk of T2DM were estimated to be 50-75% by reducing obesity and 30-50% by increasing physical activity. Obesity can be controlled with the help of proper dietary management and appropriate exercise.

#### **2. Low physical activity:**

Low physical activity or a sedentary lifestyle is associated with the development of obesity and Diabetes. Physical activity has been shown to prevent type 2 diabetes. However, the type, intensity, and amount of effective physical activity, as well as individuals' needs according to

the level of their risk for type 2 diabetes. A relation between moderate aerobic physical activity  $\geq 150$  minutes per week with decreased risk of type 2 diabetes among obese and non-obese.

### **3. High sedentary behavior:**

Higher physical activity and lower sedentary behaviors were inversely associated with incident type 2 diabetes. People are more prone to diabetes that is under higher sedentary behavior and less activity and which leads to non-consumption of glucose. Disease risks are associated with many hours per day of sitting idle, averaging 10 hrs/day or 70 hrs each week. A goal of inactivity physiology is to develop the most effective, feasible, and safest mode of physical activity to reduce as many hours per week of sedentary time as is possible for disease prevention.

### **4. Socioeconomic status:**

Socioeconomic status (SES) is a complex concept that describes the position an individual occupies in the structure of society. It consists of many dimensions and is often measured by using several indicators such as income, education, and occupation. Socioeconomic status is a major determinant of risk for diabetes (DM). Distribution of DM in the community follows a social gradient, with the highest prevalence in the lowest SES group, and then declines as SES increases. In addition, SES is also a determinant of DM complications and mortality.

### **b. Non-modifiable:**

Non-modifiable risk factors are those which can't be changed and which are not under own control of a person.

#### **1. Ethnicity:**

Type 2 diabetes is a major UK public health priority. Among minority ethnic communities, the prevalence is alarmingly high, approximately three to five times higher than in the white British population. The reasons for ethnic differences in the risk of type 2 diabetes are not

entirely understood. For example, Asian Indians have a remarkably high prevalence of type 2 diabetes compared to Caucasians. However, the incidence of obesity, an important risk factor in the development of type 2 diabetes, is significantly lower in Asian Indians compared to Caucasians.

## **2. Family history:**

A family history of diabetes is associated with a range of metabolic abnormalities and is a strong risk factor for the development of type 2 diabetes (T2D). This elevated risk of T2D is likely mediated, in part, by both genetic and shared environmental components amongst family members. The estimated risk for the diagnosis of T2DM increases approximately by 2-4 times when father, mother, or both have this condition. Conversely, many T2DM patients have family members with DM. Some researchers suggested that the likelihood of T2DM in the next generation is higher in the event of a diabetic mother than father.

## **3. Aging: -**

The unprecedented aging of the world's population is a major contributor to the diabetes epidemic, and older adults represent one of the fastest-growing segments of the diabetes population. Aging is directly proportional to the risk factor for type 2 diabetes and vice versa. Older adults with diabetes are at substantial risk for both acute and chronic microvascular and cardiovascular complications of the disease.

## **4. Gender: -**

The higher prevalence of type 2 diabetes in older men than in older women was associated with a larger amount of visceral fat in men. The prevalence of diabetic foot is higher for men than for women. Also, the prevalence of diabetic foot is higher among people with type 2 diabetes, compared to people with type 1 diabetes

## **5. Genetic predisposition:**

Estimates for the heritability of T2DM range from 20%-80% and evidence for heritability comes from a variety of populations, families, and twins. The lifetime risk of developing T2D is 40% for individuals who have one parent with T2D and 70% if both parents are affected. The detailed genetic architecture of T2D risk has not yet been precisely defined. A relatively small percentage, 5% or less, of non-autoimmune diabetes is due to monogenic causes and is classified as monogenic diabetes of the young or MODY (previously referred to as maturity onset diabetes of the young).

## **Conclusion**

Diabetes mellitus is a multifactorial disease influenced by a complex interplay of modifiable and non-modifiable risk factors. Non-modifiable risk factors such as age, gender, ethnicity, family history, and genetic predisposition contribute significantly to an individual's susceptibility. While these factors cannot be altered, awareness of them enables early screening and targeted preventive strategies. On the other hand, modifiable risk factors-such as obesity, physical inactivity, poor dietary habits, sedentary behavior, and low socioeconomic status-play a pivotal role in the increasing prevalence of type 2 diabetes. These factors can be effectively managed through lifestyle interventions, including healthy eating, regular exercise, weight management, and behavioral modifications. Obesity, in particular, remains one of the strongest predictors of diabetes, with physical inactivity exacerbating insulin resistance. Socioeconomic disparities further widen the risk due to limited access to education, healthcare, and nutritious food. By prioritizing lifestyle changes and early risk identification, especially in genetically predisposed individuals, the onset and progression of diabetes can be significantly delayed or prevented. Therefore, public health efforts must focus on educating communities, promoting healthier environments, and implementing policies that support diabetes prevention and control across all levels of society.

## **Bibliography:**

1. Fletcher B, Gulanick M, Lamendola C. Risk factors for type 2 diabetes mellitus. *J Cardiovasc Nurs*. 2002 Jan; 16(2):17-23.
2. Wilmot E, Idris I. Early onset type 2 diabetes: risk factors, clinical impact and management. *Ther Adv Chronic Dis*. 2014 Nov; 5(6):234-44.
3. Dendup T, Feng X, Clingan S, Astell-Burt T. Environmental Risk Factors for Developing Type 2 Diabetes Mellitus: A Systematic Review. *Int J Environ Res Public Health*. 2018 Jan 5;15(1).
4. Bellou V, Belbasis L, Tzoulaki I, Evangelou E. Risk factors for type 2 diabetes mellitus: An exposure-wide umbrella review of meta-analyses. *PLoS One*. 2018 Mar 20;13(3):e0194127.
5. Toplak H, Hoppichler F, Wascher TC, Schindler K, Ludvik B. Obesity and type 2 diabetes. *Wien Klin Wochenschr*. 2016 Apr;128 Suppl 2:S196-200.
6. Ghaderpanahi M, Fakhrzadeh H, Sharifi F, Badamchizade Z, Mirarefin M, Ebrahim RP. Association of physical activity with risk of type 2 diabetes. *Iran J Public Health*. 2011; 40(1):86-93.
7. Hamilton MT, Hamilton DG, Zderic TW. Sedentary behavior as a mediator of type 2 diabetes. *Med Sport Sci*. 2014;60:11-26.
8. Assari S, Moghani Lankarani M, Piette JD, Aikens JE. Socioeconomic Status and Glycemic Control in Type 2 Diabetes: Race by Gender Differences. *Healthcare (Basel)*. 2017 Nov 1;5(4). pii: E83.
9. Wu H, Meng X, Wild SH, Gasevic D, Jackson CA. Socioeconomic status and prevalence of type 2 diabetes in mainland China, Hong Kong, and Taiwan: a systematic review. *J Glob Health*. 2017 Jun;7(1):011103.
10. Goff LM. Ethnicity and Type 2 diabetes in the UK. *Diabet Med*. 2019 Jan 6.
11. Abate N, Chandalia M. Ethnicity and type 2 diabetes: focus on Asian Indians. *J Diabetes Complications*. 2001 Nov-Dec;15(6):320-7.

12. InterAct Consortium, Scott RA, Langenberg C, Sharp SJ, Franks PW, Rolandsson O. The link between family history and risk of type 2 diabetes is not explained by anthropometric, lifestyle or genetic risk factors: the EPIC-InterAct study. *Diabetologia*. 2013 Jan;56(1):60-9.
13. Papazafiropoulou AK, Papanas N, Melidonis A, Maltezos E. Family History of Type 2 Diabetes: Does Having a Diabetic Parent Increase the Risk? *Curr Diabetes Rev*. 2017;13(1):19-25.
14. Kalyani RR, Golden SH, Cefalu WT. Diabetes and Aging: Unique Considerations and Goals of Care. *Diabetes Care*. 2017 Apr;40(4):440-443.
15. Nordström A, Hadrévi J, Olsson T, Franks PW, Nordström P. Higher Prevalence of Type 2 Diabetes in Men Than in Women Is Associated With Differences in Visceral Fat Mass. *J Clin Endocrinol Metab*. 2016 Oct; 101(10):3740-3746.
16. Ali O. Genetics of type 2 diabetes. *World J Diabetes*. 2013 Aug 15;4(4):114-23.

# Complications of Diabetes

## Abstract

Diabetes mellitus is a chronic metabolic disorder characterized by hyperglycemia, leading to severe complications affecting multiple organ systems. Long-term uncontrolled diabetes contributes to both microvascular and macrovascular complications, significantly impacting morbidity and mortality. Microvascular complications include diabetic retinopathy, nephropathy, and neuropathy, which result from prolonged hyperglycemia-induced damage to small blood vessels. These conditions may lead to blindness, kidney failure, and debilitating nerve dysfunction. Macrovascular complications, such as cardiovascular disease, stroke, and peripheral artery disease, arise due to accelerated atherosclerosis, increasing the risk of life-threatening events. Additionally, diabetes predisposes individuals to infections, diabetic foot ulcers, and impaired wound healing, further complicating disease management. Emerging research highlights the role of oxidative stress, chronic inflammation, and genetic predisposition in the progression of complications. Early diagnosis, strict glycemic control, lifestyle modifications, and pharmacological interventions play a crucial role in mitigating these complications. Innovations in continuous glucose monitoring, precision medicine, and novel therapeutics offer promising strategies for improving patient outcomes. This chapter provides a comprehensive overview of the pathophysiology, clinical manifestations, and management of diabetes-related complications. Understanding these complexities is essential for healthcare professionals to develop effective prevention and treatment strategies, ultimately enhancing the quality of life for diabetic patients.

## **Introduction**

Diabetes mellitus is a chronic metabolic disorder characterized by persistent hyperglycemia due to defects in insulin secretion, insulin action, or both. While diabetes itself can be managed with appropriate lifestyle changes, medications, and insulin therapy, its long-term complications pose significant health risks. Chronic hyperglycemia affects multiple organ systems, leading to severe and potentially life-threatening complications. These complications are broadly classified into macrovascular (large blood vessels) and microvascular (small blood vessels) complications. Additionally, diabetes can lead to various other complications affecting multiple organs and overall quality of life. This chapter explores the major complications of diabetes, their pathophysiology, clinical manifestations, and potential management strategies.

### **Macrovascular complications**

Macrovascular complications result from damage to the larger blood vessels, increasing the risk of cardiovascular diseases (CVD), cerebrovascular diseases, and peripheral artery disease (PAD).

#### **Cardiovascular disease**

Cardiovascular disease (CVD) is the leading cause of morbidity and mortality in individuals with diabetes. Chronic hyperglycemia, insulin resistance, and dyslipidemia contribute to endothelial dysfunction, increased inflammation, and accelerated atherosclerosis. Patients with diabetes are at higher risk for coronary artery disease (CAD), myocardial infarction, and heart failure.

#### **Cerebrovascular disease**

Diabetes increases the risk of stroke due to atherosclerosis and hypertension. Hyperglycemia exacerbates ischemic damage by promoting oxidative stress and inflammatory responses. Stroke survivors with diabetes often experience poorer outcomes and higher rates of recurrence.

## **Peripheral artery disease**

Peripheral artery disease (PAD) results from atherosclerotic blockages in the lower extremities, leading to reduced blood flow. Symptoms include intermittent claudication, foot ulcers, and, in severe cases, gangrene, which may necessitate limb amputation.

## **Microvascular complications**

Microvascular complications arise due to damage to small blood vessels, primarily affecting the eyes, kidneys, and nerves.

### **Diabetic retinopathy**

Diabetic retinopathy is a leading cause of vision impairment and blindness. Chronic hyperglycemia damages retinal capillaries, leading to increased vascular permeability, hemorrhages, and neovascularization. The condition progresses through non-proliferative and proliferative stages, with diabetic macular edema (DME) causing significant vision loss. Regular ophthalmologic screenings and early interventions, such as laser therapy and anti-VEGF injections, can mitigate disease progression.

### **Diabetic nephropathy**

Diabetic nephropathy is a major cause of end-stage renal disease (ESRD). Hyperglycemia-induced damage to the glomerular capillaries leads to albuminuria, decreased glomerular filtration rate (GFR), and progressive kidney failure. Controlling blood glucose and blood pressure, particularly with renin-angiotensin-aldosterone system (RAAS) inhibitors, can slow the progression of kidney disease.

### **Diabetic neuropathy**

Diabetic neuropathy encompasses various forms of nerve damage, including peripheral, autonomic, and focal neuropathies.

- **Peripheral neuropathy** causes numbness, tingling, and pain in the extremities, increasing the risk of foot ulcers and infections.

- **Autonomic neuropathy** affects involuntary functions, leading to complications such as gastroparesis, orthostatic hypotension, and erectile dysfunction.
- **Focal neuropathy** presents as sudden nerve dysfunction, causing weakness or pain in specific areas.

### **Other complications**

Beyond vascular complications, diabetes impacts multiple organ systems and physiological processes.

### **Diabetic foot syndrome**

Diabetic foot syndrome results from a combination of neuropathy, ischemia, and infection, leading to chronic ulcers and a high risk of amputation. Preventative foot care and proper wound management are essential to reducing complications.

### **Diabetic ketoacidosis (DKA) and hyperosmolar hyperglycemic State (HHS)**

Diabetic ketoacidosis (DKA) is a life-threatening acute complication characterized by severe hyperglycemia, ketonemia, and metabolic acidosis. It primarily occurs in type 1 diabetes due to insulin deficiency. Symptoms include nausea, vomiting, dehydration, and altered mental status. Immediate medical intervention with insulin therapy and fluid replacement is required.

Hyperosmolar hyperglycemic state (HHS) is more common in type 2 diabetes and is marked by extreme hyperglycemia, severe dehydration, and altered consciousness without significant ketoacidosis. It has a high mortality rate if untreated, necessitating aggressive fluid resuscitation and glucose management.

### **Increased susceptibility to infections**

People with diabetes are more prone to infections due to impaired immune function. Common infections include urinary tract infections,

skin infections, pneumonia, and fungal infections such as mucormycosis. Good glycemic control and prompt treatment of infections can reduce complications.

### **Cognitive impairment and dementia**

Chronic hyperglycemia, insulin resistance, and vascular damage increase the risk of cognitive decline, including Alzheimer's disease and vascular dementia. Maintaining optimal glucose levels and a healthy lifestyle may help preserve cognitive function.

### **Depression and mental health disorders**

The psychological burden of diabetes contributes to an increased prevalence of depression and anxiety. Poor mental health negatively impacts diabetes management, creating a vicious cycle. Psychological support and counseling are crucial components of diabetes care.

### **Prevention and management of complications**

Preventing diabetes complications requires a comprehensive approach involving lifestyle modifications, regular screenings, and appropriate medical interventions.

### **Blood glucose control**

Maintaining optimal blood glucose levels through diet, exercise, medications, and insulin therapy is crucial for preventing complications. Continuous glucose monitoring (CGM) and personalized treatment plans improve glycemic control.

### **Blood pressure and lipid management**

Hypertension and dyslipidemia significantly contribute to diabetes complications. The use of antihypertensive medications, statins, and lifestyle changes can reduce cardiovascular risk.

## **Regular screening and early detection**

Routine screenings for retinopathy, nephropathy, neuropathy, and cardiovascular disease allow early intervention and improved outcomes.

## **Lifestyle modifications**

A healthy diet, regular physical activity, weight management, smoking cessation, and stress management play essential roles in reducing diabetes complications.

## **Patient education and self-care**

Empowering patients with knowledge about diabetes management, self-monitoring, and adherence to treatment plans enhances disease control and prevents complications.

## **Conclusion**

Diabetes is a serious chronic condition that, if not managed properly, can lead to severe complications affecting multiple organs and systems in the body. Long-term high blood sugar levels can damage the heart, kidneys, nerves, and eyes, and even lead to life-threatening conditions such as heart disease and stroke. Nerve damage (neuropathy) can result in loss of sensation, increasing the risk of infections and amputations, while kidney disease (nephropathy) may progress to kidney failure, requiring dialysis or transplantation. Diabetic retinopathy can lead to blindness if left untreated. Despite these risks, many complications of diabetes can be prevented or delayed with proper management. Maintaining healthy blood sugar levels, regular monitoring, adopting a balanced diet, engaging in physical activity, and taking prescribed medications can significantly reduce complications. Regular medical checkups help detect issues early, allowing for timely interventions. Education and lifestyle changes are essential in preventing and managing diabetes-related complications, improving overall health and quality of life. Ultimately, diabetes management requires a proactive approach, focusing on prevention and early treatment. By

taking control of their health, individuals with diabetes can lead full, active lives while minimizing the risk of serious complications.

### **Bibliography:**

1. Hamblin PS, Russell AW, Talic S, Zoungas S. The growing range of complications of diabetes mellitus. *Trends Endocrinol Metab.* 2025 Jan 3; S1043-2760(24)00328-X. doi: 10.1016/j.tem.2024.12.006.
2. Zheng Y, Ley SH, Hu FB. Global aetiology and epidemiology of type 2 diabetes mellitus and its complications. *Nat Rev Endocrinol.* 2018 Feb;14(2):88-98.
3. Choi YJ, Chung YS. Type 2 diabetes mellitus and bone fragility: Special focus on bone imaging. *Osteoporosis Sarcopenia.* 2016 Mar;2(1):20-24.
4. Picke AK, Campbell G, Napoli N, Hofbauer LC, Rauner M. Update on the impact of type 2 diabetes mellitus on bone metabolism and material properties. *Endocr Connect.* 2019 Mar 01;8(3):R55-
5. Yang T, Qi F, Guo F, Shao M, Song Y, Ren G, Linlin Z, Qin G, Zhao Y. An update on chronic complications of diabetes mellitus: from molecular mechanisms to therapeutic strategies with a focus on metabolic memory. *Mol Med.* 2024 May 26;30(1):71. doi: 10.1186/s10020-024-00824-9.
6. Hussain S, Chowdhury TA. The Impact of Comorbidities on the Pharmacological Management of Type 2 Diabetes Mellitus. *Drugs.* 2019 Feb;79(3):231-242.
7. Kempegowda P, Chandan JS, Abdulrahman S, Chauhan A, Saeed MA. Managing hypertension in people of African origin with diabetes: Evaluation of adherence to NICE Guidelines. *Prim Care Diabetes.* 2019 Jun;13(3):266-271.
8. Martinez LC, Sherling D, Holley A. The Screening and Prevention of Diabetes Mellitus. *Prim Care.* 2019 Mar;46(1):41-52.
9. Thewjitcharoen Y, Chotwanvirat P, Jantawan A, Siwasaranond N, Saetung S, Nimitphong H, Himathongkam T, Reutrakul S. Evaluation of Dietary Intakes and Nutritional Knowledge in Thai

- Patients with Type 2 Diabetes Mellitus. *J Diabetes Res*. 2018; 2018:9152910
10. Willis M, Asseburg C, Neslusan C. Conducting and interpreting results of network meta-analyses in type 2 diabetes mellitus: A review of network meta-analyses that include sodium glucose co-transporter 2 inhibitors. *Diabetes Res Clin Pract*. 2019 Feb; 148:222-233
  11. Lai LL, Wan Yusoff WNI, Vethakkan SR, Nik Mustapha NR, Mahadeva S, Chan WK. Screening for non-alcoholic fatty liver disease in patients with type 2 diabetes mellitus using transient elastography. *J Gastroenterol Hepatol*. 2019 Aug;34(8):1396-140312.
  12. Eckstein ML, Williams DM, O'Neil LK, Hayes J, Stephens JW, Bracken RM. Physical exercise and non-insulin glucose-lowering therapies in the management of Type 2 diabetes mellitus: a clinical review. *Diabet Med*. 2019 Mar;36(3):349-358.
  13. Massey CN, Feig EH, Duque-Serrano L, Wexler D, Moskowitz JT, Huffman JC. Well-being interventions for individuals with diabetes: A systematic review. *Diabetes Res Clin Pract*. 2019 Jan; 147:118-133.
  14. Shah SR, Iqbal SM, Alweis R, Roark S. A closer look at heart failure in patients with concurrent diabetes mellitus using glucose-lowering drugs. *Expert Rev Clin Pharmacol*. 2019 Jan;12(1):45-52.
  15. Chinese Diabetes Society; National Office for Primary Diabetes Care. [National guidelines for the prevention and control of diabetes in primary care (2018)]. *Zhonghua Nei Ke Za Zhi*. 2018 Dec 01;57(12):885-893
  16. Petersmann A, Müller-Wieland D, Müller UA, Landgraf R, Nauck M, Freckmann G, Heinemann L, Schleicher E. Definition, Classification and Diagnosis of Diabetes Mellitus. *Exp Clin Endocrinol Diabetes*. 2019 Dec;127(S 01):S1-S7.

17. Kerner W, Brückel J., German Diabetes Association. Definition, classification, and diagnosis of diabetes mellitus. *Exp Clin Endocrinol Diabetes*. 2014 Jul;122(7):384-6
18. Cepeda Marte JL, Ruiz-Matuk C, Mota M, Pérez S, Recio N, Hernández D, Fernández J, Porto J, Ramos A. Quality of life and metabolic control in type 2 diabetes mellitus diagnosed individuals. *Diabetes Metab Syndr*. 2019 Sep-Oct;13(5):2827-2832.
19. Steffensen C, Dekkers OM, Lyhne J, Pedersen BG, Rasmussen F, Rungby J, Poulsen PL, Jørgensen JOL. Hypercortisolism in Newly Diagnosed Type 2 Diabetes: A Prospective Study of 384 Newly Diagnosed Patients. *Horm Metab Res*. 2019 Jan;51(1):62-68.
20. Qin Z, Zhou K, Li Y, Cheng W, Wang Z, Wang J, Gao F, Yang L, Xu Y, Wu Y, He H, Zhou Y. The atherogenic index of plasma plays an important role in predicting the prognosis of type 2 diabetic subjects undergoing percutaneous coronary intervention: results from an observational cohort study in China. *Cardiovasc Diabetol*. 2020 Feb 21;19(1):23.

# Diagnosis of Diabetes

## Abstract

Diabetes mellitus is a chronic metabolic disorder characterized by persistent hyperglycemia due to insulin deficiency, resistance, or both. Early and accurate diagnosis is essential to prevent complications and improve patient outcomes. This chapter explores the diagnostic criteria, methodologies, and emerging trends in diabetes detection. The diagnosis of diabetes relies on standardized biochemical tests, including fasting plasma glucose (FPG), oral glucose tolerance test (OGTT), glycated hemoglobin (HbA1c), and random plasma glucose (RPG). The American Diabetes Association (ADA) and World Health Organization (WHO) have established cut-off values for these tests, ensuring consistency in clinical practice. Additionally, continuous glucose monitoring (CGM) and point-of-care testing (POCT) are gaining prominence for real-time glucose assessment. Differentiating between type 1, type 2, and gestational diabetes is crucial for appropriate management. Autoantibody testing and C-peptide levels aid in distinguishing type 1 diabetes, while insulin resistance markers and risk factor assessment support type 2 diabetes diagnosis. Gestational diabetes screening follows specific guidelines, typically involving an OGTT during pregnancy. Recent advancements, including genetic risk profiling, artificial intelligence-based predictive models, and novel biomarkers, are enhancing early detection and risk stratification. However, accessibility, affordability, and standardization remain challenges in resource-limited settings. This chapter provides a comprehensive overview of traditional and emerging diagnostic strategies, emphasizing the need for early detection and precision medicine approaches to diabetes care. Future research should focus on integrating innovative technologies to improve diagnostic accuracy and accessibility globally.

## Introduction

In Unani Medicine, Diabetes is described under the caption of *Amraz-e-Gurda*. There are four etiological factors responsible for diabetes. Balance Condition and normal function of the vital organs indicate normal parameters. Unani System of Medicine uses the unique holistic diagnostics comprising history, physical examination, pulse, and inspection of urine and stool. History taking and physical examination are undertaken according to general parameters and specific parameters required by the particular problem of the patient, guided mainly by the '**Ten Fundamental Categories**' (*Ajnas-e-Ashra*). Ten features of pulse particularly observed during the diagnosis of a disease are - size of expansion, force, duration of movement and rest, condition of vessel wall, palpation of pulse, volume, equality and inequality, rhythm, and weight of pulse. Apart, some other types of compound pulse have also been described in the Unani System of Medicine. Unani scholars have described pulse in great detail under several headings such as normal pulse, factors governing pulse, effects of intrinsic factors such as age and sex, temperament, season, region and country, food and drink, sleep and wakefulness, exercise, bath, pregnancy, pain, swelling, and emotions. Physical examination of urine helps a lot in the diagnosis of not only urogenital diseases but also other systemic disorders. Several aspects are taken into account for diagnosis, e.g., quantity, colour, odour, consistency, foam or froth, precipitates, clearness, and turbidity. The physical examination of stool also helps in the diagnosis of various diseases. Colour, quantity, consistency, and presence of foreign bodies are observed during its physical examination. In addition to the above, Unani physicians have stressed the importance of physical examination of the patient, e.g., diagnosis by skin, nails, tongue, etc. Other modern tools of diagnosis are also used to confirm the diagnosis. In Unani Medicine, Urine has great importance for the diagnosis of Diabetes.

### **General statement about urine indicators:**

There should not be a trust in urine examination unless certain conditions are followed:

- It must be the first collection in the morning.
- It has not been left out for a long time.
- It is over-the-night urine.
- No food or drink was consumed.
- The patient has not consumed any food, drink, or substances known to alter the color of urine. These include saffron, pomegranate, or purging cassia (golden shower tree, *Cassia fistula*), which can impart yellow or red hues; legumes, which may cause red or blue discoloration; *Al-Muri*, which can darken the urine to black; and alcoholic beverages, which may tint the urine to their respective colors. Additionally, external substances like henna used on the skin may also influence urine coloration
- The patient has not taken something that will push out a humor through urine, such as yellow or phlegm humors.
- The patient has not carried out movements and work.
- Some of the out-of-the-ordinary external states change the urine colour, such as fasting, lack of sleep, fatigue, hunger, and anger, which all change the colour to yellow or red.
- Intercourse markedly increases the oiliness of the urine.
- Also, vomiting and evacuation change the original colour and texture of urine. Urine should be examined fresh; this is why it is said not after six hours because its indicators become weak, its colour changes, and its density dissolves, changes, or becomes thicker.
- However, I say not to look at it after one hour.

### **Western diagnostic criteria:**

According to the American Diabetes Association, the diagnostic criteria for a diabetic patient are any one of three criteria: -

## Diagnosing diabetes

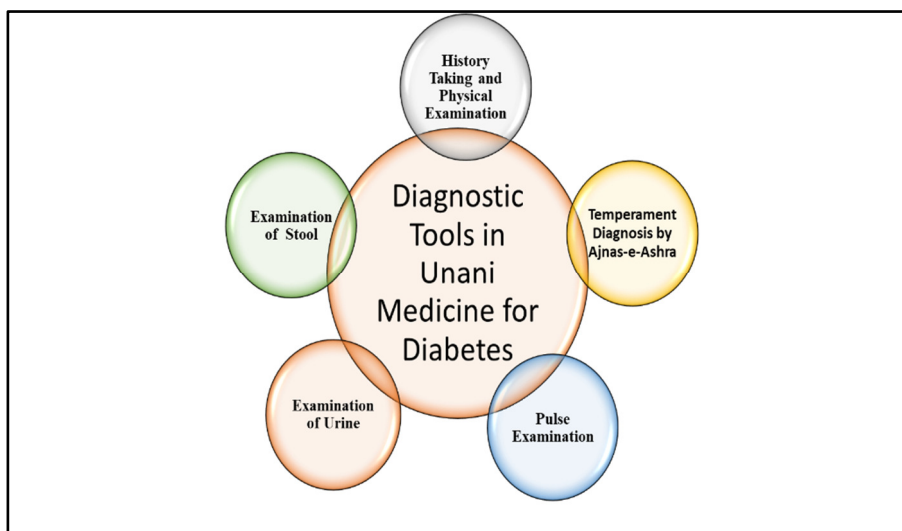
| Test                                                                                             | Results                        | Interpretation                          |
|--------------------------------------------------------------------------------------------------|--------------------------------|-----------------------------------------|
| HbA1c                                                                                            | $\geq 6.5\%$                   | Diabetes                                |
|                                                                                                  | 5.7-6.4%                       | Impaired glucose tolerance <sup>2</sup> |
|                                                                                                  | $\leq 5.7\%$                   | Normal                                  |
| Fasting Plasma Glucose                                                                           | $\geq 126$ mg/dL (7.0 mmol/L)  | Diabetes                                |
|                                                                                                  | 100–125 mg/dL                  | Impaired glucose tolerance <sup>2</sup> |
|                                                                                                  | $\leq 100$ mg/dL               | Normal                                  |
| Two-hour plasma glucose during an OGTT                                                           | $\geq 200$ mg/dL (11.1 mmol/L) | Diabetes                                |
| Random plasma glucose or patients with classic symptoms of hyperglycemia or hyperglycemic crisis | $\geq 200$ mg/dL (11.1 mmol/L) | Diabetes                                |
|                                                                                                  | 140–199 mg/dL                  | Impaired glucose tolerance <sup>1</sup> |
|                                                                                                  | $\leq 140$ mg/dL               | Normal                                  |

## Unani diagnostic methods for diabetes:

| Parameter                | Traditional Observation/Interpretation                                    | Indicative findings in diabetes                                                                                                                                                                                                |
|--------------------------|---------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Pulse<br>( <i>Nabz</i> ) | - Evaluation of the strength, speed, and rhythm of the pulse.             | - Rapid and bounding (often described as “sudden” or “thready”), indicating metabolic imbalance. In traditional texts, a rapid pulse may be interpreted as the body’s response to high blood sugar levels and associated heat. |
| Urine<br>( <i>Baul</i> ) | - Examination of the color, consistency, odor, and sediment of the urine. | - Turbid or foamy urine, sometimes with a sweet smell. In traditional diagnosis, the presence of sugar in the urine is noted by its sweetness (though                                                                          |

|                 |                                                                                                                                    |                                                                                                                                                                                                                                                                                           |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                 |                                                                                                                                    | modern testing uses chemical assays).                                                                                                                                                                                                                                                     |
| Stool<br>(Braz) | - Inspection of stool color, consistency, and frequency, which in traditional medicine may reflect digestive and metabolic status. | - Altered stool consistency (e.g., loose or irregular stools) may be observed, possibly reflecting gastrointestinal disturbances associated with diabetes. Traditional texts sometimes note that abnormal stool can be linked to “Ama” (toxins) accumulation seen in diabetic conditions. |

### Diagnostic Methods in Unani Medicine



**Figure.** Diagnostic tools in Unani Medicine for Diabetes

#### Important notes:

- **Modern diagnosis:** In current medical practice, diabetes is diagnosed by laboratory measurements such as fasting plasma glucose, oral glucose tolerance tests, and HbA<sub>1c</sub> levels rather than by pulse, urine, or stool examination.
- **Traditional methods:** The above observations come from classical systems of medicine (like Unani and Ayurveda),

where holistic evaluation, including the pulse (*Nabz*), urine (*Baul*), and stool (*Braz*), is used to gain insights into the body's balance and overall health.

