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Review Article

The role of abnormal phlegm (*Ghair Tabayi Balgham*) in Human Diseases: A Review

Imran Azam *, Sajid Kabir, Uzair Ahmad

Department of, Kulliyat-e-Tib, Aligarh Unani Medical College & ACN Hospital, Aligarh, UP, India

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For Correspondence:

Imran Azam, Department of, Kulliyat-e-Tib, Aligarh Unani Medical College & ACN Hospital, Aligarh, UP.

Abstract

The Unani system of medicine recognizes phlegm as one of the four fundamental humors responsible for preserving physiological homeostasis and maintaining tissue nourishment, lubrication, and moisture. Under normal conditions, Normal Phlegm serves as a reserve source of nutrition and supports normal metabolic functions. However, qualitative or quantitative alterations lead to the formation of abnormal phlegm, which classical Unani physicians regarded as a major etiological factor in the development of numerous acute and chronic diseases. Classical scholars, including Hippocrates, Galen, Al-Razi, Ibn Sina, Ismail Jurjani, and Akbar Arzani, described distinct forms of abnormal phlegm and their involvement in disorders affecting the digestive, respiratory, cardiovascular, musculoskeletal, nervous, and endocrine systems. Emerging biomedical evidence demonstrates remarkable similarities between the Unani concept of abnormal phlegm and pathological processes characterized by metabolic dysfunction, insulin resistance, chronic low-grade inflammation, oxidative stress, dyslipidemia, endothelial dysfunction, and hormonal imbalance. These interconnected mechanisms are increasingly recognized as central contributors to obesity, metabolic syndrome, type 2 diabetes mellitus, hypothyroidism, non-alcoholic fatty liver disease, cardiovascular diseases, chronic respiratory disorders, osteoarthritis, rheumatoid arthritis, and several neurodegenerative conditions. Integrating classical Unani concepts with contemporary biomedical knowledge provides a comprehensive framework for understanding disease pathogenesis and supports the development of holistic preventive and therapeutic approaches. This review critically evaluates the classical descriptions, classification, etiopathogenesis, clinical manifestations, and multisystem involvement of *Ghair Tabayi Balgham* while highlighting recent biomedical evidence and future research priorities. Such an integrative perspective may strengthen evidence-based Unani medicine, facilitate interdisciplinary research, and promote the scientific validation of traditional concepts in modern healthcare

Keywords: *Balgham*, *Ghair Tabayi Balgham*, Unani Medicine, Humoral Theory, *Akhlat*, Obesity, Dyslipidemia, Hypothyroidism, Diabetes Mellitus, Metabolic Syndrome, Inflammation.

Introduction

Health has traditionally been viewed as a dynamic equilibrium between the internal environment of the body and external influences. Ancient systems of medicine, particularly the Unani system, describe this equilibrium through the doctrine of *Akhlat* (humors), which forms the cornerstone of disease prevention, diagnosis, and treatment¹. According to classical Unani philosophy, the human body is governed by four principal humors-Dam (blood), *Balgham* (phlegm), *Safra* (yellow bile), and *Sauda* (black bile)-each possessing unique qualitative characteristics and physiological functions^{2,3}. The harmonious balance among these humors is essential for maintaining *I'tidal-e-Mizaj* (temperamental equilibrium) and ensuring normal bodily functions⁴.

Among these humors, *Balgham* (phlegm) occupies a distinctive position because of its vital role in maintaining tissue hydration, lubrication, flexibility, and nutritional reserve. Classical scholars described normal

Balgham as a cool and moist humor that nourishes tissues lacking direct vascular supply, including cartilage, ligaments, tendons, and nervous structures⁵. Furthermore, *Balgham* serves as a reserve source for blood formation during periods of fasting or nutritional deficiency¹.

The physiological importance of *Balgham* extends beyond simple lubrication. Classical Unani physicians believed that it contributes to the maintenance of joint mobility, protects delicate organs from friction, preserves tissue softness, and supports metabolic homeostasis⁶. Ibn Sina emphasized that the transformation of *Balgham* into blood occurs whenever the body requires additional nourishment, demonstrating its role as a metabolic reserve rather than an inert body fluid⁷.

However, disturbances in the quantity or quality of *Balgham* lead to the formation of *Ghair Tabayi Balgham* (abnormal phlegm), a pathological humor characterized by altered consistency, composition, and biological

behavior¹. According to Unani scholars, abnormal phlegm results from impaired digestion (*Su'e-Hazm*), defective hepatic metabolism, weakened innate heat (*Hararat-e-Ghariziyah*), sedentary lifestyle, excessive consumption of cold and moist foods, environmental influences, aging, and various constitutional factors⁸.

Classical Unani literature describes several varieties of abnormal phlegm, each possessing distinct physical properties and pathogenic potential. These include *Balgham Murr*, *Balgham Hamiz*, *Balgham Maleh*, and *Balgham Afis*, which differ according to alterations in taste, consistency, and associated pathological processes⁹. These abnormal humors are believed to accumulate within tissues and organs, disturb physiological functions, obstruct channels (*Sudad*), weaken innate heat, and predispose individuals to chronic diseases affecting multiple body systems¹.

Although the humoral theory originated more than two millennia ago, many of its fundamental concepts have gained renewed scientific interest through advances in systems biology, immunology, endocrinology, and metabolic medicine². The pathological features attributed to *Ghair Tabayi Balgham*-including excessive moisture, sluggish metabolism, tissue infiltration, impaired digestion, and accumulation of abnormal substances-bear remarkable resemblance to contemporary mechanisms such as chronic low-grade inflammation, adipose tissue dysfunction, insulin