- **Integration:** Some practitioners of complementary or integrative medicine may consider traditional findings alongside modern tests to get a fuller picture of the patient's condition. However, modern diabetes diagnosis relies on standardized, quantitative laboratory tests.
- This table is intended as an illustrative guide to how traditional diagnostic methods might conceptualize diabetes rather than a recommendation for diagnosis or management.

## Conclusion

Diagnosis of diabetes is a critical process that lays the foundation for effective management and prevention of complications. Early identification using reliable diagnostic tools such as fasting plasma glucose, the oral glucose tolerance test, and the HbA1c assay is essential for timely intervention. These tests help determine if an individual's blood sugar levels are within normal limits or if they indicate prediabetes or diabetes. Early diagnosis not only facilitates prompt lifestyle and pharmacological interventions but also significantly reduces the risk of long-term complications, including cardiovascular disease, neuropathy, kidney failure, and vision loss. Moreover, the diagnostic criteria provide a standardized framework that allows healthcare providers to monitor disease progression and evaluate the efficacy of treatment. Regular screening, particularly for individuals at high risk due to factors like family history, obesity, and sedentary lifestyles, is imperative. A thorough diagnosis ensures that patients receive individualized care plans tailored to their specific needs, empowering them to take control of their health. In conclusion, accurate and timely diagnosis is a cornerstone in the battle against diabetes. It enables proactive management, supports preventive

strategies, and ultimately contributes to improved patient outcomes and a reduction in the overall burden of the disease.

### **Bibliography:**

1. American Diabetes Association Professional Practice Committee.  
2. Diagnosis and Classification of Diabetes: Standards of Care in Diabetes-2024. *Diabetes Care*. 2024 Jan 1;47(Suppl 1):S20-S42. doi: 10.2337/dc24-S002.
2. Sacks DB, Arnold M, Bakris GL, Bruns DE, Horvath AR, Lernmark Å, et al. Guidelines and Recommendations for Laboratory Analysis in the Diagnosis and Management of Diabetes Mellitus. *Diabetes Care*. 2023 Oct 1;46(10):e151-e199. doi: 10.2337/dci23-0036.
3. Sina I. *Kulliyate Qanoon*. by Hkm. Kabeeruddin) part 2. Shaikh Md. Basheer and Sons, Lahore. 2006:258-97.
4. Kirmani NBA. *Kulliyat-E-Nafeesi*. Urdu Translation by Hkm. Kabeeruddin. Idara Kitab Us Shifa, New Delhi. YNM;
5. Khan MA. *Akseer-E-Azam*. Urdu Translation by Hkm. Kabeeruddin. Idara Kitab Us Shifa New Delhi; 2011:705-709.
6. Qutubuddin. Clinical Study of *Ziabetus Shakri* (Diabetes Mellitus-II) and Evaluation of Efficacy of a Unani Formulation and Its Management. Dissertation. Rajiv Gandhi University of Health Sciences, Karnataka 2012.
7. Khan HA. Hazique. Jaseem Book Depot, New Delhi; 1983:387-390.
8. Qurshi MH. *Jam-Ul-Hikmat*. Idara Kitab Us Shifa New Delhi; 2011; 864-873.
9. American Diabetes Association. 2. Classification and diagnosis of diabetes. *Diabetes care*. 2015 Jan 1;38(Supplement 1):S8-16.
10. American Diabetes Association. 2. Classification and diagnosis of diabetes: standards of medical care in diabetes—2018. *Diabetes care*. 2018 Jan 1;41(Supplement 1):S13-27.

11. American Diabetes Association. 2. Classification and diagnosis of diabetes: standards of medical care in diabetes—2019. *Diabetes care*. 2019 Jan 1;42(Supplement 1):S13-28.
12. Shah SN. *API Textbook of Medicine*. 9<sup>th</sup> Edition; Jaypee Brothers. New Delhi; 2012: 321-323.
13. Kahanovitz L, Sluss PM, Russell SJ. Type 1 diabetes—a clinical perspective. *Point of care*. 2017 Mar;16(1):37-40.
14. American Diabetes Association. Classification and diagnosis of diabetes. *Standard of Medical Care in Diabetes*. *Diabetes Care*. 2016;39:S13–22.

# Management of Diabetes

## Abstract

Diabetes mellitus, a chronic metabolic disorder characterized by hyperglycemia, has become a global health challenge. Conventional medicine offers various pharmacological interventions, including insulin therapy and oral hypoglycemic agents, alongside lifestyle modifications to manage blood glucose levels effectively. However, long-term dependence on synthetic drugs often leads to adverse effects and complications. Unani medicine, an ancient holistic system, provides an alternative approach to diabetes management by addressing underlying imbalances in the body's humors. It employs natural remedies such as herbal formulations (e.g., *Qurs Ziabetus*, *Qurs Gulnar*, *Safoof Ziabetus*, *Qurs Tabasheer* etc.), dietary modifications, regimenal therapies (*Ilaj Bil Tadbeer*), and lifestyle adjustments to restore metabolic harmony. Recent studies suggest that several Unani interventions exhibit anti-diabetic, antioxidant, and insulin-sensitizing properties. This chapter explores the strengths and limitations of both conventional and Unani treatments, highlighting their mechanisms, efficacy, and potential integration for improved diabetes care. A comparative analysis of both systems emphasizes the need for a multidisciplinary approach, leveraging evidence-based Unani practices alongside modern therapeutic advancements. By bridging these medical paradigms, an integrative model can emerge, offering sustainable and personalized diabetes management strategies.

## Introduction

The management of diabetes mellitus requires addressing multiple goals, with the primary goal being good glycemic control. There are various goals which required for good glycemic control, such as: -

**Physical activity:** Physical activity is an important element in the prevention and management of Type-2 diabetes in all its stages. Large and well-planned studies have established the importance of exercise. One has to do 30-40 minutes of aerobic exercise and resistance exercise for 6 days a week and preferably all 7 days. The beneficial effect of physical activity is thought to decrease insulin resistance or improve insulin sensitivity, decrease overall adiposity, reduce central adiposity, improve blood glucose levels, lipid levels, and blood pressure, and bring desirable changes in muscle mass.

### **Nutritional therapy for diabetes:**

A good quality balanced diet, regular exercise, a change in their sedentary lifestyle, and well-established pharmacotherapy are key components of diabetes management.

To promote and support healthy eating patterns, emphasizing a variety of nutrient-dense foods in appropriate portion sizes, to improve overall health and specifically to attain individualized glycemic, blood pressure, and lipid goals. General recommended goals from the ADA for these markers are as follows: HbA1C <7%, Blood pressure <140/80 mmHg, LDL cholesterol <100 mg/dL, triglycerides <150 mg/dL, HDL cholesterol >40mg/dL for men, HDL cholesterol >50 mg/dL for women, Achieve and maintain body weight goals and delay or prevent complications of diabetes.

To address individual nutritional needs based on personal and cultural preferences, health literacy and numeracy, access to healthy food choices, willingness and ability to make behavioural changes, as well as barriers to change.

To maintain the pleasure of eating by providing positive messages about food choices while limiting food choices only when indicated by scientific evidence.

To provide the individual with diabetes with practical tools for day-to-day meal planning rather than focusing on individual macronutrients, micronutrients, or single foods.

**Table: Practical nutrition tips for diabetes management**

| Nutritional tips      | Description/Guideline                                                              |
|-----------------------|------------------------------------------------------------------------------------|
| Fat Intake            | Restrict fats to 20%–25% of total daily calorie intake.                            |
| Fibre Intake          | Increase dietary fiber to 20–30 grams per day.                                     |
| Meal Frequency        | Eat small, frequent meals throughout the day.                                      |
| Whole Foods Inclusion | Include whole grains, beans, fruits, vegetables, and nuts in the daily diet.       |
| Eating Behavior       | Emphasize slow eating and portion control to aid digestion and glucose regulation. |

#### **Available treatment in the Unani system of medicine:**

Treatment in the Unani system of medicine is totally based on Black Box Design manner, i.e., provided in the form of a package such as regimenal therapies, diet therapies, and pharmacotherapies (Single & compound drugs).

**Tadabeer:** There are various forms of regimes accessible in the system of Unani Medicine, Unani physicians for all kinds of sickness, including *Riyazat* (exercise), *Dalk* (Massage), *Hijama* (Cupping), *Taleeq* (Leeching), *Abzan* (sitz Bath), *Takmeed* (Fomentation), etc.

**Ziabetus Haar:** *Tabreed wa Tarteeb*, Stay in cold and wet air, Cold *Aabzan*, Refrigerment *Zimad wa Tila Aabe Mako wa Kasni*, *Aabe Hayyul Alam*, *Tahlab*, *Kishneez Sabz* etc.

**Ziabetus Barid:** *Hamname Garm*, *Fasde Basalique*, *Dalk with Gharm Roghniyat* like *Roghan Qust*, *Roghan Gule*, *Roghan Habbul Ghar*, *Roghan Malkanghi*.

**Mufradat:** Many single drugs are available for the treatment from all sources of origin, like plants, animals, and minerals. Some of them are: *Gudmar Booti* (*Gymnema sylvestre*), *Tukhm Karela* (*Momordica*

*charntia*), Kachnal (*Bauhinia variegata*), Darhald (*Berberis aristata*), Tukhm Hulba (*Trigonella foenum-graecum*), Satte Gilo (*Tinospora cordifolia*), Tukhm Hammaj (*Rumex vasicarius*), Tukhm Shoneez (*Nigella sativa*), Tukhm Hayat (*Withania coagulans*), Tukhm Khurfa (*Portlaca oleracea*), Maghz Tukhm Jamun (*Syzygium cumini*) Sumaq (*Rhus glabra*), Qust (*Sassuria lappa*), Khulanjan (*Alpinia galenga*) Kundru (*Coccinia indica*), Kundur (*Boswellia serrata*), Dammul Akhwain (*Pterocarpus marsupium*), Sandal (*Santalum album*), Aqaqiya (*Acacia arabica*), Sumbuluttib (*Nardostachys jatamansi*), Tukhm Kahu (*Lactuca sativa*), ), Gule Surkh (*Rosa damascena*), Samage Arabi (*Acacia Arabica*), Gile Aramani (*Armanium bole*), Sharipha (*Annona squamosa*), Gulnar (*Punica granatum*), Muql (*Commiphora mukul*), Tabasheer (*Bambusa arundinaceae*), Baloot (*Quercus baloot*) Sadaf Daryai (*Tribunella rapa*), Mosli Siyah (*Curculigo orchoides*), Tukhme Khaskhas (*Papaver somniferum*), Maghze Chilghoza (*Pinus gerardiana*), Shilajeet (*Momiyai*), Pakhan Baid (*Berginia ligulata*), Rubbe Anaar (*Punica granatum*), Arqe Gulab (*Rosa damascena*), Tahlab (*Spirulina maxima*), Arade Jao (*Hordeum vulgare*), Aabe Kaddu Biriyan (*Cucurbita maxima*), Aabe Khayar (*Cucumis sativa*) with Isapghol (*Plantago ovata*), Aabe Toot (*Morus nigra*), Aabe Anaar Tursh (*Punica granatum*), Aabe Aalubukhara (*Prunus domestica*).

**Murakkabat:** Compound formulations which have been used since ancient times by renowned Unani Scholars for *Ziabetus* are as follows: *Qurs-e-Gulnar*, *Safoof Ziabetus*, *Qurse Ziabetus*, *Kushta Marjan*, *Kushta Zamarrad*, *Qurs Tabasheer*, *Qurse Kafoor*, *Qusta Qalai Safoof Hindi*, *Qurse Tabasheer*, *Spirulina*, etc.

## Conclusion

The management of diabetes requires a multifaceted approach, and Unani medicine offers a time-tested, holistic alternative to conventional treatments. Rooted in the principles of humoral balance and restoration of metabolic harmony, Unani therapies combine natural pharmacological agents, diet, and regimenal practices to target both the

symptoms and root causes of diabetes. Herbal and mineral formulations such as *Qurs Ziabetus*, *Safoof Ziabetus*, *Qurs Gulnar*, *Qurs Tabasheer*, etc., have shown promising effects in lowering blood glucose levels and improving insulin function. Additionally, regimenal therapies like *Hijama*, *Dalk*, and *Hammam*, along with lifestyle and dietary modifications, enhance therapeutic efficacy and patient well-being. Compared to modern pharmacotherapy, Unani interventions are more personalized, focusing on individual temperament, constitution, and symptom presentation. This personalized approach helps reduce side effects and supports long-term health goals. Moreover, the inclusion of natural and locally available ingredients makes Unani medicine a cost-effective option for many populations. However, while traditional knowledge and clinical experience support the benefits of these treatments, more scientific validation through clinical trials is needed. Integrating Unani principles with evidence-based modern medicine can offer a more comprehensive, effective, and sustainable model for diabetes care in the future.

### **Bibliography:**

1. American Diabetes Association Professional Practice Committee. 9. Pharmacologic Approaches to Glycemic Treatment: Standards of Care in Diabetes-2024. *Diabetes Care*. 2024 Jan 1;47(Suppl 1):S158-S178. doi: 10.2337/dc24-S009. Erratum in: *Diabetes Care*. 2024 Jul 1;47(7):1238. doi: 10.2337/dc24-er07a.
2. Alope C, Egwu CO, Aja PM, Obasi NA, Chukwu J, Akumadu BO, Ogbu PN, Achilonu I. Current Advances in the Management of Diabetes Mellitus. *Biomedicines*. 2022 Sep 29;10(10):2436. doi: 10.3390/biomedicines10102436.
3. Eqbal K, Alam MA, Quamri MA, Sofi G, Bhat MD. Efficacy of Qurs-e-Gulnar in Ziabetus (type 2 Diabetes Mellitus): a single blind randomized controlled trial. *Journal of Complementary and Integrative Medicine*. 2020 Jun 18;1(ahead-of-print).

4. Alam A, Quamri S, Fatima S, Roqaiya M, Ahmad Z. Efficacy of Spirulina (Tahlab) in Patients of Type 2 Diabetes Mellitus (Ziabetus Shakri)-A Randomized Controlled Trial. Journal of diabetes & metabolism. ISSN, J Diabetes Metab. 2016 Oct 1;7(10):6155-6.
5. Rhazi Z. Al-Hawi Fit Tib. Vol 10. Central Council for Research in Unani Medicine, New Delhi. Ministry of Health & Family Welfare, Govt. Of India; 2002:181-187.
6. Majusi AIA. Kamil Al-San't. Vol 2, Part II. Central Council for Research in Unani Medicine, New Delhi. Ministry of Health & Family Welfare, Govt. Of India; 2010:192-193.
7. Sina I. Al-Qanoon Fit Tib. Vol 3. Urdu Translation by G. Kantoori. Published By Idara Kitab Us Shifa, New Delhi; 2010:1031-1033.
8. Jurjani I. Zakhira Kharzam Shahi. Vol 6. Urdu Translation by Hkm. Hadi Husain. Published By Idara Kitab Us Shifa, New Delhi; 2010:540-541.
9. Zuhr I. Kitab Al-Taiseer. Central Council for Research in Unani Medicine, New Delhi. Ministry of Health & Family Welfare, Govt. of India; 1986:160-163.
10. Baghdadi IH. Kitab Al Mukhtaratfit-Tibb. Vol 3. Central Council for Research in Unani Medicine, New Delhi. Ministry of Health & Family Welfare, Govt. of India; 2004:326-328.
11. Arzani HA. Tibbe Akbar. Urdu Translation by Hkm. Mohd. Husain. Faisal Publication Deoband UP; YNM: 525-526.
12. Khan MA. Akseer-E-Azam. Urdu Translation by Hkm. Kabeeruddin. Idara Kitab Us Shifa New Delhi; 2011:705-709.
13. Qutubuddin. Clinical Study of *Ziabetus Shakri* (Diabetes Mellitus-II) and Evaluation of Efficacy of a Unani Formulation and Its Management. Dissertation. Rajiv Gandhi University of Health Sciences, Karnataka 2012.

14. Khan HA. Hazique. Jaseem Book Depot, New Delhi; 1983:387-390.
15. Qurshi MH. Jam-Ul-Hikmat. Idara Kitab Us Shifa New Delhi; 2011; 864-873.
16. Ahmed D, Sharma M, Mukerjee A, Ramteke PW, Kumar V. Improved glycemic control, pancreas protective and hepatoprotective effect by traditional poly-herbal formulation “Qurs Tabasheer” in streptozotocin-induced diabetic rats. BMC complementary and alternative medicine. 2013 Dec 1;13(1):10.
17. Ali H. Clinical evaluation of Safoof Ziabetus in management of Ziabetus Shakri (Doctoral dissertation, RGUHS). .2007.
18. Eqbal K, Alam MA, Quamri MA. Clinical efficacy of polyherbal unani formulation in patients with newly diagnosed diabetes mellitus case series study. International Journal of Physiology, Nutrition and Physical Education 2019; 4(1): 985-987.
19. TIB M. Clinical Study of Ziabetus Shakari (Diabetes Mellitus Type II) and Evaluation of Efficacy of a Unani Formulation in its Management. Rajiv Gandhi Uni Health Sci. 2012.
20. Ansari AP, Nasir A. Therapeutic effect of ‘Qurs-i-Ziabetus Khas’ in Diabetes Mellitus—A Case Report. Journal of Ayurvedic and Herbal Medicine. 2020;6(1):4-8.
21. Dwivedi C, Dasgaul S. Antidiabetic herbal drugs and polyherbal formulation used for diabetes: A review. J Phytopharmacol. 2013;2(3):44-51.
22. Grover JK, Yadav S, Vats V. Medicinal plants of India with anti-diabetic potential. Journal of ethnopharmacology. 2002 Jun 1;81(1):81-100.

# Integrating Temperament in Diabetes Management to Enhance Glycemic Control

## Abstract

Temperament or constitution (*Mizaj/ prakriti*), a fundamental concept in Unani medicine, offers a personalized approach to healthcare based on an individual's intrinsic qualities. This chapter explores the integration of Mizaj-based principles into diabetes management to optimize glycemic control. Conventional diabetes care predominantly relies on standardized pharmacological and lifestyle interventions, often overlooking individual variations in physiological responses. Mizaj classification-ranging from sanguine (*Damvi*) and choleric (*Safravi*) to melancholic (*Saudavi*) and phlegmatic (*Balghami*), provides insights into metabolic tendencies, dietary preferences, and treatment susceptibilities. By aligning diabetes care with a person's *Mizaj*, practitioners can develop tailored interventions that enhance therapeutic outcomes. For instance, individuals with a phlegmatic temperament, predisposed to metabolic sluggishness and insulin resistance, may benefit from warming and stimulating regimens. Conversely, those with a choleric temperament, prone to hyperactivity and excessive heat, may require cooling dietary and lifestyle modifications. This chapter discusses the role of *Mizaj* in dietary recommendations, herbal formulations, and lifestyle adjustments that support glucose homeostasis. Additionally, we examine emerging clinical evidence supporting temperament-based interventions for diabetes, highlighting their potential to complement conventional therapies. The holistic framework of *Mizaj* not only aids in glycemic control but also enhances patient adherence and overall well-being. By integrating traditional wisdom with modern endocrinology, *Mizaj*-informed diabetes care represents a promising paradigm shift toward

personalized and effective disease management. This chapter underscores the need for further research to validate its efficacy and encourage its adoption in contemporary diabetes treatment protocols.

## **Introduction**

Diabetes mellitus (DM) is a complex metabolic disorder characterized by chronic hyperglycemia due to impaired insulin secretion, insulin resistance, or both. While standard treatment approaches focus on pharmacological interventions and lifestyle modifications, emerging evidence suggests that individualized care based on temperament may enhance glycemic control. Temperament, an intrinsic aspect of personality, influences stress response, dietary habits, physical activity levels, and adherence to treatment plans. Understanding the role of temperament in diabetes care can help tailor interventions to improve patient outcomes.

## **Understanding temperament in medical care**

Temperament refers to biologically based individual differences in reactivity and self-regulation, which shape behavior and health outcomes. Various models classify temperament into different types. The classical model, derived from Greco-Arabic medicine (Unani system), categorizes individuals into four temperaments: Sanguine, Choleric, Melancholic, and Phlegmatic. The modern psychological approach classifies temperament based on traits such as emotional stability, activity level, and sociability.

Each temperament type exhibits distinct physiological and behavioral characteristics that can influence diabetes management. For instance:

- **Sanguine (optimistic, active, sociable):** May adhere well to treatment but struggle with impulse control regarding diet.
- **Choleric (ambitious, restless, and determined):** Highly disciplined but may experience stress-related glucose fluctuations.

- **Melancholic (thoughtful, detail-oriented, and sensitive):** More likely to follow strict regimens but prone to anxiety-related metabolic disturbances.
- **Phlegmatic (calm, reserved, easygoing):** May struggle with motivation for lifestyle modifications.

By integrating temperament insights into diabetes care, healthcare professionals can personalize treatment approaches, enhancing adherence and glycemic outcomes.

## **The impact of temperament on diabetes management**

### **1. Dietary habits and nutrition**

Dietary adherence is a crucial aspect of diabetes management. Temperament influences eating behaviors, preferences, and response to dietary restrictions:

- **Sanguine individuals** may require structured meal planning with flexibility to accommodate occasional indulgences.
- **Choleric individuals** benefit from goal-oriented dietary programs with clear outcomes.
- **Melancholic individuals** thrive on detailed, research-based dietary plans and may require emotional support to prevent stress eating.
- **Phlegmatic individuals** may need motivation and social support to make dietary changes sustainable.

A temperament-informed nutritional approach can ensure that patients follow a diet plan that aligns with their psychological disposition, improving long-term adherence.

### **2. Physical activity and exercise**

Exercise plays a vital role in glycemic control, but temperament affects motivation and exercise preferences:

- **Sanguine types** enjoy social and dynamic activities such as group workouts or sports.
- **Choleric individuals** prefer structured exercise regimens with clear progress markers.
- **Melancholic individuals** excel in meticulously planned routines but may require encouragement to prevent overexertion.
- **Phlegmatic individuals** need gentle encouragement and consistent support to maintain regular physical activity.

Tailoring exercise recommendations based on temperament, adherence, and engagement levels can improve, resulting in better metabolic control.

### **3. Stress management and emotional well-being**

Psychological stress can significantly impact glycemic control by triggering hormonal responses that elevate blood glucose levels. Temperament plays a key role in stress perception and coping mechanisms:

- Sanguine individuals benefit from social interactions and relaxation techniques such as laughter therapy.
- Choleric individuals may need structured stress-reduction techniques like goal-setting and cognitive reframing.
- Melancholic individuals require mindfulness practices, therapy, or journaling to manage anxiety.
- Phlegmatic individuals respond well to meditation and low-intensity relaxation methods such as deep breathing exercises.

Incorporating temperament-specific stress management strategies can enhance emotional resilience and stabilize blood sugar levels.

## **4. Medication adherence and treatment compliance**

Adherence to pharmacological treatment is crucial for glycemic control. Temperament can influence compliance in the following ways:

- Sanguine individuals may forget doses; reminders and interactive engagement (e.g., mobile apps) can enhance adherence.
- Choleric individuals prefer autonomy and self-tracking methods such as glucose monitors and health apps.
- Melancholic individuals adhere well but may need reassurance to avoid excessive health anxiety.
- Phlegmatic individuals may benefit from simplified regimens and routine reinforcement by caregivers.

Customizing adherence strategies based on temperament can improve consistency in medication use.

## **Practical implementation of temperament-informed diabetes care**

### **1. Patient assessment**

Healthcare professionals can assess temperament through:

- Standardized personality questionnaires.
- Patient interviews focusing on behavioral patterns.
- Observation of responses to treatment plans and lifestyle changes.

### **2. Personalized treatment planning**

Once temperament is identified, treatment plans should be customized as follows:

- **Nutrition:** Provide diet plans that match individual eating preferences and behavioral tendencies.
- **Exercise:** Recommend physical activities suited to personal motivation levels and social inclinations.

- **Psychological Support:** Offer coping mechanisms tailored to stress susceptibility and emotional needs.
- **Medication Management:** Utilize temperament-based adherence strategies to ensure consistent medication intake.

### **3. Patient education and counseling**

Educating patients on the link between temperament and diabetes care can improve self-awareness and motivation. Counseling sessions should be tailored to address individual challenges and reinforce positive behaviors.

### **4. Continuous monitoring and adjustment**

Since temperament traits can influence long-term health behaviors, ongoing monitoring and adjustments in the care plan are essential. Regular follow-ups should include reassessment of temperament-related challenges and modifications in intervention strategies.

## **Conclusion**

The integration of temperament into diabetes management represents a valuable paradigm shift toward personalized and holistic healthcare. Unani medicine emphasizes the unique physiological and psychological makeup of each individual, and by aligning treatment with a person's temperament, therapeutic interventions become more targeted and effective. Different temperaments influence dietary behavior, stress response, physical activity, and medication adherence—all critical aspects of diabetes care. For instance, phlegmatic individuals may require motivational strategies to engage in lifestyle changes, while choleric types benefit from structured goals and autonomy in disease monitoring. Tailoring dietary plans, exercise regimens, stress management techniques, and medication protocols according to temperament enhances patient engagement, improves compliance, and leads to better glycemic control. Furthermore, temperament-informed care fosters a deeper connection between practitioner and patient, promoting long-term health and adherence.

This individualized approach not only addresses hyperglycemia but also enhances emotional well-being and resilience, key factors in chronic disease management. As modern medicine increasingly moves toward patient-centered care, incorporating traditional concepts like *Mizaj* offers promising avenues for integrative and sustainable diabetes treatment. Continued clinical research and validation of temperament-based strategies are essential to refine their application and fully realize their potential in contemporary healthcare systems.

### **Bibliography:**

1. Sina I. Kulliyate Qanoon. by Hkm. Kabeeruddin) part 2. Shaikh Md. Basheer and Sons, Lahore. 2006:258-97.
2. Kirmani NBA. Kulliyat-E-Nafeesi. Urdu Translation by Hkm. Kabeeruddin. Idara Kitab Us Shifa, New Delhi. YNM;
3. Khan MA. Akseer-E-Azam. Urdu Translation by Hkm. Kabeeruddin. Idara Kitab Us Shifa New Delhi; 2011:705-709.
4. Majusi AIA. Kamil Al-San't. Vol 2, Part II. Central Council for Research in Unani Medicine, New Delhi. Ministry of Health & Family Welfare, Govt. Of India: 2010:192-193
5. Sina I. Al-Qanoon Fit Tib. Vol 3. Urdu Translation by G. Kantoori. Published By Idara Kitab Us Shifa, New Delhi; 2010:1031-1033.
6. Jurjani I. Zakhira Kharzam Shahi. Vol 6. Urdu Translation by Hkm. Hadi Husain. Published By Idara Kitab Us Shifa, New Delhi; 2010:540-541.
7. Zuhr I. Kitab Al-Taiseer. Central Council for Research in Unani Medicine, New Delhi. Ministry of Health & Family Welfare, Govt. of India; 1986:160-163.
8. Baghdadi IH. Kitab Al Mukhtaratfit-Tibb. Vol 3. Central Council for Research in Unani Medicine, New Delhi. Ministry of Health & Family Welfare, Govt. of India; 2004:326-328.

9. Arzani HA. Tibbe Akbar. Urdu Translation by Hkm. Mohd. Husain. Faisal Publication Deoband UP; YNM: 525-526.
10. Rhazi Z. Al-Hawi Fit Tib. Vol 10. Central Council for Research in Unani Medicine, New Delhi. Ministry of Health & Family Welfare, Govt. Of India; 2002:181-187.

# Non-Communicable Diseases

## Abstract

Non-communicable diseases (NCDs), particularly diabetes, pose a significant global health challenge, leading to substantial morbidity and mortality. Traditional Unani medicine emphasizes a holistic approach to disease prevention and management, incorporating the concept of *Asbab-e-Sitta Zarooriya* (Six Essential Factors), which are fundamental for maintaining health and preventing disease. These factors include air, food and drink, sleep and wakefulness, movement and rest, mental health, and excretion and retention. This chapter explores the interplay between NCDs, particularly diabetes, and *Asbab-e-Sitta Zarooriya*, emphasizing how lifestyle modifications rooted in these principles can aid in prevention and management. The Unani perspective highlights how an imbalance in these six factors contributes to metabolic disorders, including diabetes, by disrupting the body's temperament and humoral balance. Scientific evidence increasingly supports the role of diet, physical activity, sleep, and stress management in diabetes control, aligning with Unani principles. By integrating Unani wisdom with modern medical advancements, a comprehensive and sustainable approach to diabetes management can be achieved. This chapter underscores the need for a paradigm shift towards holistic, preventive, and personalized healthcare strategies, blending traditional and contemporary perspectives. Understanding and applying *Asbab-e-Sitta Zarooriya* can significantly improve health outcomes and reduce the global burden of diabetes and other NCDs.

## Introduction

Non-communicable diseases (NCDs) are also known as chronic diseases that are not passed from person to person. LSD and NCD are interchangeable terms. Lifestyle diseases (LSDs) that can be potentially prevented by changes in lifestyle, diet, and environment.

Lifestyle disorders are a group of diseases which include Hypertension, Diabetes, Obesity, Cardiovascular diseases, Dyslipidemia, Malignant and other neoplasm, Chronic low back pain, etc.

As Avicenna elaborated, the disease state starts by *dys temperament*, which is a change in the normal temperament of an individual, or of an organ, to a new temperament that is outside the range of normal. The temperament is a product of the mixing of the four physical states: warmth, coldness, wetness (or dampness), and dryness. Therefore, a change in one will produce a change in the others. Prolonged *dys temperament* imbalances the body fluids, the humors, not only in quantity but also in quality. Thus, the state of disease in Unani medicine is based on *dys temperament* and humoral imbalance. Maintaining *Asbab-e-Sitta Zarooriya* is important to the harmonious homeostasis of the temperament, humours of the body.

According to Unani medicine, health is attributed to the equilibrium of *Akhlat* (qualitatively as well as quantitatively) in the body, while disease occurs due to disturbances in this equilibrium. There is always a cause behind the origin of a disease. Unani scholars have given a very comprehensive classification of *Asbab* (causes), which almost covers all prevalent causes of all diseases. *Asbab-e-Badaniyya* (somatic causes) directly deals with the diseases caused by *Su-e-Mizaj* (inequitable temperament) or *Sue Tarkeeb* (structural malformation of body organs). While *Asbab Badiyah* (external causes) encompasses almost all causes-emotional, physical, chemical, microbes, etc, which directly or indirectly affect the equilibrium of the human body. The disease produced due to the above-described causes manifests in three forms, which make three broad categories of disease comprising almost all disorders. These are as *Amraz-e-Su-e-Mizaj*, *Amraz-e*, and *Amraz-e-Tafarruq-e-Ittisal*.

As far as non-communicable diseases are concerned, these conditions arise because of an inappropriate management of *Asbab-e-Sitta Zarooriya* (six essential factors) over a long period of time. Inappropriate management of these essential factors leads to a change

in the temperament of a person; any change in the *Mizaj* brings a change in a person's state of health. For example, overeating and a sedentary lifestyle increase *Barudat* in the body, which increases the likelihood of developing obesity. Similarly, *Bekhabi* increases *Yabusat* in the body, and *yabis Mizaj* persons become more prone to develop hypertension as compared to *Moatadil Mizaj* persons. Therefore, the main approach in Unani medicine for the prevention of these diseases is the maintenance of balanced temperament under varying conditions of life through moderation in *Asbab-e-Sitta Zarooriya*, and the therapeutic approach to the same is the evacuation of the abnormal/excess humour and strengthening the affected organ system by dietotherapy, lifestyle modifications, and use of medicinal herbs.

### ***Maintenance of Balanced Mizaj***

*Mizaj* is one of the basic concepts of the Unani system of medicine, upon which diagnosis and the line of treatment of a disease are based. This concept is not only of utmost importance in therapeutic decisions, but also of equal importance for the preservation of health and the prevention of diseases. Any change in the *Mizaj* (*Su-e-Mizaj*) of a person brings about a change in the person's state of health. Hence, as long as we can maintain a balanced *Mizaj* under varying conditions of life, health will prevail. According to Unani philosophy, health is governed by *Asbab-e-Sitta Zarooriya* (six essential factors). Implementation of them in our life, according to *Mizaj*, soothes an individual's lifestyle and helps in maintaining a balanced *Mizaj*.

### ***Asbab-e-Sitta Zarooriya***

Those factors, which are affecting all human beings perpetually are called essential factors (*Asbab-e-Sitta Zarooriya*). These essential factors are six in number and are remarkable in providing six categories that include a very large number of factors, which may outwardly be quite distant from each other. Departing from principles of these factors results in diseases, and following them restores health.

**Table summarizing the six essential factors of life in Unani medicine:**

| <b>Essential factors</b>                                     | <b>Description</b>                                                                                                                                  |
|--------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Hawae Muḥīt</i><br>(Ambient Air)                          | The quality of surrounding air affects overall health and temperament. Clean, fresh air is essential for maintaining balance in the body.           |
| <i>Ma'kul-o-Mashrub</i><br>(Food and Drinks)                 | Proper nutrition, a balanced diet, and adequate hydration are crucial for maintaining bodily functions and humoral balance.                         |
| <i>Ḥarakat-o-Sukun Badani</i> (Bodily Movements and Repose)  | Physical activity and rest play a significant role in maintaining health, metabolism, and circulation. Excess or deficiency can lead to imbalances. |
| <i>Ḥarakat-o-Sukun Nafsani</i> (Psychic Movement and Repose) | Emotional and mental well-being influence overall health. Stress, anxiety, and relaxation impact body functions and temperament.                    |
| <i>Nawm-o-Yaqza</i> (Sleep and Wakefulness)                  | A proper balance of sleep and wakefulness is necessary for maintaining metabolic functions, brain health, and energy levels.                        |
| <i>Istifragh-o-Iḥtibas</i><br>(Evacuation and Retention)     | Proper excretion of waste products (urine, stool, sweat, etc.) and retention of essential nutrients are vital for health and disease prevention.    |

### ***Hawae Muḥāt***

Atmospheric air is considered the first and foremost among the six essential factors (*Asbab-e-Sitta Zarooriya*) necessary for maintaining health. It is a fundamental component of the human body and plays a vital role in sustaining and regulating the body's vital forces (*Quwa Ḥayatiya*). Air serves as an active agent in restoring the natural balance of these forces, and as long as the inhaled air is pure, balanced, and free from harmful substances, an individual remains in good health. The significance of air in disease prevention is well recognized, particularly when variations in its quality are taken into consideration. These variations are broadly classified into three types: normal, abnormal but

harmless, and abnormal and harmful. Normal variations refer to seasonal changes that occur naturally. Abnormal but harmless variations may cause minor deviations without affecting health, while abnormal and harmful changes involve alterations in air composition that can adversely impact human health. Therefore, individuals need to remain informed about environmental conditions and adopt necessary preventive measures to protect and preserve their health.

### ***Ma'kul-o-Mashrub***

*Ma'kul-o-Mashrub* (diet and drink) is a vital component among the six essential factors (*Asbab-e-Sitta Zarooriya*) in Unani medicine. Food is defined as a substance that, upon ingestion, is altered by the body without causing harm and ultimately becomes a part of it. Each type of food, depending on its nature and quantity, produces perceptible or imperceptible effects on the body. These effects are experienced with varying intensity. For instance, if a person consumes food and notices no apparent change after its digestion and assimilation, the food is considered moderate or balanced. However, if the food produces slight sensations of heat, cold, dryness, or wetness, it is categorized accordingly-possessing a hot, cold, dry, or moist temperament. The degree to which food affects an individual is closely related to their temperament. Unani medicine offers detailed dietary guidelines based on factors such as time of day, seasonal variations, age, and most importantly, individual temperament. Thus, understanding and applying appropriate dietary principles is essential for maintaining health, enhancing vitality, and preventing the onset of diseases.

### ***Harakat-o-Sukun Badani***

For maintaining optimal health and physical well-being, both movement (exercise) and rest are essential. According to the renowned Unani physician Ibn Sina, in his classical work *Al-Qanun fi'l Tibb*, individuals who engage in moderate and consistent physical activity often do not require medicinal intervention to correct humoral or temperamental imbalances. Exercise plays a key role in preserving

internal harmony by supporting various physiological functions. On the other hand, rest is equally important, as it relieves fatigue, prevents excessive loss of bodily moisture, and helps retain nutrients until digestion is complete.

Unani scholars have elaborated several benefits of exercise, including the facilitation of waste elimination from the body, enhancement of physical agility and lightness, improvement in digestive function, and strengthening of joints, muscles, tendons, ligaments, and nerves. Furthermore, regular exercise serves as a protective measure against numerous disorders related to imbalances in temperament. Thus, a balanced regimen of physical activity and adequate rest is fundamental to the preservation of health in the Unani system of medicine.

### ***Ḥarakat-o-Sukun Nafsani***

*Ḥarakat-o-Sukun Nafsani* (Mental and Emotional Movements) is one of the six essential factors influencing human health in Unani medicine. Emotional and psychological states-such as joy, grief, fear, anger, jealousy, and anxiety-play a significant role in affecting both the physical and mental well-being of an individual. Unani scholars have extensively elaborated on the influence of these emotions, not only from a metaphysical perspective but also in terms of their physiological effects. Negative emotions, if persistent or intense, can disturb the natural temperament of the body and may lead to the development of various illnesses. Hence, it is advised to either avoid such emotions or manage them with patience, self-control, and mental resilience to reduce their harmful effects. On the other hand, positive emotions like happiness, contentment, and hope are known to invigorate the body and enhance its ability to face challenges. Maintaining a balance in emotional responses is therefore essential for preserving health and promoting overall harmony in life.

### ***Nawm-o-Yaqza***

Sleep plays a fundamental role in maintaining both physical and mental well-being. It alleviates fatigue and prevents the excessive breakdown

of bodily moisture that results from continuous activity. Sleep serves as a complete form of rest, rejuvenating the body and mind. In its absence, a person may experience a depletion of energy, cognitive decline, and disturbances in digestion. During sleep, the innate heat moves inward, enhancing the body's restorative processes and strengthening its natural faculties. It also reduces the activity of the nervous system by relaxing and moistening the nerve channels. This helps preserve the vital force by preventing its dissipation. However, excessive sleep can have adverse effects. It weakens the mental faculties, leads to the accumulation of waste materials, and may cause cold-tempered diseases. On the contrary, wakefulness increases appetite by dispersing waste products and stimulating digestive activity. Yet, prolonged wakefulness can dry out the brain, weaken its functions, and lead to confusion and poor digestion due to the loss of vital energy.

Maintaining a balance between sleep and wakefulness is essential for good health. Unani scholars have highlighted several benefits of proper sleep, including physical relaxation, reinforcement of natural strength, harmonization of bodily functions, removal of fatigue, promotion of healthy humours, and enhancement of the natural faculties. Therefore, both sleep and wakefulness, when observed in moderation, contribute significantly to preserving health and preventing disease.

### ***Istifragh-o-Ihtibas***

Elimination is a natural and essential function of the human body, responsible for removing waste materials through various channels. These include respiration (exchange of gases via the lungs), defecation, urination, sweating, and menstruation. While these are commonly recognized, Unani medicine also considers other physiological processes such as coughing, vomiting, sneezing, hiccups, flatulence, belching, nasal discharge, nosebleeds, morning eye discharge, earwax, vaginal secretions, and ejaculation as part of the body's natural mechanisms of expelling waste. When these waste products are not completely or efficiently eliminated, they tend to accumulate in the

blood vessels, body cavities, interstitial spaces, or other compartments. This retention can disrupt the normal balance of temperament and lead to the development of diseases known as diseases due to deranged humoral temperament with material involvement. In such cases, the fundamental principle of prevention and treatment is to assist the body's innate power in expelling the morbid matter through the most natural, accessible, and suitable route. Various therapeutic techniques are employed to support elimination, including physical exercise, massage, bathing, venesection, induced vomiting, leech therapy, cupping, etc. These methods help in restoring balance and maintaining health by facilitating the expulsion of harmful substances from the body.

### **Temperamental variations and health guidelines in light of *Asbab-e-Sitta Zarooriya***

Unani medicine offers a profound understanding of human creation, nature, and constitution, emphasizing the individual's intricate relationship with their environment. Its holistic philosophy recognizes the interconnectedness of physical, emotional, mental, and spiritual aspects of a person, aiming to preserve health by maintaining balance among these dimensions. Rather than focusing solely on the disease or an affected part of the body, Unani medicine views symptoms as the body's natural response to internal imbalance and as an effort to restore harmony or homeostasis.

A distinctive feature of Unani medicine is its emphasis on temperament, which reflects an individual's unique physiological and psychological constitution. Each person possesses a specific *mizaj*-be it hot, cold, moist, dry, or a combination thereof-and this inherent temperament influences their health, susceptibility to diseases, and response to treatment. Therefore, lifestyle recommendations-including dietary habits, sleep patterns, physical activity, and emotional well-being-are tailored according to one's *mizaj*. Adapting daily routines and health practices in alignment with one's temperament is believed to be essential for disease prevention and long-term wellness.

Unlike conventional systems that may overlook the body's subtle and sophisticated self-regulatory mechanisms, Unani medicine deeply acknowledges the body's innate healing capacity. It recognizes that various factors-such as temperament, mindset, emotional state, and spiritual well-being-play a vital role in the maintenance of health and recovery from illness. This comprehensive approach allows Unani medicine to contribute meaningfully, either independently or as part of integrative healthcare, in addressing the growing burden of lifestyle-related and non-communicable diseases. Through personalized guidance based on the six essential factors and individual *Mizaj*, it promotes a balanced and health-sustaining way of life.

### ***Damwi Mizaj***

Persons with sanguine temperament are typically identified by their well-built body structure, prominently shaped joints, and oval-shaped face. They tend to have more muscular tissue than fat, with thick and luxuriant hair. Their body feels pleasantly warm to the touch, and their veins are mildly prominent with a strong, full pulse. These individuals enjoy a good appetite, sound and balanced sleep, and possess a sharp sense of judgment. They are usually troubled by heat and humidity but feel more comfortable in cold and dry conditions. Their digestive power is remarkably strong. Psychologically, they are cheerful, optimistic, and outgoing. They are persuasive in conversation, socially skilled, confident, graceful, and enthusiastic. They often have a romantic nature and enjoy travel, sports, and engaging in various activities.

According to the Unani system of medicine, individuals with sanguine temperament should avoid prolonged exposure to hot and moist climates, as they are better suited to cooler environments. Winter is considered the most favorable season for them. Their diet should include foods with cold and dry qualities while avoiding excess intake of sweets, fatty foods, and meat. Cold water is preferable for drinking. Physical activity should be mild, so as not to generate excessive body heat. Emotional states like intense excitement, worry, and anger should

be controlled. A sound sleep of 6 to 7 hours is recommended, while sleeping more than 8 hours may negatively impact their health. Seasonal cleansing procedures such as venesection and purgation should ideally be carried out at the onset of spring. Additionally, gargling with decoctions of *Mastagi*, *Habbul As*, and *Aqarqarḥa*, etc, is advised to eliminate morbid substances from the brain and maintain overall well-being.

### ***Ṣafrawī Mizaj***

Individuals with bilious temperament) typically have a medium height and a lean, angular build. Their facial features are sharp and well-defined, with a yellowish complexion and bright, penetrating eyes. Prominent veins and a hairy body are common, with hair that is usually thick, abundant, black, and curly. They tend to have a rapid and strong pulse. These individuals feel most comfortable in cool environments and often experience discomfort in hot conditions, making winter their most suitable season. Their digestion is strong, with a sharp and quick appetite, and their sleep tends to be light. Energetic, bold, and intellectually sharp, they are known for being daring and courageous, although they may also be impatient, irritable, and quick-tempered. Many with this temperament show fearless and rebellious leadership qualities. They usually have a strong inclination toward sexual pleasure and exhibit persistence, zeal, passion, and sometimes a vengeful nature. To maintain balance, they should live in cool, fresh, and well-ventilated surroundings and avoid exposure to direct sunlight and hot climates, which tend to aggravate their condition. While winter benefits them, summer can cause problems due to increased bile, so the use of bile-eliminating and mild laxative remedies like *Sikanjabeen*, *Tamar Hindi*, *Aalu Bukhara*, *Gul-e-Neelofar*, and *Gul-e-Banafsha*, etc., is advised during hotter months. Their diet should include three meals a day, avoiding salty, fatty, and fried foods, and favoring moist, hydrating foods such as cucumber and watermelon. Physical activity should be moderate and preferably done early in the morning or late in the evening, while excessive exertion should be avoided. Emotional

regulation is important; extreme anger, irritability, excessive talking, and suppression of anger should be minimized. Restful and sufficient sleep is essential for health. If bile accumulation occurs, therapeutic measures like emesis or purgation may be employed according to the individual's condition, using herbal remedies such as *Banafsha*, *Tamar Hindi*, and *Halela Zard* to help eliminate excess bile.

### ***Balghami Mizaj***

Individuals with a phlegmatic temperament typically have a soft and flabby body, often appearing obese with loose muscles and a pale complexion. Their hair is thin and delicate, while their blood vessels are not prominently visible, and their pulse tends to be slow and irregular. Such individuals usually move sluggishly and prefer warm environments, finding comfort in heat and hot weather. They have round faces with full cheeks, large, moist eyes, and a medium to large body frame with more fatty tissue than muscle, with bones well covered by flesh. Mentally, they are calm, emotionally sensitive, and often inclined towards spirituality or religiousness. Their thinking is slow and somewhat foggy, with a tendency towards emotional delicacy. Sexual desire is generally low, and they are not easily angered. Their digestion is weak and slow, resulting in reduced appetite and thirst. These individuals tend to be lethargic, dull, and require more sleep than average. Their memory and perception are also slow and weak. To maintain health, they should avoid cold air, air-conditioned spaces, and damp environments, favoring warm and dry conditions instead. Their diet should consist primarily of hot and dry foods, avoiding cold foods. Physical inactivity and unnecessary rest, especially during the late afternoon before sunset, should be avoided in favor of regular, vigorous exercise like aerobics. Emotional issues such as fear, shyness, and depression are common and should be carefully managed. Rising early in the morning is beneficial, and sleeping after sunrise should be minimized. Sweating is considered beneficial for balancing this temperament and should not be suppressed, with laxatives used when appropriate.

### ***Saudawi Mizaj***

Individuals with *Saudawi Mizaj*, or melancholic temperament, are generally characterized by a lean and slender build with prominent bones, small, deep-set eyes, and sunken, hollow cheeks. Their skin tends to be coarse, rough, dry, and often has a darker complexion accompanied by abundant body hair. Their hair is usually thin, black, and grows slowly. These individuals commonly experience weak digestion and irregular appetite, along with disturbed sleep patterns, frequently suffering from insomnia. Their skin feels dry, leathery, and cool to the touch, and they often have a low sexual drive. Mentally, they are analytical, detail-oriented, and possess a strong memory. To maintain their health, it is important for them to avoid prolonged exposure to cold and dry environments, as such conditions may aggravate their natural dryness. Coastal and seashore areas with moderate humidity are more beneficial. Their diet should include moist and nourishing foods such as figs, raisins, chickpeas, black-eyed peas, and sweet pomegranate, while cold, dry, astringent, or stale foods, like excessive beans, nuts, peanuts, tomatoes, brinjal, and rancid fats should be avoided. Tea, coffee, and artificially flavored drinks are discouraged. Proper hydration by drinking two to three liters of water daily is essential. They benefit most from light, moderate exercise of short duration, such as a 15-minute walk after dinner. Emotional well-being is crucial, as feelings of loneliness, depression, or prolonged grief can have a negative impact. Early bedtime with six to eight hours of sleep is recommended, and bodily elimination should never be suppressed. To balance their temperament, the removal of excess *Sauda* (melancholic humors) through traditional remedies like *Haleelajat*, *Bisfaij*, and *Aftimoon* is advised.

### **Conclusion**

The intricate relationship between Non-Communicable Diseases (NCDs), diabetes, and *Asbab-e-Sitta Zarooriya* (Six essential factors of life) highlights the significance of lifestyle and environmental factors in disease prevention and management. Unani medicine

emphasizes the balance of these six essential factors-air, food and drink, sleep and wakefulness, physical activity and rest, mental states, and excretion and retention maintain health and prevent chronic illnesses like diabetes. Modern research aligns with this traditional wisdom, affirming that dietary habits, physical activity, and mental well-being play crucial roles in metabolic health. By integrating Unani principles with contemporary medical approaches, a holistic strategy can be developed to manage diabetes and other NCDs more effectively. Addressing the rising burden of diabetes requires a multidimensional approach that combines lifestyle modifications, public health initiatives, and personalized interventions based on *Asbab-e-Sitta Zarooriya*. Encouraging awareness and implementation of these principles can contribute to improved health outcomes and reduced disease prevalence. Thus, a collaborative approach, integrating Unani concepts with modern healthcare, holds promise for a sustainable solution to the growing challenge of NCDs, particularly diabetes.

### **Bibliography:**

1. Kotawadekar RA, Waghachavare VB, Gore A, Dhobale RV. A Cross-Sectional Study of Non-communicable Disease Risk Factors Among Non-diabetic and Non-hypertensive Population. *Cureus*. 2024 Dec 11;16(12):e75542. doi: 10.7759/cureus 75542.
2. Anjana RM, Unnikrishnan R, Deepa M, Pradeepa R, Tandon N, et al. ICMR-INDIAB Collaborative Study Group. Metabolic non-communicable disease health report of India: the ICMR-INDIAB national cross-sectional study (ICMR-INDIAB-17). *Lancet Diabetes Endocrinol*. 2023 Jul;11(7):474-489. doi: 10.1016/S2213-8587(23)00119-5.
3. Sina I. Alqanoon Fil Tib (Urdu translation by G.H. Kanturi). Vol 1. New Delhi: Idara Kitab ul Shifa; 2010; 90-96,120-6,177-178.Kabeeruddin M. Kulliyate Nafeesi. New Delhi: Idara Kitabus Shifa; YNM: 161-184, 424-427, 473-484.
4. Kabeeruddin M. Kulliyate Qanoon. New Delhi: Eijaz Publishing House; 2006: 28-36,239-40.

5. Majusi Ali I Abbas. Kamil us Sanaa't. Vol 1. New Delhi: Idara Kitabus Shifa; 2010:188-235.
6. Itrat M, Zulkifile M. A Temperamental Approach in Promotion of Health. Medical Journal of Islamic World Academy of Sciences 2014; 22(2): 102-106.
7. Jamil A Waris. Tauzeehat Asbab-e-Sitta-Zaruria. New Delhi: Bharat Offset Press; 2006: 16-246.
8. Arzani Akbar. Ikseer-al-Quloob. New Delhi: CCRUM; 2010: 3-24,562-73.
9. Tabri Rabban. Firdaus-ul-Hikmat. New Delhi: Idara Kitabus Shifa; 2010:107-110.
10. Zakariya Razi. Kitabul Mansoori. New Delhi: CCRUM; 1991: 151-186.
11. Ehsanullah M. Ilaj Bit Tadbeer. New Delhi: Rabbani Printers; 2006: 84-100, 187-198.
12. Baghdadi HI. Kitabul Mukhtarat fil Tib. Part-I. New Delhi: CCRUM; 2005: 108-117, 121, 194-207, 216-48, 251-56.
13. Ahmad Tabri. Moalajat ul Buqratiya. Vol. I. New Delhi: CCRUM; 1995: 128-160.
14. Ibn Rushd. Kitabul Kulliyat. New Delhi: CCRUM; 1980: 82-92, 158-60, 352-54.
15. Zaidi IH, Zulkifile M, Ahmad SN. Temperamentology. Aligarh: Competent Xerox centre; 1999: 12-24.
16. Cameron O Gruner. A treatise on the canon of medicine. London: Burleigh Press; 1929: 183-192.
17. Shakúr M, Zulkúfle M, ANSAR A, AKHTAR J. Unani Concept. Journal Of The International Society For The History Of Islamic Medicine (Jishim). .2008:61.
18. Rizwana AA, Hafeel MHM, Parveen A, Bsaheer A, Rashid B. Prevention and Control of Lifestyle Disorders through Asbab-Esitta Zarooriyah (Six Essential Factors) – An Appraisal. Ejpmr. 2016,3(4), 159-161.

19. Bashir F, Akhtar J, Anjum N, Alam S. Importance of Asbab E Sitta Zarooriya (Six Essentials of Life) For Prevention of Lifestyle Disorders 2018.
20. Tipo FA, Khan TN, Khanam B. Conceptual explanation of Asbab-e-Sitta Zarooriya (six essentials), their effect on vital heat and human health, A Unani perspective 2019.
21. Ahmed Y, Jamil SS, Jahangir U, Ahmad FJ. Alteration in Asbabe-Sitta-Zaruriyah (Six essential pre-requisites for maintaining health) to prevent Intithār al-Sha ‘r (Telogen Effluvium): An Insight. Journal of Drug Delivery and Therapeutics. 2019 Jan 15; 9(1):318-22.

# Unani Prescription for Diabetes and Clinical Experience

## Abstract

Diabetes mellitus is a chronic metabolic disorder characterized by hyperglycemia and associated complications, affecting millions globally. Conventional management primarily includes pharmacological interventions and lifestyle modifications. However, Unani medicine, a traditional system of healing, offers a holistic approach to diabetes management through herbal formulations, dietary recommendations, and lifestyle adjustments. This chapter explores Unani prescriptions for diabetes, their pharmacological basis, and clinical experiences supporting their efficacy. Unani medicine conceptualizes diabetes as a disorder caused by derangement in humoral balance, particularly excess heat and dryness affecting metabolism. Classical texts describe various single and compound formulations known for their hypoglycemic properties. These formulations regulate blood sugar levels by improving digestion, enhancing insulin sensitivity, and detoxifying the body. The chapter also presents clinical experiences and observational studies demonstrating the effectiveness of Unani formulations in glycemic control, reducing complications, and improving overall well-being. The holistic approach of Unani medicine emphasizes not just symptom relief but addressing the root cause through *Ilaj Bil Ghiza* (dietotherapy), *Ilaj Bil Dawa* (pharmacotherapy), and *Ilaj Bil Tadbeer* (regimen therapy). Evidence suggests that integrating Unani prescriptions with modern approaches can enhance diabetes management. By examining Unani principles, classical references, and clinical experiences, this chapter aims to bridge traditional wisdom with contemporary research, highlighting the potential of Unani medicine as a complementary approach to diabetes care.

## Introduction

Diabetes mellitus is one of the most prevalent chronic metabolic disorders worldwide, characterized by elevated blood glucose levels and associated with numerous complications such as neuropathy, nephropathy, and cardiovascular disease. While conventional medicine primarily relies on pharmacological agents and lifestyle adjustments, the Unani system of medicine offers a distinctive and holistic approach rooted in centuries of clinical experience and traditional wisdom.

Unani treatment, known as “*Nuskha Navesi*,” involves personalized prescriptions based on the patient’s symptoms, temperament (*Mizaj*), and disease progression. These prescriptions may include single or compound drugs in the form of decoctions, infusions, powders, tablets, or pills. Classical formulations are thoughtfully selected not only to lower blood sugar levels but also to address related complications such as obesity, fatigue, constipation, neuropathic pain, and excessive urination. Certain herbs work by correcting the temperament of organs like the liver and kidneys, others improve insulin secretion, enhance peripheral glucose uptake, inhibit gluconeogenesis, or function similarly to DPP-4 inhibitors.

Unani medicine also emphasizes *Ilaj Bil Tadbeer* (regimenal therapy), such as massage (*Dalk*), steam baths (*Hammam*), and exercise (*Riyazat*), along with dietary regulations (*Ilaj Bil Ghiza*) for managing diabetes holistically. This chapter explores a range of Unani prescriptions tailored for specific patient conditions, based on clinical practices and experiences of seasoned Unani practitioners. It also highlights herbal combinations that target both symptomatic relief and metabolic regulation.

The integration of traditional Unani knowledge with evidence-based practices holds great promise in advancing diabetes care. By examining authentic prescriptions, clinical outcomes, and therapeutic principles, this chapter aims to showcase the effectiveness and

practicality of Unani approaches in managing diabetes, especially when conventional treatments are limited or insufficient.

**Condition of prescription:**

- 1. When sugar level is very high (fasting> 200 and post-prandial> 300), patients complain of constipation and obesity, or dyslipidemia than prescribed.**

**Formulation No. -1:**

Turbud -10 g, Barge Sana-5 g, Post Halela Zard-12 g, Halela Siyah-7 g, Bisfayej-5 g, Saqmooniya 1 g, Gule Surkh 5 g in the form of decoction for 3 days, then use Luabe Isapgol (5 g) for 2 days, and repeat it every month along with regular exercise.

**Formulation No. -2:**

Badiyan -3 g, Zeera -2 g, Kishneez-2 g, Darchini -2 g, Tukhm Hulba -2 g, Halela Kabli -5 g, Amla Khusk-2 g, Namak Siyah 1 g, in the form of powder after one hour of food with warm water for 25 days, and repeat it up to two months along with regular exercise.

**Formulation No. -3:**

Gurmar Booti 10 g, Darhald-10 g, Tukhm Hayat-5 g, Aqerqarha-5 g, Tukhm Hulba-5 g, Chiraita-5 g, Gule Surkh 5 g, in the form of decoction, and start with in the third month up to 15 days, then use Jawarish Jalinus 10 g at night with warm water along with Habbe Jadwar 2 No.

- 2. When sugar level is very high (fasting> 200 and post-prandial> 300), and patients complain of numbness, tingling sensation, and neurological pain, then use the above formulation, after “Hammam” along with massage oil, as mentioned below: -**

**Formulation No. -1:**

Qust-10 g, Kholanjan-10 g, Aqerqarha-15 g, Qaranfal-5 g, Jaiphal-2 No, Kuchla-10 g, Olive Oil 150 ml, and heating it with low flame and preserved it, and use as per required.

**Formulation No. -2:**

Habbe Asab or Habbe Azaraqui 2 No. Twice a day for one month with Arque Gaozaban or Arque Gulab, or Arque Badiyan, 50 ml.

**3. When sugar level is high (fasting> 160 and post-prandial> 200), and patients claim tiredness, polyuria, polydipsia, then.**

**Formulation No. -1:**

Post Halela Kabli-10 g, Post Halela Zard-10 g, Barge Sana-5 g, Turbud-10 g, Badiyan-5 g, in the form of decoction for 5 days, then use Luab of Samage Arabi or Kateera for 2 days.

**Formulation No. -2:**

Asgand -2 g, Gilo-2 g, Saad Kofi-2 g, Tukhm Karela-2 g, Tukhm Hulba- 2 g, Post Kachnal-2 g, Tabasheer -2 gm, Gile Armani-3, Post Anar-3 g, Gulnar-3 g in the form of powder at the dose of 5 g with Curd or “Chhanch” twice a day for one month along with exercise, and avoid fatty and oily or Maida or sugar containing products.

**Formulation No. -3:**

Habbe Asgand, Qurs Tabasheer, Qurs Gulnar, Qurs Kushta Qalai each 2 No. Twice a day for one month along with Arque Gulab 50 ml.

**4. When sugar level is abnormal, geriatric people and patients claim polyuria, polydipsia, and burning micturition, then.**

**Formulation No. -1:**

Kundur-2 g, Mazu-2 No, Baloot-2 No, Saad Kofi-2 g, Jatamani-2 g, Aqerqarha-3 g, Kabab chini-2 g, Dammul Akhwain-2 g, Habbul

Aas-3 g, Mango Kernel-5 g in the form of powder 5 g thrice a day along with Arque Sandal 20 ml.

**Formulation No. -2:**

Qurs Gulnar, Qurs Tabasheer, Qurs Koharba, anyone 2 No at night with warm Arque Chiraita 50 ml.

**Formulation No. -3:**

Majoon Kundur, Majoon Masikul Baul, Jawarish Jalinus, Majoon Falasafa, Majoon Barhami, Majoon Najah, Majoon Waj, Majoon Baladur are effective, especially for geriatric people.

**Formulation No. -4:**

Asgand-10 g, Mosli Safaid-12 g, Aqerqarha-15 g, Gilo-13 g, Barhami-12 g, Jaiphal-2 No, Qurs Kushta Sadaf-10, Qurs Kushta Qalai-5 No, No, in the form of powder 5 g thrice a day along with Arque Badiyan 30 ml, and Jawarish Kamooni.

**“Daadi Maa Ke Nuskhe”**

| <b>Ingredient</b>            | <b>Quantity</b> | <b>Possible mechanism of actions</b>                                                                                                |
|------------------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------|
| Dry Aam Guthli (Mango Seeds) | 10 pieces       | Rich in tannins and flavonoids; may help lower blood glucose by improving insulin sensitivity and reducing carbohydrate absorption. |
| Pipli (Long Pepper)          | 5 pieces        | Contains piperine; enhances bioavailability of nutrients and drugs, improves insulin secretion, and has antioxidant activity.       |
| Kaali Mirch (Black Pepper)   | 5 pieces        | Piperine aids digestion, enhances metabolism, and may improve glucose utilization and lipid profile.                                |
| Kaala Namak (Black Salt)     | 5 g             | Provides trace minerals, improves digestion, and enhances absorption of herbal compounds.                                           |

|                  |          |                                                                                                                                                   |
|------------------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| Laung<br>(Clove) | 5 pieces | Contains eugenol and polyphenols; improves insulin sensitivity, has antioxidant and anti-inflammatory effects, and helps regulate glucose levels. |
|------------------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------|

### **Preparation method:**

Grind all the ingredients into a fine powder and store in an airtight container.

### **Traditional Usage:**

Take ½ teaspoon with water twice daily (morning and evening), preferably before meals.

**Note:** All these remedies are based on my clinical observations. Whatever I have seen in patients and recorded, I have described here. I am not making any claims. The effect of a remedy may vary from patient to patient, since every individual has a different temperament. It is advisable to prescribe them while keeping in mind the *Asbab-e-Sitta Zarooriya* (six essential factors of health), for better results.

### **Conclusion**

Unani medicine presents a holistic and individualized approach to the management of diabetes mellitus, grounded in centuries of clinical practice and traditional wisdom. By addressing the root cause of disease through humoral balance, Unani therapies focus on restoring the natural temperament and metabolic function of the body. The personalized prescriptions-whether decoctions, powders, or compound formulations-are not limited to glycemic control but also target associated complications like fatigue, neuropathy, polyuria, and digestive disturbances. The chapter highlights various formulations applied based on clinical symptoms and patient constitution, demonstrating the practical efficacy of dietotherapy, pharmacotherapy, and regimenal therapy. Commonly used herbs such as *Gurmar*, *Karela*, *Neem*, *Paneer Phool*, *Jamun*, etc., have shown hypoglycemic potential, supporting their inclusion in comprehensive diabetes care plans. Unani

physicians emphasize a patient-centric approach, considering temperament, disease stage, and associated conditions while selecting appropriate treatment. Although rich in experiential evidence, Unani medicine calls for further scientific validation and clinical trials to establish its place in modern integrative medicine. With its safe, sustainable, and natural interventions, Unani medicine offers a promising complementary path for the effective management of diabetes and improvement of overall patient well-being.

### **Bibliography:**

1. Eqbal K, Alam MA, Quamri MA, Sofi G, Bhat MD. Efficacy of Qurs-e-Gulnar in Ziabetes (type 2 Diabetes Mellitus): a single blind randomized controlled trial. *Journal of Complementary and Integrative Medicine*. 2020 Jun 18;1(ahead-of-print).
2. Alam A, Quamri S, Fatima S, Roqaiya M, Ahmad Z. Efficacy of Spirulina (Tahlab) in Patients of Type 2 Diabetes Mellitus (Ziabetes Shakri)-A Randomized Controlled Trial. *Journal of diabetes & metabolism*. ISSN, J Diabetes Metab. 2016 Oct 1;7(10):6155-6.
3. Rhazi Z. *Al-Hawi Fit Tib*. Vol 10. Central Council for Research in Unani Medicine, New Delhi. Ministry of Health & Family Welfare, Govt. Of India; 2002:181-187.
4. Majusi AIA. *Kamil Al-San't*. Vol 2, Part II. Central Council for Research in Unani Medicine, New Delhi. Ministry of Health & Family Welfare, Govt. Of India: 2010:192-193.
5. Sina I. *Al-Qanoon Fit Tib*. Vol 3. Urdu Translation by G. Kantoori. Published By Idara Kitab Us Shifa, New Delhi; 2010:1031-1033.
6. Jurjani I. *Zakhira Kharzam Shahi*. Vol 6. Urdu Translation by Hkm. Hadi Husain. Published By Idara Kitab Us Shifa, New Delhi; 2010:540-541.

7. Zuhr I. Kitab Al-Taiseer. Central Council for Research in Unani Medicine, New Delhi. Ministry of Health & Family Welfare, Govt. of India; 1986:160-163.
8. Baghdadi IH. Kitab Al Mukhtaratfit-Tibb. Vol 3. Central Council for Research in Unani Medicine, New Delhi. Ministry of Health & Family Welfare, Govt. of India; 2004:326-328.
9. Arzani HA. Tibbe Akbar. Urdu Translation by Hkm. Mohd. Husain. Faisal Publication Deoband UP; YNM: 525-526.
10. Khan MA. Akseer-E-Azam. Urdu Translation by Hkm. Kabeeruddin. Idara Kitab Us Shifa New Delhi; 2011:705-709.
11. Qutubuddin. Clinical Study of *Ziabetes Shakri* (Diabetes Mellitus-II) and Evaluation of Efficacy of a Unani Formulation and Its Management. Dissertation. Rajiv Gandhi University of Health Sciences, Karnataka 2012.
12. Khan HA. Hazique. Jaseem Book Depot, New Delhi; 1983:387-390.
13. Qurshi MH. Jam-Ul-Hikmat. Idara Kitab Us Shifa New Delhi; 2011; 864-873.
14. Ahmed D, Sharma M, Mukerjee A, Ramteke PW, Kumar V. Improved glycemic control, pancreas protective and hepatoprotective effect by traditional poly-herbal formulation “Qurs Tabasheer” in streptozotocin-induced diabetic rats. BMC complementary and alternative medicine. 2013 Dec 1;13(1):10.
15. Ali H. Clinical evaluation of Safoof Ziabetes in management of Ziabetes Shakri (Doctoral dissertation, RGUHS). .2007.
16. Eqbal K, Alam MA, Quamri MA. Clinical efficacy of polyherbal unani formulation in patients with newly diagnosed diabetes mellitus: case series study. International Journal of Physiology, Nutrition and Physical Education 2019; 4(1): 985-987.

17. TIB M. Clinical Study of Ziabetes Shakari (Diabetes Mellitus Type II) and Evaluation of Efficacy of a Unani Formulation in its Management. Rajiv Gandhi Uni Health Sci. 2012.
18. Ansari AP, Nasir A. Therapeutic effect of ‘Qurs-i-Ziabetes Khas’ in Diabetes Mellitus–A Case Report. Journal of Ayurvedic and Herbal Medicine. 2020;6(1):4-8.
19. Dwivedi C, Dasgaul S. Antidiabetic herbal drugs and polyherbal formulation used for diabetes: A review. J Phytopharmacol. 2013;2(3):44-51.
20. Grover JK, Yadav S, Vats V. Medicinal plants of India with anti-diabetic potential. Journal of ethnopharmacology. 2002 Jun 1;81(1):81-100.

# How do Unani Drugs act as antidiabetics?

## Abstract

Unani medicine, a time-honoured system of holistic healing, offers a variety of natural remedies for the effective management of diabetes mellitus. Numerous Unani pharmacological agents exhibit antidiabetic properties by targeting key organs and physiological pathways involved in glucose homeostasis. In the liver, herbs such as Methi (*Trigonella foenum-graecum*), Darhald (*Berberis aristata*), Chiraita Talkh (*Swertia chirata*), and Gurmar Booti (*Gymnema sylvestre*) help reduce hepatic glucose production, thereby contributing to the lowering of blood sugar levels. Within the intestinal tract, medicinal plants like Samage Arabi (*Astragalus species*), Dammul Akhwain (*Dracaena cinnabari*), Sibr (*Aloe barbadensis*), Muquil (*Commiphora mukul*), and Triphala (a polyherbal formulation composed of *Terminalia chebula*, *Terminalia bellirica*, and *Emblica officinalis*) act by reducing glucose absorption, thus minimizing the influx of sugar into the bloodstream. The pancreas, being central to insulin secretion, benefits from Unani drugs such as Tukhm Karela (*Momordica charantia* seeds), Gurmar Booti (*Gymnema sylvestre*), Kachnar (*Bauhinia variegata*), and Maghz Tukhm Jamun (*Syzygium cumini* seeds), which are recognized for their potential to stimulate pancreatic  $\beta$ -cell activity and enhance insulin release. Moreover, insulin sensitivity in peripheral tissues-including muscles and adipose tissue-is improved by herbs like Darchini (*Cinnamomum zeylanicum*), Spirulina (*Arthrospira platensis*), Tukhm Karela (*Momordica charantia*), Kalonji (*Nigella sativa*), and Garlic (*Allium sativum*), which facilitate glucose uptake and utilization at the cellular level.

Additionally, some Unani formulations exhibit Dipeptidyl Peptidase-4 (DPP-4) inhibitory activity, thereby prolonging the action of incretin hormones such as GLP-1, which enhance insulin secretion and reduce

postprandial blood glucose levels. The holistic approach of Unani medicine, with its emphasis on natural, plant-derived therapeutics, presents a promising complementary strategy in diabetes management, offering effective glycemic control with minimal adverse effects. This chapter delves into the diverse pharmacological mechanisms of Unani antidiabetic agents, highlighting their therapeutic potential in maintaining metabolic balance.

### Introduction

Diabetes mellitus is a chronic metabolic disorder characterized by elevated blood glucose levels, resulting from either insufficient insulin production or ineffective insulin utilization by the body. Unani medicine, an ancient holistic system of healing, provides various natural remedies that aid in managing diabetes through multiple mechanisms. The effectiveness of Unani drugs in treating diabetes is primarily due to their ability to target different organs, including the liver, the intestine, the pancreas, the adipose tissues, and muscles. This chapter delves into the specific mechanisms through which Unani drugs exert their antidiabetic effects.

### 1. Liver: Reduction of hepatic glucose production

The liver plays a crucial role in maintaining glucose homeostasis by regulating gluconeogenesis and glycogenolysis. In diabetic conditions, hepatic glucose production is often increased, leading to hyperglycemia. Several Unani drugs help mitigate this by reducing hepatic glucose output.

**Table: Unani drugs acting on the liver**

| Unani name | Botanical name                   | Active constituents         | Mechanism of action                                            |
|------------|----------------------------------|-----------------------------|----------------------------------------------------------------|
| Methi      | <i>Trigonella foenum-graecum</i> | Soluble fiber, Trigonelline | Inhibits hepatic gluconeogenesis; enhances insulin sensitivity |

|                |                          |                          |                                                                                         |
|----------------|--------------------------|--------------------------|-----------------------------------------------------------------------------------------|
| Darhald        | <i>Berberis aristata</i> | Berberine                | Activates AMP-activated protein kinase (AMPK); suppresses hepatic glucose production    |
| Chiraita Talkh | <i>Swertia chirata</i>   | Xanthenes, Flavonoids    | Modulates liver enzymes involved in glucose metabolism                                  |
| Gurmar Booti   | <i>Gymnema sylvestre</i> | Gymnemic acids, Saponins | Reduces hepatic glucose production via enzymatic modulation of gluconeogenesis pathways |

## 2. Intestine: Reduction of glucose absorption

The intestine plays a significant role in glucose metabolism by absorbing dietary sugars. By inhibiting carbohydrate digestion and glucose absorption, some Unani drugs help reduce postprandial hyperglycemia.

**Table: Unani drugs acting on the intestine**

| Unani name     | Botanical name                                   | Active constituents              | Mechanism of action                                                                             |
|----------------|--------------------------------------------------|----------------------------------|-------------------------------------------------------------------------------------------------|
| Samage Arabi   | <i>Astragalus</i> species                        | Resistant starch, dietary fibers | Slows glucose absorption in the intestine by delaying carbohydrate digestion                    |
| Dammul Akhwain | <i>Dracaena cinnabari</i>                        | Tannins                          | Inhibits $\alpha$ -glucosidase, reducing carbohydrate breakdown and postprandial glucose spikes |
| Sibr           | <i>Aloe barbadensis</i> (syn. <i>Aloe vera</i> ) | Aloin, barbaloin, chromones      | Inhibits glucose transporters, reducing intestinal glucose absorption                           |
| Muquail        | <i>Commiphora mukul</i>                          | Guggulsterones, essential oils   | Enhances lipid metabolism and decreases glucose                                                 |

|          |                                                                                                     |                                  |                                                                                           |
|----------|-----------------------------------------------------------------------------------------------------|----------------------------------|-------------------------------------------------------------------------------------------|
|          |                                                                                                     |                                  | absorption in the intestine                                                               |
| Triphala | Combination of <i>Terminalia chebula</i> , <i>Terminalia bellirica</i> , <i>Emblica officinalis</i> | Polyphenols, tannins, flavonoids | Modulates gut microbiota, decreases glucose absorption, and improves insulin sensitivity. |

### 3. Pancreas: Enhancement of insulin secretion

The pancreas is the primary organ responsible for insulin secretion. In diabetes, particularly type 2 diabetes, pancreatic beta-cell dysfunction leads to inadequate insulin release. Certain Unani drugs stimulate pancreatic cells to enhance insulin production.

**Table: Unani drugs acting on pancreas**

| Unani name        | Botanical name                   | Active Chemical constituents          | Mechanism of action                                                 |
|-------------------|----------------------------------|---------------------------------------|---------------------------------------------------------------------|
| Tukhm Karela      | <i>Momordica charantia</i> seeds | Charantin, polypeptide-p, vicine      | Stimulates pancreatic $\beta$ -cells and promotes insulin secretion |
| Gurmar Booti      | <i>Gymnema sylvestre</i>         | Gymnemic acids, saponins              | Enhances $\beta$ -cell regeneration and insulin secretion           |
| Kachnar           | <i>Bauhinia variegata</i>        | Flavonoids, triterpenoids             | Boosts $\beta$ -cell function and insulin production                |
| Maghz Tukhm Jamun | <i>Syzygium cumini</i> seeds     | Jamboline, ellagic acid, anthocyanins | Improves insulin release and lowers blood glucose levels            |

### 4. Adipose tissues and muscles: Enhancement of peripheral glucose uptake

Skeletal muscles and adipose tissues play vital roles in glucose utilization. Impaired glucose uptake by these tissues is a hallmark of insulin resistance. Certain Unani drugs improve insulin sensitivity and facilitate glucose uptake.

**Table: Unani drugs acting on adipose tissues & muscles**

| <b>Unani name</b> | <b>Botanical name</b>            | <b>Major Chemical constituents</b>                                       | <b>Mechanism of action</b>                                                                       |
|-------------------|----------------------------------|--------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| Darchini          | <i>Cinnamomum zeylanicum</i>     | Cinnamaldehyde, eugenol, cinnamic acid, coumarin                         | Enhances insulin receptor sensitivity and promotes glucose uptake in muscle tissues.             |
| Spirulina         | <i>Arthrospira platensis</i>     | Phycocyanin, gamma-linolenic acid, phenolic compounds, $\beta$ -carotene | Antioxidants improve insulin action and support glucose metabolism in peripheral tissues.        |
| Tukhm Karela      | <i>Momordica charantia</i> seeds | Charantin, vicine, polypeptide-p, momordicosides                         | Facilitates glucose uptake in muscle cells by enhancing insulin signaling.                       |
| Kalonji           | <i>Nigella sativa</i>            | Thymoquinone, nigellone, alpha-hederin, fixed and volatile oils          | Thymoquinone enhances insulin-mediated glucose uptake in adipose and muscle tissues.             |
| <b>Garlic</b>     | <i>Allium sativum</i>            | Allicin, alliin, diallyl disulfide, ajoene                               | Allicin improves insulin sensitivity and enhances glucose metabolism in muscles and fat tissues. |

## **5. DPP-4 Inhibitors: Enhancing incretin hormones**

Dipeptidyl peptidase-4 (DPP-4) is an enzyme that degrades incretin hormones, which play a role in insulin secretion and glucose homeostasis. Inhibition of DPP-4 leads to prolonged action of incretin hormones, thereby improving insulin secretion and reducing glucagon release.

**Table: Unani drugs with DPP-4 Inhibitory properties**

| <b>Unani name</b> | <b>Botanical name</b>             | <b>Key Chemical constituents</b>             | <b>Mechanism of DPP-4 Inhibition</b>                                                                 |
|-------------------|-----------------------------------|----------------------------------------------|------------------------------------------------------------------------------------------------------|
| Darchini          | <i>Cinnamomum cassia</i>          | Procyanidins, cinnamaldehyde, cinnamic acid  | Inhibits DPP-4 enzyme activity, increases incretin levels (GLP-1), and improves insulin sensitivity. |
| Sibr              | <i>Aloe barbadensis</i> (A. vera) | Aloin, aloe-emodin, acemannan                | Stimulates incretin hormone secretion, enhances insulin production via the GLP-1 pathway.            |
| Kalonji           | <i>Nigella sativa</i>             | Thymoquinone, nigellidine, $\alpha$ -hederin | Thymoquinone inhibits DPP-4, improving glycemic control by prolonging incretin activity.             |
| Gurmar Booti      | <i>Gymnema sylvestre</i>          | Gymnemic acids, saponins, flavonoids         | Enhances incretin hormone function, stimulates insulin secretion, and may inhibit DPP-4 indirectly   |
| Darhald           | <i>Berberis aristata</i>          | Berberine, oxyberberine, berbamine           | Berberine inhibits DPP-4 activity, enhances GLP-1 secretion, improves glucose metabolism             |

## Conclusion

Unani medicine provides a diverse array of herbal remedies that target different physiological pathways involved in glucose regulation. These remedies work through distinct mechanisms, such as reducing hepatic glucose production, inhibiting intestinal glucose absorption, enhancing pancreatic insulin secretion, increasing peripheral glucose uptake, and inhibiting DPP-4 enzyme activity. By leveraging the synergistic actions of these natural remedies, Unani medicine offers a holistic

approach to diabetes management with minimal side effects. Further research and clinical trials are needed to optimize dosage and understand the precise biochemical interactions of these traditional therapies in diabetes care.

### **Bibliography:**

1. Salehi B, Ata A, V Anil Kumar N, Sharopov F, Ramírez-Alarcón K, Ruiz-Ortega A, et al. Antidiabetic Potential of Medicinal Plants and Their Active Components. *Biomolecules*. 2019 Sep 30;9(10):551. doi: 10.3390/biom9100551.
2. Eqbal K, Alam MA, Quamri MA, Sofi G, Bhat MD. Efficacy of Qurs-e-Gulnar in Ziabetus (type 2 Diabetes Mellitus): a single blind randomized controlled trial. *Journal of Complementary and Integrative Medicine*. 2020 Jun 18;1(ahead-of-print).
3. Alam A, Quamri S, Fatima S, Roqaiya M, Ahmad Z. Efficacy of Spirulina (Tahlab) in Patients of Type 2 Diabetes Mellitus (Ziabetus Shakri)-A Randomized Controlled Trial. *Journal of diabetes & metabolism. ISSN, J Diabetes Metab*. 2016 Oct 1;7(10):6155-6.
4. Ahmed D, Sharma M, Mukerjee A, Ramteke PW, Kumar V. Improved glycemic control, pancreas protective and hepatoprotective effect by traditional poly-herbal formulation “Qurs Tabasheer” in streptozotocin-induced diabetic rats. *BMC complementary and alternative medicine*. 2013 Dec 1;13(1):10.
5. Ali H. Clinical evaluation of Safoof Ziabetus in management of Ziabetus Shakri (Doctoral dissertation, RGUHS). .2007.
6. Eqbal K, Alam MA, Quamri MA. Clinical efficacy of polyherbal unani formulation in patients with newly diagnosed diabetes mellitus: case series study. *International Journal of*

Physiology, Nutrition and Physical Education 2019; 4(1): 985-987.

7. TIB M. Clinical Study of Ziabetes Shakari (Diabetes Mellitus Type II) and Evaluation of Efficacy of a Unani Formulation in its Management. Rajiv Gandhi Uni Health Sci. 2012.
8. Ansari AP, Nasir A. Therapeutic effect of ‘Qurs-i-Ziabetes Khas’ in Diabetes Mellitus–A Case Report. Journal of Ayurvedic and Herbal Medicine. 2020;6(1):4-8.
9. Dwivedi C, Dasgaul S. Antidiabetic herbal drugs and polyherbal formulation used for diabetes: A review. J Phytopharmacol. 2013;2(3):44-51.
10. Grover JK, Yadav S, Vats V. Medicinal plants of India with anti-diabetic potential. Journal of ethnopharmacology. 2002 Jun 1;81(1):81-100.

# Traditional Unani Formulations and Their Antidiabetic Effects

## Abstract

Diabetes mellitus is a chronic metabolic disorder characterized by hyperglycemia due to impaired insulin secretion, insulin resistance, or both. With the rising global burden of diabetes, there is a growing interest in traditional medicine systems, such as Unani medicine, for effective and holistic management. Unani formulations, derived from natural sources, have been traditionally used to regulate blood sugar levels, enhance insulin sensitivity, and improve overall metabolic health. This chapter explores the antidiabetic effects of renowned Unani formulations, including *Qurs Ziabetus*, *Qurs Qulnar*, *Qurs Tabasheer*, *Safoof Ziabetus*, *Safoof Gilo*, and *Qurs Kushta Baiza Murg*. These formulations, composed of medicinal herbs and mineral-based ingredients, are known for their hypoglycemic, antioxidant, and pancreatic  $\beta$ -cell protective properties. Major constituents such as Tabasheer (*Bambusa arundinacea*), Gilo (*Tinospora cordifolia*), Gurmar (*Gymnema sylvestre*), and Baiza Murg (*Calcined Eggshell*) have been extensively used in Unani medicine for diabetes management. The mechanisms of action of these formulations include enhancing glucose uptake, improving pancreatic function, reducing oxidative stress, and modulating lipid metabolism. This chapter reviews traditional knowledge, scientific evidence, pharmacological insights, and clinical applications of these Unani formulations. Furthermore, it discusses their potential integration into modern diabetes management strategies, highlighting their efficacy, safety, and scope for further research. By bridging traditional wisdom with contemporary scientific validation, this chapter aims to emphasize the significance of Unani medicine in diabetes care, promoting a complementary approach for better health outcomes.

**Introduction**

Diabetes mellitus is a chronic metabolic disorder characterized by hyperglycemia due to insufficient insulin production, resistance to insulin action, or both. Unani medicine, a traditional system of healthcare with roots in ancient Greek and Islamic medical philosophies, offers several herbal and mineral-based formulations for managing diabetes. These formulations are designed based on the principles of humoral imbalance and the correction of metabolic dysfunctions. This chapter explores the antidiabetic effects of well-known Unani formulations such as *Qurs Ziabetus*, *Qurs Qulnar*, *Qurs Tabasheer*, *Safoof Ziabetus*, *Safoof Gilo*, and *Qurs Kushta Baiza Murg*, highlighting their ingredients, mechanisms of action, and clinical significance.

**Unani perspective on diabetes (*Ziabetus*)**

In Unani medicine, diabetes, referred to as *Ziabetus*, is attributed to excessive heat (*Hararat*) and dryness (*Yubusat*) in the liver and kidneys, leading to the loss of control over sugar metabolism. The disease is classified into *Ziabetus Sada* (non-sweet urine diabetes) and *Ziabetus Shakri* (sweet urine diabetes). Treatment aims at balancing the four humors (blood, phlegm, yellow bile, and black bile) and restoring metabolic homeostasis through dietary regulation, lifestyle modifications, and herbal-mineral formulations.

**Renowned Unani formulations for diabetes management**

**Qurs Ziabetus**

**Ingredient details:**

| Common name                    | Scientific name           | Family name   | Parts used | Quantity      | Mechanism of action                  |
|--------------------------------|---------------------------|---------------|------------|---------------|--------------------------------------|
| Purslane Seeds (Tukhme-Khurfa) | <i>Portulaca oleracea</i> | Portulacaceae | Seeds      | As prescribed | Cooling, diuretic, anti-inflammatory |

|                                     |                               |             |                  |               |                                           |
|-------------------------------------|-------------------------------|-------------|------------------|---------------|-------------------------------------------|
| Lettuce Seeds<br>(Tukhm-e-Kahu)     | <i>Lactuca sativa</i>         | Asteraceae  | Seeds            | As prescribed | Sedative, cooling, laxative               |
| Licorice Extract<br>(Rub-us-Soos)   | <i>Glycyrrhiza glabra</i>     | Fabaceae    | Root extract     | As prescribed | Demulcent, anti-inflammatory, expectorant |
| Bamboo Silica<br>(Tabasheer)        | <i>Bambusa arundinacea</i>    | Poaceae     | Silica (exudate) | As prescribed | Cooling, expectorant, diuretic            |
| Armenian Clay (Gile-Armani)         | -                             | -           | Clay             | As prescribed | Absorbent, cooling, detoxifying           |
| Rose Petals<br>(Gul-e-Surkh)        | <i>Rosa damascena</i>         | Rosaceae    | Petals           | As prescribed | Astringent, cooling, tonic                |
| Dried Coriander<br>(Kishneez Khusk) | <i>Coriandrum sativum</i>     | Apiaceae    | Seeds            | As prescribed | Carminative, cooling, digestive           |
| Acacia (Aqaqia)                     | <i>Acacia arabica</i>         | Fabaceae    | Gum              | As prescribed | Astringent, anti-inflammatory             |
| Arabic Gum<br>(Samag-e-Arabi)       | <i>Acacia senegal</i>         | Fabaceae    | Gum              | As prescribed | Demulcent, emulsifier, binding agent      |
| White Sandalwood<br>(Sandal Safaid) | <i>Santalum album</i>         | Santalaceae | Wood             | As prescribed | Cooling, diuretic, antimicrobial          |
| Red Sandalwood<br>(Sandal Surkh)    | <i>Pterocarpus santalinus</i> | Fabaceae    | Wood             | As prescribed | Cooling, astringent, anti-inflammatory    |

|                             |                            |            |         |               |                                           |
|-----------------------------|----------------------------|------------|---------|---------------|-------------------------------------------|
| Pomegranate Flower (Gulnar) | <i>Punica granatum</i>     | Lythraceae | Flowers | As prescribed | Astringent, hemostatic, anti-inflammatory |
| Camphor                     | <i>Cinnamomum camphora</i> | Lauraceae  | Extract | As prescribed | Cooling, stimulant, antimicrobial         |

### **Mechanism of action:**

#### **Mechanism of action of Qurs Ziabetus in diabetes**

Qurs Ziabetus is a Unani herbal formulation composed of multiple natural ingredients that work together to regulate blood sugar levels and manage diabetes (Ziabetus). The mechanism of action involves enhancing insulin function, improving kidney health, reducing inflammation, and restoring humoral balance. Below is a detailed breakdown of how each ingredient contributes to its antidiabetic effects:

#### **1. Enhancing insulin secretion and sensitivity**

- **Purslane seeds** (*Tukhme-Khurfa*): Rich in omega-3 fatty acids and flavonoids, which help enhance insulin sensitivity and glucose metabolism.
- **Lettuce seeds** (*Tukhm-e-Kahu*): Contain antioxidants that support pancreatic  $\beta$ -cell function, improving insulin secretion.

#### **2. Reducing blood sugar levels (hypoglycemic effect)**

- **Licorice extract** (*Rub-us-Soos*): Helps in modulating glucose metabolism and reducing oxidative stress in the pancreas, preventing  $\beta$ -cell damage.
- **Dried coriander** (*Kishneez Khusk*): Known for its ability to lower postprandial (after-meal) glucose levels and regulate carbohydrate metabolism.

### 3. Improving kidney function and reducing polyuria

- **Armenian clay** (*Gile-Armani*): A natural detoxifier that absorbs excess glucose and toxins, improving kidney function.
- **Acacia** (*Aqaqia*) and **arabic gum** (*Samag-e-Arabi*): Help restore kidney retention (*Quwate Masika*), reducing excessive urination (polyuria).
- **Pomegranate flower** (*Gulnar*): Acts as a renal tonic, preventing excess water loss and helping in fluid retention.

### 4. Anti-inflammatory and antioxidant properties

- **White sandalwood** (*Sandal Safaid*) and **red sandalwood** (*Sandal Surkh*): Possess strong cooling and anti-inflammatory properties, reducing oxidative stress, which is a major factor in diabetes complications.
- **Rose petals** (*Gul-e-Surkh*): Contains polyphenols and flavonoids that help in neutralizing free radicals and reducing chronic inflammation.

### 5. Improving digestion and metabolism

- **Bamboo silica** (*Tabasheer*): Helps in slowing down glucose absorption from the intestines, preventing rapid spikes in blood sugar levels.
- **Licorice extract** (*Rub-us-Soos*): Supports liver function, ensuring proper metabolism of carbohydrates and preventing insulin resistance.

### 6. Cooling effect and restoring humoral balance

- **Camphor**: Has a cooling effect, reducing excessive thirst (polydipsia) and balancing the hot temperament (*Sue Mizaj Haar*) associated with diabetes.

- **Rose petals** (*Gul-e-Surkh*) and **White sandalwood** (*Sandal Safaid*): Help in correcting imbalances in humors (*Akhlat*), especially *Safra* (Yellow Bile) and *Balgham* (Phlegm), which are associated with diabetes in Unani medicine.

## Qurs Gulnar

### Ingredients details:

| Common name | Scientific name            | Family name | Parts used | Quantity | Mechanism of action                                                               |
|-------------|----------------------------|-------------|------------|----------|-----------------------------------------------------------------------------------|
| Gulnar      | <i>Punica granatum</i>     | Lythraceae  | Flower     | 12.0 g   | Astringent, hemostatic, helps in wound healing and reducing excessive secretions. |
| Gile Armani | Armenian bole              | -           | Clay       | 12.0 g   | Absorbent, anti-inflammatory, and helps in gastrointestinal disorders.            |
| Gond Kekar  | <i>Acacia nilotica</i>     | Fabaceae    | Gum        | 12.0 g   | Demulcent, anti-inflammatory, used in respiratory and digestive disorders.        |
| Gul-e-Surkh | <i>Rosa damascena</i>      | Rosaceae    | Flower     | 9.0 g    | Cooling, astringent, used for soothing irritation and inflammation.               |
| Aqaqiya     | <i>Acacia arabica</i>      | Fabaceae    | Gum        | 9.0 g    | Astringent, demulcent, useful in diarrhea and throat infections.                  |
| Kateera     | <i>Astragalus gummifer</i> | Fabaceae    | Gum        | 6.0 g    | Thickening agent, expectorant, relieves throat irritation and cough.              |

## **Mechanism of action:**

**Qurs Gulnar** is a Unani formulation primarily composed of Gulnar (*Punica granatum* flower) along with other ingredients like *Gile Armani*, *Gond Kekar*, *Gul-e-Surkh*, *Aqaqiya*, and *Kateera*. It is traditionally used for its hypoglycemic, astringent, and antioxidant properties, making it effective in diabetes management.

### **1. Antihyperglycemic action**

- **Regulates glucose absorption:** The polyphenols and flavonoids in **Gulnar** help reduce glucose absorption from the intestine, thereby preventing sudden spikes in blood sugar levels.
- **Enhances insulin sensitivity:** Bioactive compounds in ***Punica granatum*** improve insulin sensitivity, facilitating better glucose uptake by cells.
- **Inhibits  $\alpha$ -amylase and  $\alpha$ -Glucosidase:** The tannins and polyphenols inhibit these enzymes, slowing carbohydrate digestion and reducing postprandial blood sugar levels.

### **2. Antioxidant and anti-inflammatory effects**

- **Reduces Oxidative Stress:** Diabetes is associated with increased oxidative stress, which leads to complications. Gulnar has potent antioxidants like ellagic acid and punicalagin that neutralize free radicals and protect pancreatic  $\beta$ -cells.
- **Anti-inflammatory action:** Chronic inflammation is a key factor in insulin resistance. The flavonoids in Qurs Gulnar help reduce inflammation, improving glucose metabolism.

### **3. Astringent and kidney protective action**

- **Prevents excessive urination (polyuria):** Gulnar and *Aqaqiya* have astringent properties that strengthen the kidney's retentive

faculty (*Quwate Masika*), reducing excessive water loss, a common symptom in diabetes.

- **Protects renal function:** The formulation reduces renal inflammation, preventing diabetic nephropathy and maintaining kidney function.

#### 4. Gastrointestinal benefits and gut microbiota regulation

- **Improves gut health:** Ingredients like *Gond Kekar* and *Kateera* act as prebiotics, supporting beneficial gut microbiota that play a role in glucose metabolism and insulin regulation.
- **Enhances digestive function:** Gile Armani helps absorb excess moisture, reducing excessive thirst (polydipsia) and improving digestion, which is often impaired in diabetes.

### Qurs Tabasheer

#### Ingredients details:

| Common name | Scientific name                  | Family name | Part used             | Quantity | Mechanism of action                                                                                             |
|-------------|----------------------------------|-------------|-----------------------|----------|-----------------------------------------------------------------------------------------------------------------|
| Tabasheer   | <i>Bambusa arundinacea</i> Retz. | Poaceae     | Siliceous concretions | 1 part   | Cooling, anti-inflammatory, and diuretic properties help regulate fluid balance and reduce excessive urination. |
| Gul-e-Surkh | <i>Rosa damascena</i> Mill.      | Rosaceae    | Flower                | 1 part   | Astringent, cooling, and antioxidant properties support kidney and liver function.                              |

|                |                                 |               |               |        |                                                                                                |
|----------------|---------------------------------|---------------|---------------|--------|------------------------------------------------------------------------------------------------|
| Gulnar         | <i>Punica granatum</i> Linn.    | Lythraceae    | Flower        | 1 part | Astringent and anti-inflammatory effects help in reducing excessive urination.                 |
| Tukhm-e-Kahu   | <i>Lactuca sativa</i> Linn.     | Asteraceae    | Seed          | 1 part | Sedative and cooling effects help in calming excessive thirst and heat in the body.            |
| Tukhm-e-Khurfa | <i>Portulaca oleracea</i> Linn. | Portulacaceae | Seed          | 1 part | Anti-diabetic, diuretic, and cooling effects help in regulating blood sugar and fluid balance. |
| Gile Armani    | -                               | -             | Armenian clay | 1 part | Absorbent and cooling properties aid in reducing excessive urination and heat imbalance.       |

### **Mechanism of Action:**

**Qurs Tabasheer (QT)** is a Unani polyherbal formulation traditionally used for managing diabetes (Ziabetes). The combined action of its six herbal ingredients helps in regulating blood sugar levels, improving kidney function, and balancing body fluids. The mechanism of action of Qurs Tabasheer as an antidiabetic can be understood as follows:

## 1. Regulation of blood sugar levels

- **Tabasheer** (*Bambusa arundinacea*): Contains siliceous compounds that help in reducing excessive urination (**polyuria**) and have a cooling effect on the body, which may contribute to glycemic control.
- **Tukhm-e-Khurfa** (*Portulaca oleracea*): Rich in omega-3 fatty acids, flavonoids, and antioxidants, which enhance insulin sensitivity and regulate glucose metabolism.

## 2. Astringent action on the kidneys and urinary tract

- **Gul-e-Surkh** (*Rosa damascena*) and **Gulnar** (*Punica granatum*): Have astringent and anti-inflammatory properties that help reduce excessive urination by strengthening kidney function and improving water retention.
- **Gile Armani**: A natural absorbent, it helps in reducing excessive fluid loss and stabilizing internal moisture balance, indirectly aiding in glucose control.

## 3. Antioxidant and anti-inflammatory effects

- **Gul-e-Surkh, Gulnar, and Tukhm-e-Kahu**: Contain polyphenols and flavonoids, which combat oxidative stress—a key factor in insulin resistance and  $\beta$ -cell dysfunction.
- **Portulaca oleracea** (Tukhm-e-Khurfa): Acts as a free radical scavenger, protecting pancreatic  $\beta$ -cells from oxidative damage, thereby improving insulin secretion.

## 4. Cooling and humoral balance (*Mizaj* correction)

- **Qurs Tabasheer** primarily works by correcting the hot temperament (*Sue Mizaj Haar*) of the kidneys and liver, which is believed in Unani medicine to be a major cause of diabetes.

- The cooling and soothing action of Tabasheer, *Gul-e-Surkh*, and *Tukhm-e-Kahu* helps in maintaining the balance of bodily fluids and preventing excessive thirst (polydipsia).

## 5. Improvement of digestive and metabolic functions

- ***Tukhm-e-Kahu* and *Gulnar*** aid in improving digestion and metabolism, ensuring better absorption of nutrients and glucose regulation.
- ***Tukhm-e-Khurfa*** has a mild laxative effect, which helps in eliminating toxins that may contribute to metabolic dysfunction.

## Safoof Ziabetus Dulabi

### Ingredients detail:

| Common name                      | Scientific name               | Family name    | Part used | Quantity | Mechanism of action                                |
|----------------------------------|-------------------------------|----------------|-----------|----------|----------------------------------------------------|
| Post-e-Andrun-e-Darakht-e-Gulnar | <i>Punica granatum</i> L.     | Lythraceae     | Stem bark | 2 part   | Astringent, anti-inflammatory, antimicrobial       |
| Gul-e-Farsi                      | <i>Punica granatum</i> L.     | Lythraceae     | Flower    | 1 Part   | Astringent, antioxidant, hemostatic                |
| Dana Anar Shireen                | <i>Punica granatum</i> L.     | Lythraceae     | Seeds     | 1 Part   | Antioxidant, cardioprotective, anti-inflammatory   |
| Maghz-e-Tukhm-e-Anba             | <i>Mangifera indica</i> L.    | Anacardiaceae  | Seed      | 1 Part   | Antioxidant, astringent, antimicrobial             |
| Amla                             | <i>Phyllanthus emblica</i> L. | Phyllanthaceae | Fruit     | 1 Part   | Immunomodulatory, antioxidant, digestive stimulant |

|                    |                                 |          |       |        |                                                  |
|--------------------|---------------------------------|----------|-------|--------|--------------------------------------------------|
| Kishneez<br>Khushk | <i>Coriandrum sativum</i><br>L. | Apiaceae | Fruit | 1 Part | Carminative,<br>digestive, anti-<br>inflammatory |
| Gil-e-<br>Armani   | Clay - Soil                     | -        | Clay  | 1 Part | Absorbent,<br>cooling,<br>detoxifying            |

### Mechanism of action:

- Hypoglycemic action may be attributed to the synergistic effect of several herbal ingredients that have been historically used in Unani medicine.
- The formulation is believed to lower blood glucose levels by modulating multiple metabolic pathways. Its actions might include enhancing insulin secretion from pancreatic  $\beta$ -cells and improving insulin sensitivity in peripheral tissues, thereby promoting more efficient glucose uptake.
- Additionally, bioactive phytoconstituents present in the formulation-such as flavonoids, saponins, and polyphenols-are thought to impart antioxidant effects that protect pancreatic cells from oxidative stress and reduce inflammation.
- These properties can help mitigate insulin resistance and curb the progression of diabetic complications.
- There is also evidence that *Safoof Zibetus Dulabi* may inhibit key digestive enzymes (e.g.,  $\alpha$ -glucosidase) responsible for carbohydrate breakdown, thereby delaying glucose absorption and preventing postprandial hyperglycemia.
- Although detailed pharmacokinetic and clinical studies remain limited, experimental models have demonstrated reductions in fasting blood glucose levels and improved glucose tolerance upon treatment with this formulation.

- Overall, the integration of these multiple mechanisms-enhanced insulin dynamics, enzyme inhibition, and antioxidant protection-positions *Safoof Zibetus Dulabi* as a promising adjunct in the holistic management of diabetes, warranting further research and clinical validation.

### **Pharmacological validation of Unani formulations**

Several scientific studies have validated the efficacy of Unani formulations for diabetes management:

- *Gymnema sylvestre* has been shown to lower blood glucose levels by stimulating insulin secretion and regenerating beta cells.
- *Nigella sativa* exhibits significant antihyperglycemic effects by modulating glucose metabolism and enhancing insulin sensitivity.
- *Tinospora cordifolia* improves pancreatic function and reduces oxidative stress markers associated with diabetes.
- Cinnamon enhances insulin receptor signaling, leading to better glucose uptake in peripheral tissues.

### **Clinical applications and safety profile**

Unani formulations are generally well-tolerated with minimal side effects when used under proper supervision. However, potential interactions with conventional antidiabetic medications should be considered. Monitoring blood glucose levels and adjusting dosages accordingly is essential to prevent hypoglycemia.

### **Future prospects and research directions**

Further research and clinical trials are needed to:

- Standardize Unani formulations and validate their bioactive components.

- Explore synergistic effects of herbal combinations for enhanced glycemic control.
- Develop novel drug delivery systems (e.g., nano-formulations) for improved bioavailability and efficacy.
- Investigate genetic and molecular mechanisms underlying Unani medicine's role in diabetes management.

## Conclusion

Unani medicine offers a comprehensive and holistic approach to diabetes management through time-tested herbal and mineral-based formulations. Classical preparations such as *Qurs Ziabetus*, *Qurs Gulnar*, *Qurs Tabasheer*, *Safoof Ziabetus*, and *Qurs Kushta Baiza Murg* have demonstrated significant antidiabetic potential by targeting multiple aspects of the disease. These formulations work by enhancing insulin secretion and sensitivity, protecting pancreatic  $\beta$ -cells, reducing oxidative stress, and improving glucose metabolism. Chief ingredients like *Tabasheer*, *Gilo*, *Gurmar*, and *Baiza Murg* contribute cooling, anti-inflammatory, antioxidant, and hypoglycemic effects, addressing the humoral imbalances described in Unani theory. Pharmacological studies and preliminary clinical evidence validate their efficacy in lowering blood sugar levels, preventing diabetic complications, and improving metabolic health with minimal side effects. Despite their promising benefits, standardization, rigorous clinical trials, and detailed pharmacokinetic studies are needed to establish safety, dosage, and long-term efficacy. Integrating these traditional Unani formulations with modern diabetes care could provide a cost-effective, culturally acceptable, and complementary strategy to enhance patient outcomes. Future research exploring molecular mechanisms and novel delivery methods may further strengthen the role of Unani medicine in global diabetes management.

## Bibliography:

1. Eqbal K, Alam MA, Quamri MA, Sofi G, Ahmad Bhat MD. Efficacy of *Qurs-e-Gulnar* in Ziabetus (type 2 Diabetes Mellitus): a single blind randomized controlled trial. *J Complement Integr Med*. 2020;18(1):147-153.
2. Khan MA. Akseer-E-Azam. Urdu Translation by Hkm. Kabeeruddin. Idara Kitab Us Shifa New Delhi; 2011:705-709.
3. Qutubuddin. Clinical Study of *Ziabetus Shakri* (Diabetes Mellitus-II) and Evaluation of Efficacy of a Unani Formulation and Its Management. Dissertation. Rajiv Gandhi University of Health Sciences, Karnataka 2012.
4. Khan HA. Hazique. Jaseem Book Depot, New Delhi; 1983:387-390.
5. Qurshi MH. Jam-UI-Hikmat. Idara Kitab Us Shifa New Delhi; 2011; 864-873.
6. Alam A, Quamri S, Fatima S, Roqaiya M, Ahmad Z. Efficacy of Spirulina (Tahlab) in Patients of Type 2 Diabetes Mellitus (*Ziabetus Shakri*)-A Randomized Controlled Trial. *Journal of diabetes & metabolism*. ISSN, J Diabetes Metab. 2016 Oct 1;7(10):6155-6.
7. Quamri MA, Begum S, Siddiqui MA, Alam MA. Efficacy of Kanduri (*Coccinia indica*) in diabetes associated dyslipidemia randomized, single blind, standard controlled study. *Age (Mean±SD)*: 43(7.845):44-9.
8. Kabeeruddin A. Bayaze Kabeer. Part-II. Idara Kitab Us Shifa, New Delhi. 2014.
9. Itrat M, Nasir F, K R, Khan TN, Tayyeb Bukhari STT. Unani Medicines for Glycemic Control in Type 2 Diabetes Mellitus: A Systematic Review. *Altern Ther Health Med*. 2024;30(6):46-51.
10. Ali W, Shaikh H, Ansari A, Khanam S. Standardization of Unani Antidiabetic Tablet - Qurse Tabasheer. *Pharmacognosy Res*. 2016;8(2):147-152.

# Unani Approaches for Non-Healing Diabetic Ulcers

## Abstract

Diabetic foot ulcers (DFUs) are a major complication of diabetes, often leading to prolonged healing and an increased risk of infection, amputation, and reduced quality of life. Conventional treatments, including wound dressings, antibiotics, and surgical interventions, have shown limitations in managing chronic, non-healing ulcers. In this context, Unani medicine offers a promising, integrative approach by utilizing time-tested therapies that promote wound healing, enhance tissue regeneration, and improve microcirculation. This chapter explores the Unani perspective on diabetic ulcers, classifying them under *Quruh-e-Muzminah* and attributing their pathogenesis to *Sue Mizaj* (altered temperament), *Imtila* (toxic accumulation), and *Zoaf-e-Aaza* (organ weakness). Traditional Unani strategies include *Ilaj bil Tadbeer* (regimenal therapy), *Ilaj bil Ghiza* (dietary therapy), and *Ilaj bil Dawa* (herbal and pharmacological interventions). Specific treatments such as *Munzij wa Mushil* (detoxification), *Tachheer* (debridement), and *Taleeq* (leech therapy) are extensively discussed. Medicinal herbs with anti-inflammatory, antimicrobial, and wound-healing properties-such as *Zingiber officinale* (ginger), *Curcuma longa* (turmeric), *Aloe barbadensis* (aloe vera), and *Commiphora mukul* (guggul)-are highlighted for their therapeutic potential in DFUs. Additionally, Unani formulations like *Marham-e-Raal*, *Roghan-e-Zaitoon*, and *Kafooradi Marham* are examined for their role in ulcer management. The chapter also integrates modern scientific findings that support the efficacy of these treatments. By merging traditional wisdom with contemporary research, Unani medicine provides a holistic, cost-effective, and sustainable alternative for managing non-healing diabetic ulcers.

**Introduction**

Diabetic ulcers are one of the most challenging complications of diabetes mellitus, often leading to severe infections, amputations, and significant morbidity. Non-healing diabetic ulcers (NHDUs) result from a combination of neuropathy, ischemia, and infection, making their management complex. Unani medicine, a holistic and traditional system of healing, offers unique strategies and therapeutic approaches for the management of such chronic wounds. This chapter explores the Unani principles of wound healing and discusses various pharmacological and non-pharmacological interventions employed in Unani medicine to manage NHDUs effectively.

**Pathophysiology of non-healing diabetic ulcers:** Diabetic foot ulcers (DFUs) are categorized as chronic wounds that fail to progress through the normal stages of healing. The underlying mechanisms include:

| Factors                           | Mechanism                                       | Impact on health                                                        |
|-----------------------------------|-------------------------------------------------|-------------------------------------------------------------------------|
| Peripheral Neuropathy             | Leads to loss of protective sensation           | Causes unnoticed injuries, increasing the risk of ulcers and infections |
| Peripheral Arterial Disease (PAD) | Results in reduced blood supply and ischemia    | Delays wound healing and increases the risk of tissue necrosis          |
| Hyperglycemia                     | Impairs immune response                         | Increases susceptibility to infections and delays wound healing         |
| Biofilm Formation                 | Provides a protective environment for pathogens | Delays healing and contributes to chronic infections                    |

**Unani perspective on wound healing:** According to Unani medicine, wound healing follows a systematic process involving:

| Unani term               | Stage description                 | Role in wound healing                                       |
|--------------------------|-----------------------------------|-------------------------------------------------------------|
| Tahleel-e-Varam          | Reduction of inflammation         | Initial response to injury; helps control swelling and pain |
| Takwin Alqih Wal Ifrazat | Suppuration and exudate formation | Cleansing stage: removes toxins and waste from the wound    |
| Inqibaz                  | Contraction of the wound          | Promotes tissue regeneration and wound closure              |
| Inbate Lahm              | Tissue remodeling                 | Strengthens and matures new tissues for complete healing    |

**Note:** NHDUs in Unani medicine are classified under *Quruh-e-Muzminah* (chronic ulcers), requiring specialized treatment regimens.

### Strategies for management of NHDUs in Unani medicine:

#### 1. Regimenal therapy:

Regimenal therapy includes physical and lifestyle modifications to enhance circulation and metabolism for a non-healing diabetic ulcer:

| Regimenal therapy         | Description                                           | Therapeutic benefits                                                                                |
|---------------------------|-------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| Dalk (Massage Therapy)    | Manual manipulation of body tissues                   | Enhances local blood flow and promotes tissue repair                                                |
| Hamam (Hydrotherapy)      | Use of steam or warm water baths                      | Improves microcirculation in affected areas                                                         |
| Mahajim (Cupping Therapy) | Application of suction cups to draw out blood         | Removes morbid humors and improves circulation                                                      |
| Riyazat (Exercise)        | Physical activity tailored to the patient's condition | Aids in glucose metabolism and prevents neuropathic complications                                   |
| Taleeqe (Leech Therapy)   | Application of leeches on the affected area           | Removes morbid blood through hirudin (an anticoagulant), reduces inflammation, and promotes healing |

## 2. Dietotherapy:

Diet plays a crucial role in managing diabetes and wound healing. Unani physicians recommend:

| Dietary recommendation                                     | Purpose/Mechanism                                               | Expected benefits                            |
|------------------------------------------------------------|-----------------------------------------------------------------|----------------------------------------------|
| Low-Glycemic Index Foods                                   | Help maintain stable blood sugar levels                         | Better glycemic control                      |
| Rich-Protein Diet                                          | Supports collagen synthesis and tissue repair                   | Enhances wound healing                       |
| Antioxidant-Rich Foods<br>(e.g., dates, pomegranate, figs) | Promote tissue regeneration through oxidative stress reduction  | Accelerated healing and reduced inflammation |
| Avoidance of Barid and Ratab (Cold & Moist Foods)          | Based on Unani principles, these may hamper the healing process | Prevents delay in wound healing              |

## 3. Pharmacotherapy:

Unani medicine offers a range of single and compound drugs with anti-inflammatory, antimicrobial, and wound-healing properties.

### a. Single herbs used for non-healing diabetic ulcer (NHDUs):

| Common name      | Scientific name           | Therapeutic properties                                                                      |
|------------------|---------------------------|---------------------------------------------------------------------------------------------|
| Neem             | <i>Azadirachta indica</i> | Antibacterial, antifungal, and anti-inflammatory; helps prevent and control infections.     |
| Haldi (Turmeric) | <i>Curcuma longa</i>      | Curcumin promotes wound contraction, reduces inflammation, and enhances collagen formation. |
| Sandalwood       | <i>Santalum album</i>     | Cooling, soothing; reduces inflammation in ulcers                                           |
| Guggul           | <i>Commiphora mukul</i>   | Stimulates tissue regeneration, anti-inflammatory                                           |

|                         |                                      |                                                                      |
|-------------------------|--------------------------------------|----------------------------------------------------------------------|
| Aloe Vera               | <i>Aloe barbadensis</i>              | Promotes epithelialization, reduces pain and inflammation            |
| Anar (Pomegranate peel) | <i>Punica granatum</i>               | Astringent, antimicrobial, enhances wound healing                    |
| Mazoo (Oak gall)        | <i>Quercus infectoria</i>            | Astringent, stops discharge, contracts tissues                       |
| Abhal (Juniper)         | <i>Juniperus communis</i>            | Antiseptic, reduces wound odor, dries excessive exudate              |
| Sange Jarahat           | <i>Lapis judaicus</i>                | Desiccant promotes granulation tissue, helps cleanse infected wounds |
| Fitkari (Alum)          | <i>Potassium aluminum sulfate</i>    | Astringent, contracts tissues, stops minor bleeding, disinfectant    |
| Tootiya Sabz            | <i>Copper sulfate</i>                | Antibacterial, antifungal, dries the wound                           |
| Chuna (Lime)            | <i>Calcium hydroxide</i>             | Antiseptic, maintains alkaline pH, counters infection                |
| Roghan-e-Zaitoon        | <i>Olea europaea</i> (Olive oil)     | Moisturizes wound bed, anti-inflammatory, antimicrobial              |
| Roghan-e-Badam          | <i>Prunus amygdalus</i> (Almond oil) | Softens scar tissue, aids in skin regeneration                       |
| Madar (Arka)            | <i>Calotropis procera</i>            | Anti-inflammatory, promotes slough removal, antiseptic               |
| Suranjan Shirin         | <i>Colchicum luteum</i>              | Reduces inflammation and pain                                        |
| Zarawand Mudahraj       | <i>Aristolochia rotunda</i>          | Used traditionally in wound cleansing and granulation                |
| Kafoor                  | <i>Cinnamomum camphora</i>           | Antiseptic, reduces itching and irritation.                          |
| Sirka (Vinegar)         | <i>Acetic acid</i>                   | Antiseptic, cleansing agent, dissolves necrotic tissue               |
| Asgandh                 | <i>Withania somnifera</i>            | Promotes regeneration, anti-inflammatory                             |
| Roghan-e-Kunjad         | <i>Sesamum indicum</i> (Sesame oil)  | Moisturizing, antioxidant, supports tissue repair                    |

## b. Compound Unani formulations

| Unani formulation       | Major ingredients/Type                                 | Therapeutic role                                                  |
|-------------------------|--------------------------------------------------------|-------------------------------------------------------------------|
| Roghan-e-Gul (Rose Oil) | Extracted from <i>Rosa damascena</i>                   | Soothing effect, antimicrobial, reduces inflammation              |
| Majoon Dabid-ul-Ward    | Polyherbal compound                                    | Enhances blood circulation, reduces inflammation                  |
| Qurs Kushta-e-Sangraf   | Mineral-based tablet                                   | Promotes tissue repair and granulation                            |
| Arque Shahtara          | Distillate of <i>Fumaria parviflora</i>                | Blood detoxification prevents secondary infections                |
| Arque Chiraita          | Distillate of <i>Swertia chirayita</i>                 | Blood purifier, anti-inflammatory                                 |
| Arque Mako              | Distillate of <i>Solanum nigrum</i>                    | Liver detoxification, anti-ulcerative                             |
| Arque Kasni             | Distillate of <i>Cichorium intybus</i>                 | Detoxifies blood, supports liver function, and prevents infection |
| Itiriphal Shatara       | Triphala (three fruits) with <i>Fumaria parviflora</i> | Blood purifier, promotes wound healing                            |
| Majoon Chobchini        | Polyherbal Unani compound                              | Anti-inflammatory, enhances circulation                           |
| Arque Mundi             | Distillate of <i>Solanum nigrum</i> (black nightshade) | Detoxifies blood, reduces inflammation                            |
| Habbe Seen              | Tablet formulation                                     | Antimicrobial aids wound healing                                  |
| Qurs Kushta Sadaf       | Calcined mineral-based tablet                          | Tissue regeneration, antimicrobial                                |
| Qurs Kushta Qalai       | Calcined mineral-based tablet                          | Promotes granulation, anti-infective                              |
| Qurs Kushta Gaudanti    | Mineral-based tablet                                   | Stimulates tissue repair, anti-inflammatory                       |
| Qurs Jawahr Mohra       | Precious stone-based mineral tablet                    | Promotes wound healing and tissue repair                          |
| Qurs Asfar              | Mineral-based tablet                                   | Anti-inflammatory, antimicrobial, bacteriostatic                  |

#### 4. Topical applications for diabetic ulcers

Unani medicine employs various formulations for direct application on wounds to expedite healing.

| Local application            | Type/Chief Ingredients                    | Therapeutic role                                                                                             |
|------------------------------|-------------------------------------------|--------------------------------------------------------------------------------------------------------------|
| Marham-e-Raal                | Resin-based ointment                      | Prevents bacterial growth, antiseptic, bacteriostatic, promotes wound regeneration and healing.              |
| Marham Kafoor                | Camphor-based ointment                    | Cooling, analgesic, anti-inflammatory, numbs the area, promotes healing                                      |
| Marham Hina                  | Camphor-based ointment                    | Cooling, analgesic, anti-inflammatory, antiseptic                                                            |
| Marham Gulabi                | Camphor-based ointment with rose extracts | Soothing, cooling, analgesic, anti-inflammatory, promotes wound healing                                      |
| Marham Dakhliyoon            | Camphor-based ointment                    | Cooling and numbing effect, analgesic, anti-inflammatory                                                     |
| Zimad-e-Kafoor               | Camphor-based ointment                    | Cooling, antiseptic, analgesic, bacteriostatic                                                               |
| Safoof Zaj                   | Herbal powder paste                       | Promotes granulation, wound regeneration, analgesic, and anti-inflammatory                                   |
| Zaroor Kath                  | Herbal powder paste                       | Granulation-promoting, wound healing, analgesic, anti-inflammatory                                           |
| Zimad Jalinus                | Herbal paste                              | Enhances wound healing, tissue regeneration, antiseptic, and anti-inflammatory                               |
| Qairooti-e-Sandal            | Paste with sandalwood and herbs.          | Soothes pain, promotes granulation, is analgesic, anti-inflammatory, and regeneration tissue.                |
| Papaya/Honey-Based Dressings | Natural fruit enzyme and honey            | Antimicrobial, bacteriostatic, promotes wound healing and tissue regeneration, anti-inflammatory, analgesic. |

## 5. Detoxification and immune modulation

Unani medicine emphasizes detoxification to remove harmful substances that impede healing.

| Therapy/Herb                     | Type/Chief Ingredients                                      | Therapeutic role                                                                   |
|----------------------------------|-------------------------------------------------------------|------------------------------------------------------------------------------------|
| Munzij and Mushil Therapy        | Combination of concoctives (Munzij) and purgatives (Mushil) | Detoxifies the body by cleansing the gastrointestinal tract and eliminating toxins |
| Suranjan (Colchicum luteum)      | Herbal rhizome                                              | Reduces inflammation and pain, anti-arthritis                                      |
| Halela (Terminalia chebula)      | Dried fruit                                                 | Digestive tonic, mild laxative, detoxifier                                         |
| Neem (Azadirachta indica)        | Leaves, bark                                                | Blood purifier, antimicrobial, anti-inflammatory                                   |
| Giloy (Tinospora cordifolia)     | Stem extract                                                | Immunomodulatory, detoxifying, anti-inflammatory                                   |
| Amla (Emblica officinalis)       | Fruit                                                       | Rich in vitamin C, an antioxidant, it detoxifies the blood                         |
| Haritaki (Terminalia bellirica)  | Dried fruit                                                 | Purgative: detoxifies the digestive system                                         |
| Senna (Senna alexandrina)        | Leaves and pods                                             | Natural purgative, clears toxins through bowel movement                            |
| Ashwagandha (Withania somnifera) | Root powder                                                 | Anti-inflammatory, adaptogen, supports healing                                     |
| Manjistha (Rubia cordifolia)     | Root extract                                                | Blood purifier, promotes wound healing, anti-inflammatory                          |

## **Clinical evidence and efficacy of Unani treatment:**

Several studies have highlighted the efficacy of Unani medicine in wound management, particularly in the treatment of non-healing and diabetic ulcers. Unani formulations, with their multifaceted therapeutic actions such as anti-inflammatory, antimicrobial, antioxidant, and tissue-regenerative properties, have demonstrated significant potential in accelerating wound healing. Clinical trials and observational studies indicate that topical applications like *Marham-e-Raal* and *Arque Shahtara*, along with oral therapies including *Munzij* and *Mushil* regimens, help detoxify the body, reduce inflammation, and promote granulation and tissue repair. Furthermore, polyherbal compounds such as *Majoon Dabid-ul-Ward*, *Qurs Kushta-e-Sangraf*, *Safoof Zaj*, and Non-pharmacopeial formulation (*Kundur*, *Raal*, *Anzaroot*, *Sibr*, *Murmuki*) have been shown to enhance blood circulation and stimulate the regeneration of damaged tissues. These findings support the integrative use of Unani medicine as a complementary approach in managing chronic wounds and diabetic ulcers, providing a promising avenue for improving patient outcomes with minimal adverse effects.

## **Conclusion**

Unani medicine presents a promising and holistic alternative for managing non-healing diabetic ulcers, a complex and challenging complication of diabetes. By addressing the underlying imbalances such as toxic accumulation, altered temperament, and organ weakness, Unani therapies focus on restoring the body's natural healing capacity. The integrated approach combines regimenal therapy, dietary modifications, herbal pharmacotherapy, and topical applications to enhance circulation, reduce inflammation, and promote tissue regeneration. Herbal formulations and ointments like *Marham-e-Raal*, *Roghan-e-Zaitoon*, and compound preparations (pharmacopeial or non-pharmacopeial) have demonstrated significant anti-inflammatory, antimicrobial, and wound-healing properties. Complementary treatments such as detoxification (*Munzij* and *Mushil* therapy) and physical therapies (leech therapy, massage, cupping therapy) further

support the healing process by removing harmful substances and improving microcirculation. Clinical evidence supports the effectiveness of these interventions in accelerating wound closure, reducing infection risk, and minimizing pain, thereby potentially lowering the need for invasive surgical procedures such as amputations. Although preliminary findings are encouraging, more rigorous, controlled clinical trials with larger patient cohorts are necessary to fully establish the safety and efficacy of Unani treatments. Overall, integrating Unani medicine with modern wound care protocols could provide a cost-effective, culturally acceptable, and less invasive approach to managing diabetic foot ulcers, improving patient outcomes and quality of life.

### **Bibliography:**

1. Zulkifle M, Ansari AH, Shakir M, Kamal Z, Alam MT. Management of non-healing leg ulcers in the Unani system of medicine. *Int Wound J*. 2014 Aug;11(4):366-72. doi: 10.1111/j.1742-481X.2012.01099.x.
2. Begum S, Fareed R, Shoaib M, Sultana A. Exploring the Therapeutic Potential: Ta'līq al-'Alaq (Leech Therapy) for Qarha Khabītha (Non-Healing Ulcer): A Case Study. *Altern Ther Health Med*. 2024 Dec 18:AT11336. Epub ahead of print.
3. Jose J, Soni B, Jose S, Kokkatt JK. Medical Management to Treat Chronic Non-healing Ulcers: A Case Series. *Cureus*. 2024 Jan 1;16(1):e51449. doi: 10.7759/cureus 51449.
4. Rhazi Z. *Al-Hawi Fit Tib*. Vol 10. Central Council for Research in Unani Medicine, New Delhi. Ministry of Health & Family Welfare, Govt. Of India; 2002:181-187.
5. Majusi AIA. *Kamil Al-San't*. Vol 2, Part II. Central Council for Research in Unani Medicine, New Delhi. Ministry of Health & Family Welfare, Govt. Of India: 2010:192-193.

6. Sina I. Al-Qanoon Fit Tib. Vol 3. Urdu Translation by G. Kantoori. Published By Idara Kitab Us Shifa, New Delhi; 2010:1031-1033.
7. Jurjani I. Zakhira Kharzam Shahi. Vol 6. Urdu Translation by Hkm. Hadi Husain. Published By Idara Kitab Us Shifa, New Delhi; 2010:540-541.
8. Zuhr I. Kitab Al-Taiseer. Central Council for Research in Unani Medicine, New Delhi. Ministry of Health & Family Welfare, Govt. of India; 1986:160-163.
9. Baghdadi IH. Kitab Al Mukhtaratfit-Tibb. Vol 3. Central Council for Research in Unani Medicine, New Delhi. Ministry of Health & Family Welfare, Govt. of India; 2004:326-328.

# Diabetes and Sexual Problems, and their management in Unani Medicine

## Burning Issue

### Abstract

Diabetes mellitus is a chronic metabolic disorder characterized by persistent hyperglycemia, which leads to multiple systemic complications, including sexual dysfunction. Sexual health issues in diabetic patients are often underreported and inadequately addressed, despite their significant impact on quality of life. Both men and women with diabetes may experience sexual dysfunction due to vascular, neurological, and psychological factors. Erectile dysfunction (ED) in men and reduced libido, vaginal dryness, and dyspareunia in women are common manifestations. Unani medicine, an ancient holistic healing system, offers a comprehensive approach to managing diabetes and its associated complications, including sexual dysfunction. Unani principles emphasize the maintenance of bodily humor balance, strengthening the vital faculties, and detoxification through regimens like regimenal therapy, dietary management, and pharmacotherapy. Several Unani formulations containing herbs like Asgandh (*Withania somnifera*), Salab Misri (*Orchis latifolia*), and Musli Sufaid (*Chlorophytum borivilianum*) are traditionally used to enhance sexual health by improving circulation, reducing oxidative stress, and revitalizing reproductive functions. This chapter explores the intricate relationship between diabetes and sexual dysfunction, delves into the pathophysiological mechanisms involved, and highlights the evidence-based Unani interventions for effective management. By integrating Unani medicine with conventional approaches, a holistic and personalized treatment strategy can be developed to alleviate sexual dysfunction in diabetic individuals. Addressing this critical yet often

neglected issue can significantly improve overall well-being and quality of life in diabetic patients.

## **Introduction**

Diabetes is a common problem among both genders. Sexual problem is frequently seen in diabetic people during clinical practice. Complications of diabetes may lead to erection or ejaculation or loss of libido among males, whereas in females, decreased sexual stimulation, low sexual desire, lack of sexual satisfaction, and lack of lubrication at the time of coitus and feeling dyspareunia due to vascular and neuropathic damage. Every adult person knows about male action and female satisfaction during coitus. A female partner can endure with a male partner without food or clothes, but without sexual satisfaction, cannot tolerate, and may experience discontinuity in a long-term relationship. A proverb stated that sometimes neighbour people can get benefits easily, because coitus has no substitute. For this, maintain good arousal, orgasm, erection, and penile size preference, by most of the female partners. ED is defined as the persistent inability to achieve or maintain a penile erection for successful sexual intercourse. Erectile Dysfunction hampers the quality of life in males and their life partner, and causes psychological distress for both. Incidence of sexual problems increases with age, and such a type of sexual problem is frequently associated with comorbid conditions like malnutrition, addiction (smoking, charas, ganja, bhang, afiyoan, alcohol), cardiovascular disease, hypertension, dyslipidaemia, and diabetes. Poorly controlled glycaemic control, long duration of diabetes, and other factors also act as precursors of erectile dysfunction and loss of libido. The overall prevalence of ED has been reported to be 16%–25% in the general population, depending on the cohort of study and the definition of ED being applied. Several studies have reported that the prevalence of ED is 60%-80% in diabetic people.

## **Pathophysiology of sexual problems:**

The pathophysiology of erectile dysfunction in the case of diabetes is multifactorial, consisting of endothelial, vascular, autonomic, neurologic, psychogenic, and hormonal. Diabetic neuropathy may impair autonomic and somatic nerve processes essential to erections. Diabetes is also associated with impaired relaxation of cavernosal smooth muscle due to endothelial-derived nitric oxide or failure of nitric oxide (NO)-induced smooth muscle relaxation, which may be a side effect of glycosylation products. According to the Unani concept, such a type of problem arises due to excess consumption of sour food items, *Zoaf-e-Asab*, *Zoaf-e-Dimagh*, *Zoaf-e-Qalb*, *Zoaf-e-Gurda*, *Zoaf-e-Kabid*, *Nuqs Taghziya*, *Amraz-e-Musharikat*, *Ziabetus*, *Izterab-e-Nafsani*, etc.

## **Management:**

### **Treatment modalities for sexual problems among diabetics:**

#### **1. Lifestyle modifications:**

It includes altering long-term habits, especially eating and physical activities. Lifestyle modification can be used to manage or treat a wide range of diseases (obesity, diabetes, CVS, atherosclerosis, dyslipidemia, HTN, and Cancer). For this modification, required daily physical activity, weight loss, fiber-containing foods should be consumed, stop smoking, and alcohol consumption, glycaemic control with the help of appropriate regimes (steam bath, exercise, massage, diaphoresis, purgation) or drugs (*Asgand*, *Gilo*, *Tukhm Hulba*, *Tukhm Karela*, *Maghz Tukhm Jamun*, *Post Kachnal*, *Tukhm Hayat*, *Kalonji*, *Spirulina*, *Gurmar Booti*, *Dammul Akhwain*, *Gulnar*, *Post Anar*, *Tabasheer*, etc).

#### **2. Pharmacological approach:**

In the Unani System of Medicine, the pharmacological approach consists of single and compound drugs derived from triad sources, i.e., plant origin (*Aqerqarha*, *Mosli*, *Satavar*, *Azaraqui*, *Bhilanwan*, *Barhami*, *Gokhru*, *Konch*, *Darchini*, *Qaranfal*, *Zanjabeel*, *Kabab*

*Chini, Asgand*), mineral origin (*Tila, Nuqra, Khabsul Hadeed, Sammul Faar, Qalai, Jasta, Sisa, Salajeet, Momiyai*), and animal origin drugs (*Beer Bahooti, Raigh Mahi, Zarareeh*). Some of these drugs are used locally (liniment) or orally (powder, pills, tablet, majoon) to increase the blood circulation in the penis or nerve stimulant activities or increase the level of testosterone. Scientifically reported that some herbs provoke the release of nitric oxide (NO), increase the level of cGMP and inhibit the Phosphodiesterase 5 (PDE 5), and promote penile smooth muscle relaxation. Most of them are single drugs that have to be reported for antioxidant, immunomodulatory, antidiabetic, antidyslipidemic, cardioprotective, hepatoprotective, and nootropic activities.

#### **Antidiabetic formulations:**

*Safoof Zibetis, Safoof Hindi, Safoof Gilo, Qurs Zibetis, Qurs Gulnar, Qurs Tabasheer, Qurs Kushta Qalai.*

#### **Nootropic and nerve stimulant formulations:**

*Habbe Asab, Habbe Jadwar, Habbe Azaraqui, Habbe Asgand, Habbe Munish, Habbe Momiyai, Habbe Beesh etc.*

#### **Nerve stimulant oil for massage:**

*Roghan Qust, Roghan Malkangni, Roghan Azaraqui, Roghan Bhilawan, Roghan Zaitoon, Roghan, Zarareeh, Roghan Kharateen, Roghan Raigh Mahi, Roghan Habbul Ghaar, Roghan Darchini, Tila Majlook, Tila Beer Bahooti, Tila Mulazziz, Tila Mumsik.*

#### **Conclusion**

Sexual dysfunction, including erectile dysfunction and reduced libido, is a common yet often overlooked complication of diabetes mellitus, severely impacting the quality of life and emotional well-being of affected individuals. The Unani system of medicine offers a holistic and individualized approach to managing diabetes-related sexual

issues by addressing both the metabolic roots and symptomatic manifestations. Unani interventions incorporate lifestyle modifications, dietary regulations, and pharmacological treatments using plant-based, mineral, and animal-origin formulations. These remedies not only help control blood sugar levels but also improve blood circulation, enhance nerve function, and strengthen reproductive health. Herbal drugs like *Asgandh*, *Musli Sufaid*, and *Salab Misri* are traditionally known to possess aphrodisiac and revitalizing properties and may contribute to improved erectile function and libido. Additionally, topical applications such as *Tila* and *Roghniyat* stimulate local circulation and promote penile health. Clinical observations suggest that Unani therapies improve erection quality, sexual satisfaction, and overall vitality. However, further well-designed scientific studies are required to establish their safety, efficacy, and pharmacodynamics. Integrating these time-tested Unani treatments with conventional medicine and lifestyle management may offer a comprehensive solution to the multifactorial problem of sexual dysfunction in diabetic patients, ultimately enhancing their physical, emotional, and relational health.

### **Bibliography:**

1. Kouidrat Y, Pizzol D, Cosco T, Thompson T, Carnaghi M, Bertoldo A, Solmi M, Stubbs B, Veronese N. High prevalence of erectile dysfunction in diabetes: a systematic review and meta-analysis of 145 studies. *Diabetic Medicine*. 2017 Sep;34(9):1185-92.
2. Asefa A, Nigussie T, Henok A, Mamo Y. Prevalence of sexual dysfunction and related factors among diabetes mellitus patients in Southwest Ethiopia. *BMC Endocrine Disorders*. 2019 Dec;19(1):1-8.
3. Jumani DK, Patil O. Erectile dysfunction in diabetes mellitus: A review. *Journal of Diabetology*. 2020 Jan 1;11(1):1-7.
4. Shiferaw WS, Akalu TY, Aynalem YA. Prevalence of erectile dysfunction in patients with diabetes mellitus and its association

- with body mass index and Glycated hemoglobin in Africa: a systematic review and meta-analysis. *International Journal of Endocrinology*. 2020 Jan 18;2020.
5. Rahmanian E, Salari N, Mohammadi M, Jalali R. Evaluation of sexual dysfunction and female sexual dysfunction indicators in women with type 2 diabetes: a systematic review and meta-analysis. *Diabetology & metabolic syndrome*. 2019 Dec 1;11(1):73.
  6. Maiorino MI, Bellastella G, Esposito K. Diabetes and sexual dysfunction: current perspectives. *Diabetes, metabolic syndrome and obesity: targets and therapy*. 2014; 7:95-105.
  7. Morano S. Pathophysiology of diabetic sexual dysfunction. *Journal of Endocrinological Investigation*. 2003;26(3; SUPP):65-71.
  8. Cellek S, Cameron NE, Cotter MA, Muneer A. Pathophysiology of diabetic erectile dysfunction: potential contribution of vasa nervorum and advanced glycation endproducts. *International journal of impotence research*. 2013 Jan;25(1):1-6.
  9. Anwar Z, Sinha V, Mitra S, Mishra AK, Ansari MH, Bharti A, Kumar V, Nigam AK. Erectile dysfunction: An underestimated presentation in patients with diabetes mellitus. *Indian journal of psychological medicine*. 2017 Sep;39(5):600-604.
  10. Mobley DF, Khera M, Baum N. Recent advances in the treatment of erectile dysfunction. *Postgraduate medical journal*. 2017 Nov 1;93(1105):679-85.
  11. De Berardis G, Franciosi M, Belfiglio M, Di Nardo B, Greenfield S, Kaplan SH, Pellegrini F, Sacco M, Tognoni G, Valentini M, Nicolucci A. Erectile dysfunction and quality of life in type 2 diabetic patients: a serious problem too often overlooked. *Diabetes care*. 2002 Feb 1;25(2):284-91.
  12. Lue TF, Brant WO, Shindel A, Bella AJ. Sexual dysfunction in diabetes. In *Endotext* [Internet] 2017 Feb 27. MDText. Com, Inc.
  13. Temkitthawon P, Hinds TR, Beavo JA, Viyoch J, Suwanborirux K, Pongamornkul W, Sawasdee P, Ingkaninan K. *Kaempferia parviflora*, a plant used in traditional medicine to enhance sexual

- performance, contains large amounts of low-affinity PDE5 inhibitors. *Journal of ethnopharmacology*. 2011 Oct 11;137(3):1437-41.
14. Manosroi A, Tangjai T, Chankhampan C, Manosroi W, Najarut Y, Kitdamrongtham W, Manosroi J. Potent Phosphodiesterase Inhibition and Nitric Oxide Release Stimulation of Anti-Impotence Thai Medicinal Plants from “MANOSROI III” Database. *Evidence-Based Complementary and Alternative Medicine*. 2017 Jan 1;2017.
  15. GamalEl Din SF, Abdel Salam MA, Mohamed MS, Ahmed AR, Motawaa AT, Saadeldin OA, Elnabarway RR. Tribulus terrestris versus placebo in the treatment of erectile dysfunction and lower urinary tract symptoms in patients with late-onset hypogonadism: a placebo-controlled study. *Urologia Journal*. 2019 May;86(2):74-8.
  16. Kamenov Z, Fileva S, Kalinov K, Jannini EA. Evaluation of the efficacy and safety of Tribulus terrestris in male sexual dysfunction—a prospective, randomized, double-blind, placebo-controlled clinical trial. *Maturitas*. 2017 May 1;99:20-6.
  17. Haghmorad D, Mahmoudi MB, Haghighi P, Alidadiani P, Shahvazian E, Tavasolian P, Hosseini M, Mahmoudi M. Improvement of fertility parameters with Tribulus Terrestris and Anacyclus Pyrethrum treatment in male rats. *International Braz J Urol*. 2019 Sep;45(5):1043-54.
  18. Suresh S, Prakash S. Effect of Mucuna pruriens (Linn.) on sexual behavior and sperm parameters in streptozotocin-induced diabetic male rat. *The journal of sexual medicine*. 2012 Dec 1;9(12):3066-78.
  19. Seppan P, Muhammed I, Mohanraj KG, Lakshmanan G, Premavathy D, Muthu SJ, Wungpam Shimray K, Sathyanathan SB. Therapeutic potential of Mucuna pruriens (Linn.) on ageing-induced damage in dorsal nerve of the penis and its implication on erectile function: an experimental study using albino rats. *The Aging Male*. 2018 Feb 13:1-4.

20. Jani DK. Comparative Clinical Study on *Anacyclus pyrethrum* and *Spilanthes acmella* as Akarakarabha in Erectile Dysfunction and Premature Ejaculation. *Shodha Samagya*. 2007 Oct;1(04).
21. Rath SK, Panja AK. Clinical evaluation of root tubers of Shweta Musali (*Chlorophytum borivillianum* L.) and its effect on semen and testosterone. *Ayu*. 2013 Jul;34(3):273-275.
22. Das S, Singhal S, Kumar N, Rao CM, Sumalatha S, Dave J, Dave R, Nandakumar K. Standardised extract of safed musli (*Chlorophytum borivillianum*) increases aphrodisiac potential besides being safe in male Wistar rats. *Andrologia*. 2016 Dec;48(10):1236-43.
23. Ahmad S, Latif A, Qasmi IA. Effect of 50% ethanolic extract of *Syzygium aromaticum* (L.) Merr. & Perry. (clove) on the sexual behaviour of normal male rats. *BMC complementary and Alternative medicine*. 2004 Dec;4(1):1-7.
24. Mamidi P, Thakar AB. Efficacy of Ashwagandha (*Withania somnifera* Dunal. Linn.) in the management of psychogenic erectile dysfunction. *Ayu*. 2011 Jul;32(3):322-328.
25. Dongre S, Langade D, Bhattacharyya S. Efficacy and safety of Ashwagandha (*Withania somnifera*) root extract in improving sexual function in women: a pilot study. *BioMed Research International*. 2015 Jan 1;2015.
26. Lopresti AL, Drummond PD, Smith SJ. A randomized, double-blind, placebo-controlled, crossover study examining the hormonal and vitality effects of ashwagandha (*Withania somnifera*) in aging, overweight males. *American journal of men's health*. 2019 Mar;13(2):1557988319835985.
27. Borrelli F, Colalto C, Delfino DV, Iriti M, Izzo AA. Herbal dietary supplements for erectile dysfunction: a systematic review and meta-analysis. *Drugs*. 2018 Apr 1;78(6):643-73.
28. Ho CC, Tan HM. Rise of herbal and traditional medicine in erectile dysfunction management. *Current urology reports*. 2011 Dec 1;12(6):470-8.

29. Virani NV, Chandola HM, Vyas SN, Jadeja DB. Clinical study on erectile dysfunction in diabetic and non-diabetic subjects and its management with *Ficus religiosa* Linn. *Ayu.* 2010 Jul;31(3):272-279.
30. ALAM S, Anjum N, Akhtar J, Bashir F, Khan AA. Majoon-E-Piyaz: A Potent Unani Formulation for Premature Ejaculation. *Journal of Drug Delivery and Therapeutics.* 2020 Jun 15;10(3-s):330-4.

# Regimes for Diabetes

## Abstract

Diabetes mellitus is a chronic metabolic disorder that requires a comprehensive and structured approach for effective management. This chapter, *Regimes for Diabetes*, explores the various therapeutic strategies used to control blood glucose levels, prevent complications, and improve overall quality of life for individuals with diabetes. It delves into the role of lifestyle modifications, including dietary interventions, exercise routines, and weight management, as foundational elements in diabetes care. Additionally, the chapter examines pharmacological treatments such as oral antidiabetic drugs, insulin therapy, and emerging novel medications that target specific metabolic pathways. A critical aspect of diabetes management is individualized treatment plans, which consider factors such as age, comorbidities, and disease progression. The chapter also discusses the importance of continuous glucose monitoring, patient education, and adherence to prescribed regimens to enhance glycemic control. Furthermore, it highlights advancements in technology, including insulin pumps and artificial pancreas systems, which are transforming diabetes care. Beyond medical and technological interventions, the chapter underscores the significance of psychological and behavioral support in diabetes management. Addressing challenges related to mental health, motivation, and social determinants of health is essential for achieving long-term success in diabetes care. By providing an in-depth analysis of both traditional and emerging diabetes management strategies, this chapter offers valuable insights for healthcare professionals, researchers, and individuals living with diabetes. It emphasizes a holistic, patient-centered approach to improve health outcomes and minimize complications associated with this prevalent chronic disease.

Introduction

Diabetes mellitus is a chronic metabolic disorder characterized by high blood sugar levels resulting from either insufficient insulin production or ineffective insulin utilization. It affects millions globally and requires a disciplined regimen for effective management. A well-structured diabetes regimen encompasses dietary guidelines, physical activity, medical interventions, and lifestyle modifications. This chapter explores various regimes that help manage diabetes efficiently.

Dietary regimes for diabetes

1. Balanced meal planning

Diet plays a crucial role in diabetes management. A balanced meal plan focuses on maintaining stable blood sugar levels while providing essential nutrients. The key aspects of a balanced diabetes diet include:

Table: Dietary guidelines for diabetes management

| Principle                                                                                                                                          | Details                                                                                                |
|----------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| Macronutrient Distribution                                                                                                                         | Carbohydrates: 45-55%                                                                                  |
| <ul style="list-style-type: none"><li>Proteins: 15-20%</li><li>Healthy Fats: 20-35%</li><li>Ensures balanced energy and nutrient intake.</li></ul> |                                                                                                        |
| Glycemic Index (GI)                                                                                                                                | Prefer low-GI foods like whole grains, legumes, and non-starchy vegetables to slow glucose absorption. |
| Portion Control                                                                                                                                    | Helps avoid excessive caloric intake and prevents blood sugar spikes, supporting weight management.    |
| Meal Timing                                                                                                                                        | Regular, small, and frequent meals help stabilize blood glucose levels throughout the day.             |

## 2. Recommended foods

A diabetes-friendly diet includes:

**Table: Recommended foods for diabetes management**

| Category              | Examples                                                                            | Health benefits                                                      |
|-----------------------|-------------------------------------------------------------------------------------|----------------------------------------------------------------------|
| Complex Carbohydrates | Brown rice, quinoa, oats, legumes, fiber-rich vegetables                            | Provide sustained energy, lower glycemic response                    |
| Healthy Proteins      | Lean meats, poultry, fish, tofu, eggs, legumes                                      | Support muscle repair, maintain satiety                              |
| Healthy Fats          | Nuts, seeds, olive oil, and fatty fish (e.g., salmon, mackerel) are rich in omega-3 | Improve heart health, reduce inflammation.                           |
| Fiber-Rich Foods      | Green leafy vegetables, berries, apples, pears, whole grains                        | Aid digestion, slow glucose absorption, and improve glycemic control |

## 3. Foods to avoid

**Table: Foods to avoid or limit in diabetes management**

| Category                 | Examples                                      | Reason to avoid or limit                                                          |
|--------------------------|-----------------------------------------------|-----------------------------------------------------------------------------------|
| Refined Carbohydrates    | White bread, sugary cereals, processed snacks | Causes rapid spikes in blood sugar; low in fiber and nutrients                    |
| Sugary Beverages         | Sodas, fruit juices, energy drinks            | High sugar content contributes to insulin resistance and poor glycemic control    |
| Saturated and Trans Fats | Fried foods, processed meats, fast food       | Increase risk of heart disease and insulin resistance                             |
| Alcohol                  | Beer, wine, spirits (especially with mixers)  | It can cause blood sugar fluctuations and may interact with diabetes medications. |

4. Exercise regimes for diabetes

Physical activity is essential for managing diabetes as it helps control blood sugar levels, improves insulin sensitivity, and promotes cardiovascular health.

1. Aerobic exercise

Aerobic exercises enhance insulin sensitivity and aid in weight management. Recommended activities include:

Table: Recommended physical activities for diabetes management

| Activity | Description                                 | Health benefits                                                        |
|----------|---------------------------------------------|------------------------------------------------------------------------|
| Walking  | 30-minute brisk walk, five days a week      | Enhances glucose metabolism, supports weight management                |
| Cycling  | Low-impact aerobic exercise                 | Strengthens lower body, improves cardiovascular health                 |
| Swimming | Full-body workout with minimal joint stress | Boosts cardiovascular endurance, ideal for joint-sensitive individuals |
| Dancing  | Rhythmic movement with music                | Improves fitness, coordination, and blood sugar control                |

2. Resistance training

Strength training helps build muscle mass, which in turn enhances insulin utilization. Effective resistance exercises include:

Strength training exercises for diabetes management

| Exercise Type        | Examples                           | Benefits                                                                     |
|----------------------|------------------------------------|------------------------------------------------------------------------------|
| Bodyweight Exercises | Push-ups, squats, lunges           | Build muscle strength, enhance insulin sensitivity, and require no equipment |
| Weight Training      | Lifting moderate weights (2x/week) | Improves blood sugar control, increases lean muscle mass                     |
| Resistance Bands     | Band-based arm and leg exercises   | Low-impact muscle strengthening, joint-friendly alternative to weights       |

### 3. Flexibility and balance training

Activities like yoga and tai chi help improve flexibility, reduce stress, and enhance balance, minimizing the risk of falls and injuries.

### Medical regimes for diabetes

#### 1. Insulin therapy

For Type 1 diabetes and some cases of Type 2 diabetes, insulin injections are necessary to regulate blood sugar levels. Types of insulin include:

**Table: Types of insulin and their action profiles**

| Type of Insulin             | Onset of action   | Duration                | Usage                                                  |
|-----------------------------|-------------------|-------------------------|--------------------------------------------------------|
| Rapid-acting Insulin        | Within 15 minutes | 3–5 hours               | Taken just before meals to manage post-meal spikes     |
| Short-acting Insulin        | Within 30 minutes | 3–6 hours               | Usually taken 30 minutes before meals                  |
| Intermediate-acting Insulin | 2–4 hours         | Up to 18 hours          | Covers blood sugar between meals and overnight         |
| Long-acting Insulin         | 1–2 hours         | Up to 24 hours (steady) | Maintains consistent insulin levels throughout the day |

#### 2. Oral medications

**Table: Common oral antidiabetic drugs and their mechanisms**

| Drug Class | Example(s) | Mechanism of Action                             | Potential Benefits                                            |
|------------|------------|-------------------------------------------------|---------------------------------------------------------------|
| Biguanides | Metformin  | Reduces hepatic glucose production and enhances | First-line therapy; weight neutral; may improve lipid profile |

|                                  |                                        |                                                                                            |                                                          |
|----------------------------------|----------------------------------------|--------------------------------------------------------------------------------------------|----------------------------------------------------------|
|                                  |                                        | insulin sensitivity                                                                        |                                                          |
| Sulfonylureas                    | Glibenclamide , Glipizide, Glimepiride | Stimulate pancreatic $\beta$ -cells to secrete more insulin                                | Effective in boosting insulin levels; inexpensive        |
| Meglitinides (Glinides)          | Repaglinide, Nateglinide               | Rapid, short-acting stimulation of insulin secretion from $\beta$ -cells                   | Good for postprandial glucose control; flexible dosing   |
| Thiazolidinediones (TZDs)        | Pioglitazone, Rosiglitazone            | Improve insulin sensitivity in muscle and adipose tissue via PPAR- $\gamma$ activation     | Durable glycemic control; may improve lipid profile      |
| $\alpha$ -Glucosidase Inhibitors | Acarbose, Miglitol                     | Delay carbohydrate absorption in the intestine by inhibiting $\alpha$ -glucosidase enzymes | Reduces postprandial glucose spikes; non-systemic action |
| DPP-4 Inhibitors                 | Sitagliptin, Vildagliptin, Saxagliptin | Increase incretin levels, enhancing insulin release and decreasing glucagon secretion      | Low risk of hypoglycemia ; weight neutral                |

|                         |                                             |                                                                            |                                                                       |
|-------------------------|---------------------------------------------|----------------------------------------------------------------------------|-----------------------------------------------------------------------|
| SGLT2 Inhibitors        | Dapagliflozin, Empagliflozin, Canagliflozin | Inhibit renal glucose reabsorption, leading to glucosuria                  | Promotes weight loss; cardiovascular and renal protection             |
| Dual SGLT1/2 Inhibitors | Sotagliflozin                               | Inhibit glucose absorption in both intestine (SGLT1) and kidney (SGLT2)    | Improves both fasting and postprandial glucose; potential CV benefits |
| Bile Acid Sequestrants  | Colesevelam                                 | Unclear; may reduce hepatic glucose production and improve incretin effect | Modest glucose-lowering; improves lipid profile                       |
| Dopamine-2 Agonists     | Bromocriptine -QR                           | Modulates hypothalamic regulation of glucose and energy metabolism         | Modest HbA1c reduction; weight neutral                                |

### 3. Continuous glucose monitoring (CGM)

CGM devices help diabetics track blood sugar levels in real-time, enabling better decision-making regarding diet and medication.

### 4. Emerging therapies

New developments in diabetes treatment include:

**Table: Emerging therapies in diabetes management**

| Therapy             | Description                                                                         | Potential benefits                                                 |
|---------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------|
| Artificial Pancreas | An automated system that continuously monitors glucose and adjusts insulin delivery | Mimics natural pancreatic function; improves blood sugar control   |
| Gene Therapy        | Experimental approach to alter or replace genes related to insulin production       | May restore or enhance endogenous insulin secretion                |
| Stem Cell Research  | Investigates regenerating insulin-producing $\beta$ -cells from stem cells          | Potential to cure diabetes by restoring natural insulin production |

**5. Lifestyle modifications for diabetes management**

**5.1. Stress management**

Chronic stress affects blood sugar levels. Effective stress management techniques include:

**Table: Stress management techniques for diabetes care**

| Technique                      | Description                                                                | Health benefits                                                     |
|--------------------------------|----------------------------------------------------------------------------|---------------------------------------------------------------------|
| Mindfulness and Meditation     | Practices focused on present-moment awareness and mental calm              | Lowers cortisol levels, stabilizes glucose metabolism               |
| Breathing Exercises            | Deep, diaphragmatic breathing techniques                                   | Reduces stress, enhances insulin sensitivity                        |
| Hobbies and Leisure Activities | Engaging in creative or recreational activities (e.g., reading, gardening) | Lowers stress, improves emotional well-being, and metabolic control |

**5.2. Sleep hygiene**

Quality sleep is essential for blood sugar regulation. Poor sleep can cause insulin resistance and increase hunger hormones. Strategies for better sleep include:

**Table: Sleep hygiene practices for better diabetes management**

| Practice                         | Description                                    | Benefits                                              |
|----------------------------------|------------------------------------------------|-------------------------------------------------------|
| Regular Sleep Schedule           | Consistent bedtime and wake-up time daily      | Improves sleep quality and circadian rhythm           |
| Screen Time Reduction            | Limiting exposure to blue light before bedtime | Enhances melatonin production, promotes restful sleep |
| Comfortable Sleeping Environment | Keeping the bedroom cool, dark, and quiet      | Supports deep, restorative sleep                      |

**5.3. Hydration and alcohol consumption**

**Table: Lifestyle factors affecting diabetes management**

| Factor           | Description                                                                   | Impact on diabetes                                        |
|------------------|-------------------------------------------------------------------------------|-----------------------------------------------------------|
| Water Intake     | Adequate hydration helps maintain fluid balance and supports kidney function. | Prevents blood sugar spikes; aids in glucose elimination  |
| Limiting Alcohol | Reducing alcohol consumption to moderate or avoid excessive intake            | Prevents glucose fluctuations and medication interactions |

**4. Smoking cessation**

**Table: Impact of smoking on diabetes**

| Factors          | Effect                                               | Health outcomes                                            |
|------------------|------------------------------------------------------|------------------------------------------------------------|
| Smoking          | Impairs circulation and increases insulin resistance | Worsens diabetes complications                             |
| Quitting Smoking | Improves circulation and insulin sensitivity         | Significantly enhances overall health and diabetes control |

**Conclusion**

Effective diabetes management is multifaceted, requiring a structured approach that integrates diet, exercise, medication, and lifestyle modifications. A balanced dietary regimen, focusing on complex carbohydrates, lean proteins, healthy fats, and fiber-rich foods, plays a

foundational role in maintaining stable blood glucose levels. Complementing this, regular physical activity-both aerobic and resistance training-not only enhances insulin sensitivity but also supports cardiovascular and muscular health. Medical interventions, including insulin therapy, oral antidiabetic drugs, and continuous glucose monitoring, are vital for individualized care. Emerging therapies like artificial pancreas systems, gene therapy, and stem cell research hold promise for future advancements. Equally important are lifestyle factors such as stress management, adequate sleep, hydration, and smoking cessation, which significantly influence glycemic control and long-term outcomes. This chapter underscores the need for a holistic, patient-centered approach tailored to individual needs, preferences, and risk factors. Empowering patients through education and self-management strategies fosters better adherence and quality of life. As research and technology evolve, incorporating innovative tools and therapies will further enhance diabetes care. Ultimately, consistent adherence to a comprehensive regimen is key to minimizing complications and achieving sustainable health in individuals living with diabetes.

### **Bibliography:**

1. Taylor R, Davies R, Fox C, Sampson M, Weaver JU, Wood L. Appropriate insulin regimes for type 2 diabetes: a multicenter randomized crossover study. *Diabetes Care*. 2000 Nov;23(11):1612-8. doi: 10.2337/diacare.23.11.1612.
2. Analey JA, Colberg SR, Corcoran MH, Malin SK, Rodriguez NR, Crespo CJ, Kirwan JP, Zierath JR. Exercise/Physical Activity in Individuals with Type 2 Diabetes: A Consensus Statement from the American College of Sports Medicine. *Med Sci Sports Exerc*. 2022 Feb 1;54(2):353-368. doi: 10.1249/MSS.0000000000002800.
3. Sami W, Ansari T, Butt NS, Hamid MRA. Effect of diet on type 2 diabetes mellitus: A review. *Int J Health Sci (Qassim)*. 2017 Apr-Jun;11(2):65-71.

4. Whiteley C, Benton F, Matwiejczyk L, Luscombe-Marsh N. Determining Dietary Patterns to Recommend for Type 2 Diabetes: An Umbrella Review. *Nutrients*. 2023 Feb 8;15(4):861. doi: 10.3390/nu15040861.
5. Garedow AW, Jemaneh TM, Hailemariam AG, Tesfaye GT. Lifestyle modification and medication use among diabetes mellitus patients attending Jimma University Medical Center, Jimma zone, south west Ethiopia. *Sci Rep*. 2023 Mar 27;13(1):4956. doi: 10.1038/s41598-023-32145-y.
6. Xie Y, Huan MT, Sang JJ, Luo SS, Kong XT, Xie ZY, Zheng SH, Wei QB, Wu YC. Clinical Effect of Abdominal Massage Therapy on Blood Glucose and Intestinal Microbiota in Patients with Type 2 Diabetes. *Oxid Med Cell Longev*. 2022 Aug 3;2022:2286598. Doi: 10.1155/2022/2286598.
7. Vakilinia SR, Bayat D, Asghari M. Hijama (Wet Cupping or Dry Cupping) for Diabetes Treatment. *Iran J Med Sci*. 2016 May;41(3 Suppl):S37.
8. Qiu S, Cai X, Schumann U, Velders M, Sun Z, Steinacker JM. Impact of walking on glycemic control and other cardiovascular risk factors in type 2 diabetes: a meta-analysis. *PLoS One*. 2014 Oct 17;9(10):e109767. doi: 10.1371/journal.pone.0109767.
9. Hu H, Lei Y, Yin L, Luo X. Evaluation of walking exercise on glycemic control in patients with type 2 diabetes mellitus: A protocol for systematic review and meta-analysis of randomized cross-over controlled trials. *Medicine (Baltimore)*. 2020 Nov 20;99(47):e22735. doi: 10.1097/MD.00000000000022735.
10. Arora T, Taheri S. Sleep Optimization and Diabetes Control: A Review of the Literature. *Diabetes Ther*. 2015 Dec;6(4):425-468. doi: 10.1007/s13300-015-0141-z. Epub 2015 Nov 4.

11. Sajid Ansari, Zafar Iqbal, Musarrat Nafees, Mushtaque Mukadam. Role of Asbab-e-Sitta Zarooriya in Ziyabetus Shakri (Diabetes Mellitus): an insight into Unani Medicine: A Review. Research & Reviews: A Journal of Unani, Siddha and Homeopathy. 2019; 6(1): 8–13p.

# Plant-Based Therapeutics for Diabetes: A Unani Perspective

## Abstract

Diabetes mellitus is a chronic metabolic disorder posing a global health challenge due to its rising prevalence and complications associated with conventional therapies. This chapter explores the historical roots and contemporary relevance of botanical parts in diabetes management within the Unani System of Medicine tradition, steeped in Greco-Arabic pharmacology. Historical texts by scholars such as *Dioscorides*, *Rhazi*, *Majusi*, *Ibn Sina*, *Ibn Nafis*, and *Ibn Al-Baitar* document the use of over 1,400 medicinal substances, including 300 novel drugs, thereby underscoring the enduring legacy of plant-based remedies. Unani physicians have long harnessed the hypoglycemic potential of various botanical parts; leaves, seeds, flowers, fruits, rhizomes, roots, and bark-formulated as decoctions, infusions, powders, pills, and herbal pastes. Medicinal plants from families including Caesalpiniaceae, Liliaceae, Fabaceae, Apiaceae, Asteraceae, Lamiaceae, and Cucurbitaceae are highlighted for their efficacy. The chapter further examines key botanicals such as *fenugreek*, *neem*, *jamun*, and *gurmar*, detailing their phytochemical constituents-alkaloids, flavonoids, saponins, and polyphenols-that exert effects by enhancing insulin secretion, promoting glucose uptake, inhibiting carbohydrate digestion, and mitigating oxidative stress. With approximately 80% of the global population relying on herbal medicine for primary healthcare, the integration of Unani botanical remedies offers a promising, cost-effective adjunct to conventional diabetes treatments. The discussion emphasizes the need for evidence-based validation of these traditional practices to unlock novel therapeutic avenues and improve patient outcomes in modern diabetes care. This review not only bridges historical insights with contemporary biomedical research but also

advocates for integrating traditional Unani methods into current clinical paradigms.

## Introduction

In the Unani System of Medicine, pharmacology is based on triad sources of origin, i.e., plant sources, mineral sources, and animal sources. Out of them, most of the medicine is based on plant sources for any type of disease. Dioscorides was a famous Greek physician and botanist whose renowned book, *Kitab Al-Hashaish (De Materia Medica)*, was written in the first century. The period from the ninth to the thirteenth century is known as the “Golden Age of Arab Science,” during which Medicine and Pharmacy held a significant place among the taught sciences. Famous Arabic scholars *Rhazi*, *Majusi*, *Ibn Sina*, *Ibn Nafis*, and *Ibn Al-Baitar* wrote many books on pharmacognosy and pharmacology. The most famous Arab botanist was **Ibn Al-Baitar** (1197-1248 AD). The results of his studies and travels have been collected in a large book that, in the Latin edition, is titled “*Corpus simplicia medicamentorum et ciborum continens*”. In this book, simple drugs are listed in alphabetical order, and the number of substances described is 1,400. Of these, 300 new drugs that he mentioned for the first time. In the Unani System of Medicine, various plant-based medicines are described for the management of diabetes. During the Greek and Arabic period, most of the Unani Physicians used herbs and their parts, either single prescriptions or compound prescriptions, Decoction, Infusion, Arque, Powder, Pills, Tablets, Majoon, etc. Most common plant parts used during the Greek and Arabic period are Leaves, Seeds, Flowers, Fruits, rhizomes, bulbs, Roots, Tubers, stems, Bark, whole plants, Aerial Parts, and their derivatives (Gums, resins, latex, extract, etc.). These plants belong to the families of Caesalpiniaceae, Liliaceae, Leguminosae, Fabaceae, Apiaceae, Asteraceae, Lamiaceae, Cucurbitaceae, Gramineae, Moraceae, Myrtaceae, Rosaceae, Gentianaceae, and Araliaceae. According to a WHO report, 80% of the world population depends on herbal medicine for primary health care. Currently, herbal medicine

has been regarded as a dietary supplement or adjuvant for the prevention and cure of disease. All over the world, a wide range of herbal medicines is readily available on the market.

**Common Anti-diabetic medicinal plants mentioned in unani literature:**

| S.No. | Unani name / English name                     | Family name   | Parts used   | Mechanism of action                                                                           |
|-------|-----------------------------------------------|---------------|--------------|-----------------------------------------------------------------------------------------------|
| 1     | Gurmar<br>( <i>Gymnema sylvestre</i> )        | Apocynaceae   | Leaves       | Increases insulin secretion, regenerates beta cells, and reduces sugar absorption.            |
| 2     | Jamun ( <i>Syzygium cumini</i> )              | Myrtaceae     | Seeds, Bark  | Enhances insulin activity, reduces blood glucose levels, and improves glucose metabolism      |
| 3     | Neem<br>( <i>Azadirachta indica</i> )         | Meliaceae     | Leaves, Bark | Stimulates insulin secretion, improves glucose uptake, antioxidant properties.                |
| 4     | Karela<br>( <i>Momordica charantia</i> )      | Cucurbitaceae | Fruit, Seeds | Enhances insulin secretion, improves glucose utilization, and inhibits glucose absorption     |
| 5     | Methi<br>( <i>Trigonella foenum-graecum</i> ) | Fabaceae      | Seeds        | Delays carbohydrate digestion, improves insulin sensitivity, and lowers postprandial glucose. |
| 6     | Tulsi ( <i>Ocimum sanctum</i> )               | Lamiaceae     | Leaves       | Enhances insulin secretion, reduces oxidative stress, and regulates lipid metabolism          |

|    |                                           |                |               |                                                                                                  |
|----|-------------------------------------------|----------------|---------------|--------------------------------------------------------------------------------------------------|
| 7  | Aloe Vera ( <i>Aloe barbadensis</i> )     | Asphodelaceae  | Leaves (Gel)  | Improves glucose metabolism, enhances insulin sensitivity, and reduces oxidative stress          |
| 8  | Bael ( <i>Aegle marmelos</i> )            | Rutaceae       | Leaves, Fruit | Stimulates pancreatic beta cells, regulates blood glucose levels, and reduces insulin resistance |
| 9  | Asgandh ( <i>Withania somnifera</i> )     | Solanaceae     | Root          | Reduces cortisol levels, improves insulin sensitivity, anti-inflammatory properties              |
| 10 | Gilo ( <i>Tinospora cordifolia</i> )      | Menispermaceae | Stem, Leaves  | Enhances insulin secretion, regulates glucose metabolism, boosts immunity                        |
| 11 | Dalchini ( <i>Cinnamomum zeylanicum</i> ) | Lauraceae      | Bark          | Enhances insulin sensitivity, lowers fasting blood glucose, antioxidant action                   |
| 12 | Haldi ( <i>Curcuma longa</i> )            | Zingiberaceae  | Rhizome       | Reduces insulin resistance, is anti-inflammatory, and protects pancreatic beta cells.            |
| 13 | Chirayta ( <i>Swertia chirayita</i> )     | Gentianaceae   | Whole plant   | Lowers blood sugar, stimulates pancreatic function, improves digestion                           |
| 14 | Bel ( <i>Limonia acidissima</i> )         | Rutaceae       | Fruit, Leaves | Enhances insulin activity, controls postprandial glucose levels                                  |

|    |                                        |                |           |                                                                                   |
|----|----------------------------------------|----------------|-----------|-----------------------------------------------------------------------------------|
| 15 | Soya ( <i>Glycine max</i> )            | Fabaceae       | Seeds     | Reduces insulin resistance, improves lipid metabolism                             |
| 16 | Arjun ( <i>Terminalia arjuna</i> )     | Combretaceae   | Bark      | Antioxidant improves cardiovascular health in diabetics                           |
| 17 | Haritaki ( <i>Terminalia chebula</i> ) | Combretaceae   | Fruit     | Regulates carbohydrate metabolism, antioxidant, and improves digestion            |
| 18 | Amla ( <i>Phyllanthus emblica</i> )    | Phyllanthaceae | Fruit     | Enhances insulin secretion, reduces oxidative stress, and improves glucose uptake |
| 19 | Babool ( <i>Acacia nilotica</i> )      | Fabaceae       | Bark, Gum | Reduces blood sugar, regulates lipid profile                                      |
| 20 | Banafsha ( <i>Viola odorata</i> )      | Violaceae      | Flowers   | Anti-inflammatory, helps in glucose metabolism                                    |
| 21 | Lasun ( <i>Allium sativum</i> )        | Amaryllidaceae | Bulb      | Enhances insulin secretion, reduces cholesterol, antioxidant                      |
| 22 | Piyaz ( <i>Allium cepa</i> )           | Amaryllidaceae | Bulb      | Reduces blood glucose levels, enhances insulin activity                           |
| 23 | Rewandchini ( <i>Rheum emodi</i> )     | Polygonaceae   | Root      | Regulates glucose levels, improves digestion                                      |
| 24 | Anjeer ( <i>Ficus carica</i> )         | Moraceae       | Leaves    | Regulates blood sugar, antioxidant properties                                     |
| 25 | Chaksu ( <i>Cassia absus</i> )         | Fabaceae       | Seeds     | Regulates blood glucose, improves digestion                                       |

|    |                                              |              |                  |                                                        |
|----|----------------------------------------------|--------------|------------------|--------------------------------------------------------|
| 26 | Khurasani Ajwain ( <i>Hyoscyamus niger</i> ) | Solanaceae   | Seeds            | Reduces blood sugar, has anti-inflammatory properties  |
| 27 | Amaltas ( <i>Cassia fistula</i> )            | Fabaceae     | Bark, Fruit Pulp | Improves glucose tolerance, laxative effect            |
| 28 | Sana Makki ( <i>Cassia angustifolia</i> )    | Fabaceae     | Leaves           | Regulates glucose metabolism, detoxifying properties   |
| 29 | Shatavari ( <i>Asparagus racemosus</i> )     | Asparagaceae | Root             | Improves insulin sensitivity, antioxidant action       |
| 30 | Khatmi ( <i>Althaea officinalis</i> )        | Malvaceae    | Root, Leaves     | Reduces oxidative stress, improves pancreatic function |

### **Polyherbo-mineral Unani formulations:**

Unani formulations have been traditionally used for effective diabetes management. They incorporate herbs and minerals designed to restore humoral balance, improve pancreatic function, and modulate metabolism. Scientific studies suggest that these formulations exhibit antioxidant, anti-inflammatory, and hypoglycemic properties, thereby supporting glycemic control and overall metabolic health in diabetic patients effectively.

| <b>Formulation name</b> | <b>Proposed mechanism of action</b>                                                                                                                                                                                                                                                                                |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Safoof-e-Ziabetus       | A powdered formulation traditionally used to treat diabetes. It is believed to work by “balancing” the diabetic (hot and dry) temperament, enhancing pancreatic function, and improving insulin sensitivity. Modern studies suggest its constituents exert antioxidant effects and may improve glucose metabolism. |
| Qurs-e-Ziabetus         | A tablet-based preparation whose chief action is hypoglycemic. It is thought to stimulate the beta-cells of the pancreas and reduce insulin resistance, thereby                                                                                                                                                    |

|                         |                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                         | lowering blood sugar levels. Its mechanism is also described in Unani terms as correcting the abnormal “mizaj” of the blood.                                                                                                                                                                                                                                                     |
| Qurs-e-Gulnar           | Contains extracts of “Gulnar” (pomegranate flower). Traditionally, it is used for its cooling and astringent properties. Contemporary insights indicate that its antioxidant and anti-inflammatory effects help improve peripheral glucose utilization and may protect pancreatic cells.                                                                                         |
| Qurs-e-Tabasheer        | Formulated with “Tabasheer” (the crystalline silica from bamboo stems), this preparation is used to restore the natural temperament of the body. It is thought to reduce oxidative stress and modulate metabolism by enhancing the action of insulin while also exerting a cooling effect on the system.                                                                         |
| Jawarish Jalinus        | Jawarish formulations are light, emulsion-type tonics. Jawarish Jalinus is used to improve digestion and nutrient assimilation. It is proposed to indirectly support glycemic control by promoting effective gastrointestinal function and proper metabolism of carbohydrates.                                                                                                   |
| Qurs Kushta Baiza Murgh | This tablet uses “kushta” (calcined mineral ash, such as that from hen’s egg shells) combined with herbal extracts. In Unani theory, such mineral constituents help restore humoral equilibrium and may supply trace elements that support insulin secretion and antioxidant defenses. Modern researchers speculate that these actions contribute to improved metabolic control. |
| Jawarish Gulab          | A tonic enriched with rose (gulab) extracts that imparts a cooling effect. It is traditionally used to alleviate stress and “heat” in the body. This may lead to improved insulin responsiveness and reduced stress-induced hyperglycemia.                                                                                                                                       |
| Arq-e-Gulab             | A distillate prepared from rose water. Its mild hypoglycemic action is thought to result from its vasodilatory (and hence circulatory) benefits along with a mild stimulatory effect on pancreatic insulin secretion.                                                                                                                                                            |

|                  |                                                                                                                                                                                                                                                                                                                                          |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Qurs-e-Marwareed | This tablet formulation often contains pomegranate-derived ingredients (among others). Traditionally, it is used for its cooling and astringent properties; modern research suggests its antioxidant and insulin-sensitizing activities help improve lipid and glucose metabolism.                                                       |
| Safoof-e-Gilo    | A powdered formulation based on “Gilo” (commonly associated with bitter gourd). In Unani practice, its bitter (talkh) nature is believed to “cool” the system and lower blood sugar. Modern studies attribute its effects to bioactive hypoglycemic compounds that reduce intestinal glucose absorption and improve insulin sensitivity. |

## Notes

- In Unani medicine, formulations are often explained in terms of correcting “*mizaj*” (temperament) imbalances, “*Taseer*” (quality), and restoring the balance of humours.
- Modern research efforts tend to examine these traditional claims by investigating antioxidant activity, enzyme inhibition (e.g.,  $\alpha$ -glucosidase), stimulation of insulin secretion, and improvement in lipid profiles.
- Many of these formulations are used either as single drugs or as compounds and may also be employed as adjuvant therapy along with conventional antidiabetic medications.
- The modern proposed mechanisms (antioxidant, anti-inflammatory, insulin sensitizing, and modulation of digestive function) provide a bridge between traditional theory and contemporary biomedical research.
- While several preclinical studies support these actions, clinical evidence is still emerging. Researchers continue to investigate the exact bioactive components and their interactions.
- This table is meant to serve as an overview. For further details, one might refer to classical Unani pharmacopeias and recent

research reviews that aim to scientifically validate these traditional claims.

## **Conclusion**

Unani formulations for diabetes management reflect a unique confluence of traditional wisdom and modern scientific inquiry. Botanical parts-such as seeds, leaves, bark, and fruits-serve as the fundamental building blocks in these remedies. Each part contains distinct bioactive compounds, including alkaloids, flavonoids, terpenes, and phenolics, which contribute to hypoglycemic, antioxidant, and anti-inflammatory effects. These phytochemicals help in promoting insulin secretion, enhancing peripheral glucose uptake, inhibiting carbohydrate-digesting enzymes, and protecting pancreatic cells from oxidative stress. Unani medicine conceptualizes diabetes not merely as a disorder of glucose metabolism but as an imbalance in the body's inherent temperament. Hence, compound formulations are carefully crafted to restore this balance by combining ingredients with complementary "hot" or "cold" qualities. For instance, preparations like *Qurs-e-Tabasheer* and *Safoof-e-Ziabetus Dulabi* are designed to correct the deranged metabolic state while providing holistic protection to vital organs. This integrated approach offers a safe, multi-targeted strategy for managing Type 2 Diabetes Mellitus. However, further controlled clinical studies and pharmacological research are essential to validate these mechanisms, optimize dosages, and ensure that the beneficial actions of these botanical parts translate into consistent, long-term improvements in glycemic control and overall metabolic health.

## **Bibliography:**

1. Masic I, Skrbo A, Naser N, Tandir S, Zunic L, Medjedovic S, Sukalo A. Contribution of Arabic Medicine and Pharmacy to the development of health care Protection in Bosnia and Herzegovina-the First Part. Medical Archives. 2017 Oct;71(5):364-372.

2. Zunic L, Skrbo A, Dobraca A. Historical Contribution of Pharmaceutics to Botany and Pharmacognosy Development. *Materia socio-medica*. 2017 Dec;29(4):291-300.
3. Woo CS, Lau JS, El-Nezami H. Herbal medicine: toxicity and recent trends in assessing their potential toxic effects. In *Advances in Botanical Research* 2012 Jan 1 (Vol. 62, pp. 365-384). Academic Press.
4. Patel DK, Prasad SK, Kumar R, Hemalatha S. An overview on antidiabetic medicinal plants having insulin mimetic property. *Asian Pacific journal of tropical biomedicine*. 2012 Apr 1;2(4):320-30.
5. Grover JK, Yadav S, Vats V. Medicinal plants of India with anti-diabetic potential. *Journal of ethnopharmacology*. 2002 Jun 1;81(1):81-100.
6. Grover JK, Vats V, Rathi SS. Anti-hyperglycemic effect of *Eugenia jambolana* and *Tinospora cordifolia* in experimental diabetes and their effects on key metabolic enzymes involved in carbohydrate metabolism. *Journal of Ethnopharmacology*. 2000 Dec 1;73(3):461-70.
7. Vats V, Grover JK, Rathi SS. Evaluation of anti-hyperglycemic and hypoglycemic effect of *Trigonella foenum-graecum* Linn, *Ocimum sanctum* Linn, and *Pterocarpus marsupium* Linn in normal and alloxanized diabetic rats. *Journal of ethnopharmacology*. 2002 Feb 1;79(1):95-100.
8. Rathi SS, Grover JK, Vats V. The effect of *Momordica charantia* and *Mucuna pruriens* in experimental diabetes and their effect on key metabolic enzymes involved in carbohydrate metabolism. *Phytotherapy research*. 2002 May;16(3):236-43.
9. Ghani N. *Khazainul advia*. New Delhi: Idara Kitabul Shifa. 2010.
10. Kabeeruddin M. *Makhzanul Mufradat*. Idara Kitab-ulshifa, New Delhi. 2007.
11. Kabeeruddin M. *Ilmul Advia Nafeesi*. Aijaz Publication, New Delhi. 2007.

12. Anzar MA, Shamim A, Nafis H, Tanwir MA. Drugs Indicated for The Management of Ziabetes Shakri (Diabetes Mellitus in Unani Medicine Overview. International Journal of Pharmamedix India 2013;1(3):460-74.
13. Khan HA. Hazique.Jaseem Book Depot, New Delhi: 1983:387-390.
14. Qurshi MH. Jam-Ul-Hikmat.Idara Kitab Us Shifa New Delhi; 2011; 864-873.
15. Alam A, Quamri S, Fatima S, Roqaiya M, Ahmad Z. Efficacy of Spirulina (Tahlab) in Patients of Type 2 Diabetes Mellitus (Ziabetes Shakri)-A Randomized Controlled Trial. Journal of diabetes & metabolism. ISSN, J Diabetes Metab. 2016 Oct 1;7(10):6155-6.
16. Eqbal K, Alam MA, Quamri MA, Sofi G, Bhat MD. Efficacy of Qurs-e-Gulnar in Ziabetes (type 2 Diabetes Mellitus): a single blind randomized controlled trial. Journal of Complementary and Integrative Medicine. 2020 Jun 18;1(ahead-of-print).
17. Quamri MA, Begum S, Siddiqui MA, Alam MA. Efficacy of Kanduri (Coccinia indica) in diabetes associated dyslipidemia randomized single-blind standard controlled study. Age (Mean $\pm$ SD): 43(7.845):44-9.
18. Majusi AIA. Kamil Al-San't. Vol. 2, Part II. Central Council for Research in Unani Medicine, New Delhi. Ministry of Health & Family Welfare, Govt. Of India: 2010:192-193
19. Sina I. Al-Qanoon Fit Tib. Vol 3. Urdu Translation by G. Kantoori. Published By Idara Kitab Us Shifa, New Delhi; 2010:1031-1033.
20. Jurjani I. Zakhira Kharzam Shahi. Vol 6.Urdu Translation by Hkm. Hadi Husain. Published By Idara Kitab Us Shifa, New Delhi; 2010:540-541.

21. Zuhr I. Kitab Al-Taiseer. Central Council for Research in Unani Medicine, New Delhi. Ministry of Health & Family Welfare, Govt. of India; 1986:160-163.
22. Baghdadi IH. Kitab Al Mukhtaratfit-Tibb. Vol 3. Central Council for Research in Unani Medicine, New Delhi. Ministry of Health & Family Welfare, Govt. of India; 2004:326-328.
23. Arzani HA. Tibbe Akbar. Urdu Translation by Hkm. Mohd. Husain. Faisal Publication Deoband UP; YNM: 525-526.
24. Rhazi Z. Al-Hawi Fit Tib. Vol 10. Central Council for Research in Unani Medicine, New Delhi. Ministry of Health & Family Welfare, Govt. Of India; 2002:181-187.

# Preventive Approach to Diabetes

## Abstract

Diabetes is a growing global health burden, with type 2 diabetes comprising over 90% of cases. This chapter outlines a comprehensive preventive approach to diabetes, emphasizing early detection, lifestyle modification, and policy interventions. It reviews epidemiological trends showing a rapid increase in diabetes prevalence, especially in low- and middle-income countries where rising obesity and sedentary lifestyles are major drivers. Evidence from landmark studies, such as the Diabetes Prevention Program and the Finnish Diabetes Prevention Study, demonstrates that modest weight loss, increased physical activity, and dietary changes can significantly reduce diabetes incidence. The chapter discusses the role of nutrition, highlighting high-fiber diets, low glycemic index foods, and the Mediterranean dietary pattern as effective strategies for blood sugar control. Additionally, stress management, sleep optimization, and regular blood glucose monitoring are identified as crucial components of diabetes prevention. Public health strategies, including community-based screening programs and national initiatives to promote healthy behaviors, are explored as means to mitigate risk factors at the population level. Future directions for research, including digital health tools and personalized interventions, are proposed to enhance prevention efforts further. This multidisciplinary framework serves as a resource for clinicians, policymakers, and public health practitioners seeking to implement effective diabetes prevention strategies. Ultimately, the chapter demonstrates that a preventive approach not only improves health outcomes but also reduces healthcare costs, contributing to sustainable healthcare systems worldwide. By integrating evidence-based interventions with innovative policies, this chapter argues for a paradigm shift emphasizing prevention over

treatment. Such strategies are essential for reducing the diabetes epidemic.

## **Introduction**

Diabetes is a disease that occurs when your blood sugar levels become too high. High blood sugar can damage many parts of the body over time. In recent decades, the number of people with diabetes has increased all over the world. Most of these cases are type 2 diabetes, which often affects adults and is linked to lifestyle factors such as diet, physical activity, and weight. Because diabetes can cause serious health problems like heart disease, nerve damage, and vision loss, preventing it is very important. In this chapter, we explore a range of preventive approaches in a way that is easy to understand, and we share practical tips to help you make healthy changes.

## **Understanding diabetes**

### **What is Diabetes?**

Diabetes is a condition where the body does not handle sugar (glucose) properly. Glucose is a type of sugar that gives your body energy. Normally, a hormone called insulin, made by your pancreas, helps move glucose from your blood into your cells. In diabetes, either your body does not make enough insulin or your cells do not use it well. This leads to high blood sugar levels.

### **Types of Diabetes**

There are two main types of diabetes:

- **Type 1 Diabetes:** This type is usually diagnosed in children or young adults. In type 1 diabetes, the body's immune system mistakenly attacks the cells in the pancreas that produce insulin. People with type 1 diabetes need to take insulin every day.
- **Type 2 Diabetes:** This is the most common type and usually develops in adults. In type 2 diabetes, the body does not use

insulin properly (a condition called insulin resistance). It is often linked to being overweight, eating an unhealthy diet, and not getting enough physical activity.

There is also prediabetes, a condition where blood sugar levels are higher than normal but not yet high enough to be diagnosed as diabetes. Prediabetes is important because it is a warning sign; with proper changes, many people can prevent or delay the progression to type 2 diabetes.

**Why prevention is important?**

Diabetes can lead to serious complications such as heart disease, kidney problems, nerve damage, and vision loss. By taking steps to prevent diabetes, you not only lower your risk of developing these complications but also improve your overall quality of life. Prevention is possible through simple changes in daily habits and lifestyle. Studies have shown that lifestyle changes can reduce the risk of type 2 diabetes by as much as 50% to 60%.

**Risk factors and early warning signs**

**Common risk factors**

Understanding your risk factors is the first step in prevention. The most common risk factors for type 2 diabetes include:

**Table: Risk factors for Type 2 Diabetes**

| Risk factors           | Description                                                        | Impact on diabetes risk                           |
|------------------------|--------------------------------------------------------------------|---------------------------------------------------|
| Overweight and Obesity | Excess body fat, especially abdominal fat                          | Increases insulin resistance and diabetes risk    |
| Physical Inactivity    | Sedentary lifestyle with little to no exercise                     | Reduces insulin sensitivity                       |
| Unhealthy Diet         | High intake of processed foods, refined sugars, and unhealthy fats | Contributes to weight gain and insulin resistance |

|                                            |                                                                          |                                                       |
|--------------------------------------------|--------------------------------------------------------------------------|-------------------------------------------------------|
| Age                                        | Increased age, especially over 45 years                                  | Raises the likelihood of developing type 2 diabetes   |
| Family History                             | Having parents or siblings with diabetes                                 | Genetic predisposition increases risk                 |
| Ethnicity                                  | Certain ethnic groups (e.g., South Asians, African Americans, Hispanics) | Higher prevalence of diabetes                         |
| High Blood Pressure & Abnormal Cholesterol | Co-existing hypertension and dyslipidemia                                | Often associated with insulin resistance and diabetes |
| Prediabetes                                | Elevated blood sugar levels not yet in diabetic range                    | Strong predictor for progression to type 2 diabetes   |

**Table: Early warning signs of Type 2 Diabetes**

| Symptoms            | Description                                                                                                         |
|---------------------|---------------------------------------------------------------------------------------------------------------------|
| Increased Thirst    | Feeling more thirsty than usual                                                                                     |
| Frequent Urination  | Needing to urinate more often                                                                                       |
| Fatigue or Weakness | Feeling unusually tired or weak                                                                                     |
| Note                | Symptoms may be mild or absent; regular screening is essential for early detection and prevention of complications. |

**Note:** Because these symptoms are mild or may not appear at all, regular screening is very important. Early detection of prediabetes or diabetes allows you to take action before serious damage occurs.

### **Lifestyle modifications for prevention**

Making changes in your daily habits is the most powerful way to prevent type 2 diabetes. Here we discuss three major areas: healthy eating, physical activity, and weight management.

## A. Healthy eating

A balanced, nutritious diet is the cornerstone of diabetes prevention. Here are some simple tips for healthy eating:

**Table: Focus on whole foods for diabetes management**

| Food Category       | Examples                                                     | Health benefits                                         |
|---------------------|--------------------------------------------------------------|---------------------------------------------------------|
| Whole Grains        | Brown rice, whole wheat, quinoa                              | Slow glucose absorption prevents blood sugar spikes     |
| Fruits & Vegetables | Variety of colors and types (berries, leafy greens, carrots) | Rich in fiber and antioxidants, it reduces inflammation |
| Lean Proteins       | Fish, poultry, beans, tofu                                   | Provide essential nutrients, low in saturated fat       |
| Healthy Fats        | Olive oil, nuts, avocados                                    | Improve insulin sensitivity, support heart health       |

### Reduce processed foods and sugars

Cutting back on processed foods, sugary drinks, and snacks is very important. Foods that are highly processed often contain added sugars and unhealthy fats, which can lead to weight gain and insulin resistance.

- **Avoid sugary beverages:** Instead of soda, fruit juices, or sweetened teas, drink water, unsweetened tea, or coffee.
- **Limit sweets and snacks:** Try replacing candy and pastries with fruits or nuts.

### Portion control

Eating too much of even healthy foods can lead to weight gain. Learning about portion sizes and practicing mindful eating can help you control your calorie intake.

### Meal planning

Planning your meals ahead of time can prevent last-minute choices that are often unhealthy. Consider preparing a weekly menu that includes a variety of balanced meals.

### B. Physical activity

Regular exercise is crucial for keeping your blood sugar under control and reducing the risk of diabetes. Here are some tips for being more active:

#### Types of exercise

Different types of exercise benefit your health in various ways:

**Table: Types of exercise for diabetes management**

| Exercise type                     | Examples                              | Benefits                                               | Recommended frequency                     |
|-----------------------------------|---------------------------------------|--------------------------------------------------------|-------------------------------------------|
| Aerobic Exercise                  | Walking, jogging, swimming, cycling   | Improves cardiovascular health and insulin sensitivity | At least 150 minutes per week             |
| Strength Training                 | Weight lifting, body-weight exercises | Builds muscle, enhances insulin efficiency             | 2 to 3 times per week                     |
| Flexibility and Balance Exercises | Yoga, stretching                      | Maintains flexibility, improves balance, and mobility  | Regularly, as part of an exercise routine |

#### Making exercise a habit

It is important to find activities you enjoy so that you are more likely to stick with them. Consider these tips:

**Table: Tips for establishing a successful exercise routine**

| <b>Tips</b>    | <b>Description</b>                                                      | <b>Benefits</b>                                        |
|----------------|-------------------------------------------------------------------------|--------------------------------------------------------|
| Set a Schedule | Allocate specific time daily for exercise like an important appointment | Promotes regularity and commitment                     |
| Start Slowly   | Begin with short walks and gradually increase duration and intensity    | Reduces injury risk and builds endurance               |
| Be Consistent  | Maintain regular exercise rather than sporadic intense sessions         | Enhances long-term fitness and glucose control         |
| Mix It Up      | Include varied activities targeting different muscle groups             | Prevents boredom and improves overall physical fitness |

**Overcoming barriers**

Sometimes, finding time or motivation to exercise can be difficult. Here are some strategies to overcome common barriers:

**Table: Strategies to stay motivated for diabetes-friendly exercise**

| <b>Strategy</b>        | <b>Description</b>                        | <b>Benefits</b>                                   |
|------------------------|-------------------------------------------|---------------------------------------------------|
| Exercise with a Friend | Partnering with someone for workouts      | Increases enjoyment and accountability            |
| Use Technology         | Utilize fitness apps and wearable devices | Tracks progress and provides reminders            |
| Set Realistic Goals    | Begin with small, achievable targets      | Builds confidence and encourages continued effort |

**C. Weight management**

Being overweight or obese is a major risk factor for type 2 diabetes. Losing even a small amount of weight can significantly reduce your risk.

**The importance of weight loss**

Research shows that losing 5% to 10% of your body weight can lower the risk of diabetes by improving insulin sensitivity. For example, if

you weigh 200 pounds, a weight loss of 10 to 20 pounds can have a meaningful impact on your health.

**Strategies for weight loss**

**Table: Effective lifestyle strategies for diabetes and weight management**

| Strategy          | Description                                               | Benefits                                           |
|-------------------|-----------------------------------------------------------|----------------------------------------------------|
| Balanced Diet     | Emphasize whole foods and control portion sizes           | Supports stable blood sugar and a healthy weight   |
| Regular Exercise  | Engage in consistent physical activity                    | Controls blood sugar and promotes calorie burning  |
| Mindful Eating    | Listen to hunger cues; avoid eating when not truly hungry | Prevents overeating and promotes healthier choices |
| Set Small Goals   | Focus on achievable, short-term targets                   | Enhances motivation and sustained progress         |
| Keep a Food Diary | Track daily food intake                                   | Increases awareness and accountability             |
| Seek Support      | Join weight loss programs or support groups               | Provides motivation and guidance                   |

**Preventing weight gain**

Even if you are not trying to lose weight, preventing gradual weight gain is an important part of diabetes prevention. Maintaining a steady weight with regular physical activity and a balanced diet is key.

**Preventive nutrition: The role of diet in diabetes prevention**

Nutrition plays a major role in preventing diabetes. The foods you choose can affect how your body processes sugar and stores fat. Let’s explore some core ideas in preventive nutrition.

**The benefits of a plant-rich diet**

A diet that is high in plant-based foods-such as fruits, vegetables, legumes, and whole grains-can help lower the risk of diabetes. These foods are naturally high in fiber, which slows the absorption of sugar

into the blood and keeps blood sugar levels more stable. They also provide essential vitamins and minerals that support overall health.

**Healthy fats vs. Unhealthy fats**

Not all fats are bad. Healthy fats, like those found in olive oil, nuts, and seeds, help improve insulin sensitivity. In contrast, unhealthy fats, such as trans fats and excessive saturated fats found in fried foods and many processed snacks, can lead to inflammation and insulin resistance. Choosing the right fats is an important part of a diabetes-preventive diet.

**Simple food swaps**

Making small changes in your diet can have a big impact on your diabetes risk. Consider these simple swaps:

**Table: Healthy dietary substitutions for diabetes management**

| Replace               | With                                       | Benefits                                                |
|-----------------------|--------------------------------------------|---------------------------------------------------------|
| Refined Carbohydrates | Whole grains (brown rice, oats)            | Provides fiber, slows glucose absorption                |
| Sugary Snacks         | Fresh fruit                                | Natural sweetness with vitamins and fiber               |
| Sugary Drinks         | Water or unsweetened tea                   | Hydrates without added sugars, reduces calorie intake   |
| Processed Meats       | Lean proteins (fish, chicken, plant-based) | Lower saturated fats support heart and metabolic health |
| Trans Fats            | Healthy fats (olive oil, avocado)          | Improves cholesterol profile and reduces inflammation   |

**The importance of fiber**

Fiber is an important nutrient for controlling blood sugar levels. Foods high in fiber help slow the digestion of carbohydrates, which leads to a slower, steadier rise in blood sugar after meals. Aim for a diet that includes plenty of vegetables, fruits, legumes, and whole grains to boost your fiber intake.

# Stress management and mental health

Stress and emotional health play a significant role in the risk of developing diabetes. High stress levels can lead to unhealthy eating habits, reduced physical activity, and hormonal changes that may raise blood sugar levels.

## How stress affects diabetes risk

When you are stressed, your body releases stress hormones such as cortisol. These hormones can increase blood sugar levels and make it harder for your body to use insulin effectively. Over time, chronic stress can contribute to weight gain and insulin resistance.

## Strategies to manage stress

**Table: Stress reduction strategies for diabetes management**

| Strategy                   | Description                                                                            | Benefits                                              |
|----------------------------|----------------------------------------------------------------------------------------|-------------------------------------------------------|
| Mindfulness and Meditation | Mindfulness meditation and related practices to reduce stress                          | Enhances well-being and lowers stress levels          |
| Regular Physical Activity  | Exercise that manages weight and blood sugar while releasing mood-enhancing endorphins | Improves mood and glycemic control                    |
| Adequate Sleep             | Ensuring sufficient, quality sleep                                                     | Reduces stress hormones and supports metabolic health |
| Talk to Someone            | Sharing feelings with friends, family, or counselors                                   | Provides emotional support and stress relief          |

## Creating a supportive environment

Building a supportive network can help you manage stress and maintain healthy habits. Whether it’s joining a group class, talking with friends, or seeking professional counseling, support can make a big difference in your mental and physical health.

## The role of preventive care programs and education

Prevention does not have to be a solo journey. Many communities and health organizations offer programs designed to help people prevent diabetes. Education and support are key components of these programs.

### Community-based programs

Many communities offer lifestyle change programs that focus on healthy eating, regular physical activity, and weight management. These programs often include:

**Table: Types of support for diabetes management**

| Support Type          | Description                                                     | Benefits                                              |
|-----------------------|-----------------------------------------------------------------|-------------------------------------------------------|
| Group Sessions        | Workshops or classes on nutrition, exercise, and healthy habits | Provides education and peer motivation                |
| One-on-One Counseling | Personalized advice from healthcare professionals               | Tailors risk understanding and management plans       |
| Peer Support          | Sharing experiences with others facing similar challenges       | Encourages motivation and sustained lifestyle changes |

### Workplace and school initiatives

Workplaces and schools are also great places to encourage healthy living. Some companies offer wellness programs that include gym memberships, healthy food options, and stress management workshops. Schools can teach children about nutrition and physical activity, laying the foundation for lifelong healthy habits.

### Health screenings and early detection

Regular health screenings are an important part of diabetes prevention. Simple tests such as fasting blood sugar levels, HbA1c tests, and body mass index (BMI) measurements can help detect early warning signs. Early detection allows for timely intervention through lifestyle

changes, which can prevent or delay the progression of prediabetes to diabetes.

### **Educational resources**

Many organizations, such as the American Diabetes Association and local health departments, provide educational materials and online resources. These materials explain what diabetes is, how it affects your body, and what you can do to reduce your risk. Learning about diabetes and its risk factors empowers you to make better health choices.

### **Technological advances in prevention**

Modern technology is changing the way we manage our health. Several new tools can help you monitor your health and prevent diabetes.

#### **Digital health tools**

There are many smartphone apps available that help you track your diet, exercise, and even blood sugar levels. These apps can remind you to take your medication, log your meals, and record your physical activity. By keeping track of your daily habits, you can see patterns in your behavior and make better choices.

#### **Wearable devices**

Fitness trackers and smartwatches can monitor your heart rate, steps, and overall activity levels. Many devices also offer sleep tracking features. These gadgets can help you stay motivated by showing you how much exercise you're getting and how well you are sleeping—both important factors in diabetes prevention.

#### **Continuous glucose monitors**

For people who already have prediabetes or diabetes, continuous glucose monitors (CGMs) can provide real-time data on blood sugar levels. While these devices are more commonly used for diabetes management, they can also offer insights into how diet and exercise

affect blood sugar levels. This information can be very useful for fine-tuning your lifestyle habits to prevent further health issues.

**Telehealth and online coaching**

Telehealth services have made it easier for people to access health advice without leaving their homes. Online coaching, virtual nutrition counseling, and remote fitness classes can all play a role in diabetes prevention. These services are particularly helpful for people who live in rural areas or who have busy schedules.

**Medications and other interventions for prevention**

While lifestyle changes are the most effective way to prevent diabetes, in some cases medications may also be used-especially for people with prediabetes who are at high risk of developing type 2 diabetes.

**Role of medications**

Some medications have been shown to reduce the risk of progressing from prediabetes to diabetes. For example:

**Table: Medications used in prediabetes management**

| Medication  | Mechanism of action                                                                                  | Notes                                                                   |
|-------------|------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|
| Metformin   | Reduces hepatic glucose production and improves insulin sensitivity                                  | Often recommended for prediabetes with risk factors like obesity        |
| Other Drugs | Examples: Acarbose (slows carbohydrate absorption), Thiazolidinediones (improve insulin sensitivity) | Used in some cases, but lifestyle changes remain the primary treatment. |

**Note:** It is important to note that medications should always be used under the guidance of a healthcare professional. They are not a substitute for a healthy diet and regular exercise, but can be an additional tool in the fight against diabetes.

## **Bariatric surgery**

For people with severe obesity who are at very high risk for diabetes, bariatric surgery is sometimes an option. This surgery helps people lose a significant amount of weight, which can lead to improved insulin sensitivity and, in some cases, remission of diabetes. Bariatric surgery is usually considered only after other methods of weight loss have not worked.

## **Future directions in diabetes prevention**

Research in diabetes prevention is ongoing. Scientists are constantly looking for new ways to understand and fight this disease. Some of the promising areas include:

### **Personalized prevention**

New tools are being developed to predict an individual's risk of developing diabetes. For example, researchers are working on risk calculators that use information such as age, BMI, family history, and even genetic data to give a personalized risk score. This can help doctors and patients work together to create a plan that is tailored to the person's specific needs.

### **Advances in nutrition science**

Studies continue to examine how specific nutrients and food compounds—such as lignans found in flaxseeds and whole grains—may help lower the risk of diabetes. As researchers learn more, dietary recommendations can become more refined and effective.

### **Innovative technology**

New devices and digital health tools are on the horizon that may make it easier than ever to monitor your health. From smarter continuous glucose monitors to advanced apps that integrate data from multiple sources, technology will continue to play a big role in prevention and management.

## **Community and policy efforts**

Prevention is not only about individual choices-it is also about creating environments that support healthy living. Future efforts may focus on policies that promote access to healthy foods, safe places for physical activity, and education programs that reach everyone in the community.

## **Conclusion**

Type 2 diabetes is a major public health challenge, but it is largely preventable with the right strategies. This chapter highlighted how lifestyle modifications-such as healthy eating, regular physical activity, weight management, and stress reduction-can significantly lower the risk of developing diabetes. Early detection through regular screenings and participation in preventive programs plays a crucial role in catching risk factors before they progress. Technological advancements like fitness trackers, health apps, and glucose monitors further support these efforts. In some high-risk individuals, medications such as metformin may also be beneficial alongside lifestyle changes. Importantly, prevention is not just an individual responsibility; it also requires community and policy-level support to create environments that promote healthy choices. Even small steps-like replacing sugary drinks, walking daily, or improving sleep-can lead to meaningful improvements. By committing to a preventive approach, individuals can enhance their quality of life, reduce healthcare burdens, and contribute to a healthier society. As research evolves, personalized and technology-driven interventions will further strengthen diabetes prevention efforts. Ultimately, focusing on prevention over treatment empowers people to take control of their health and stop diabetes before it starts.

## **Bibliography:**

1. Allende-Vigo MZ. Diabetes mellitus prevention. *Am J Ther.* 2015 Jan-Feb;22(1):68-72. doi: 10.1097/MJT.0b013e3182211bae.

2. Russ SM, Nhim K, Gregg E, Bell M, Luman E, Albright A. Public Health Approaches to Type 2 Diabetes Prevention: the US National Diabetes Prevention Program and Beyond. *Curr Diab Rep.* 2019 Aug 5;19(9):78. doi: 10.1007/s11892-019-1200-z. Erratum in: *Curr Diab Rep.* 2020 Jun 27;20(8):36. doi: 10.1007/s11892-020-01323-x.
3. Golovaty I, Ritchie ND, Tuomilehto J, Mohan V, Ali MK, Gregg EW, Bergman M, Moin T. Two decades of diabetes prevention efforts: A call to innovate and revitalize our approach to lifestyle change. *Diabetes Res Clin Pract.* 2023 Apr;198:110195. doi: 10.1016/j.diabres.2022.110195.
4. Haw JS, Galaviz KI, Straus AN, Kowalski AJ, Magee MJ, Weber MB, Wei J, Narayan KMV, Ali MK. Long-term Sustainability of Diabetes Prevention Approaches: A Systematic Review and Meta-analysis of Randomized Clinical Trials. *JAMA Intern Med.* 2017 Dec 1;177(12):1808-1817. doi: 10.1001/jamainternmed.2017.6040.
5. Uusitupa M, Khan TA, Viguiliouk E, Kahleova H, Rivellese AA, Hermansen K, Pfeiffer A, Thanopoulou A, Salas-Salvadó J, Schwab U, Sievenpiper JL. Prevention of Type 2 Diabetes by Lifestyle Changes: A Systematic Review and Meta-Analysis. *Nutrients.* 2019 Nov 1;11(11):2611. doi: 10.3390/nu11112611.
6. White M. Population Approaches to Prevention of Type 2 Diabetes. *PLoS Med.* 2016 Jul 12;13(7):e1002080. Doi: 10.1371/journal.pmed.1002080.
7. Templer S, Abdo S, Wong T. Preventing diabetes complications. *Intern Med J.* 2024 Aug;54(8):1264-1274. doi: 10.1111/imj.16455.
8. Botana López MA. Estrategias para la prevención y tratamiento no farmacológico de la diabetes. Modelos de atención [Strategies for the prevention and non-pharmacological treatment of diabetes. Models of care]. *Aten Primaria.* 2024 Sep;56(9):102947. Spanish. doi: 10.1016/j.aprim.2024.102947.

# Acknowledgement

I would like to express my deepest gratitude to the great Unani physicians whose timeless wisdom and Unani classical texts laid the foundation for understanding diabetes mellitus and its management. Their invaluable contributions continue to inspire the medical fraternity and provide direction for modern research. I am sincerely thankful to the researchers and scientists whose relentless pursuit of knowledge and innovation has advanced our understanding of this complex disease, culminating in the discovery of insulin; a true milestone in medical history. I gratefully acknowledge the use of internet-based scientific resources, including PubMed, Medline, Scopus, Web of Science, Google Scholar, and ResearchGate etc, which provided access to a vast repository of literature, enriching the quality and authenticity of this work.

My heartfelt appreciation goes to my mentors and guardian, especially **Professor (Dr.) M. Afshar Alam**, Vice-Chancellor, Jamia Hamdard, whose constant encouragement and academic guidance have been a source of inspiration, and the **Honorable Governor of Bihar, Shri Arif Mohammad Khan**, for his support and kind consideration.

I also remain indebted to my family members and colleagues, whose encouragement, support, and understanding gave me strength throughout the process of writing this book.

I wish to acknowledge the assistance of **AI tools**, which facilitated the structuring, refinement, and organization of the manuscript, thereby making the research and writing process more efficient.

Finally, I extend my sincere thanks to Bluerose Publishers for their professional support and for providing me with the platform to share this work with the academic and scientific community.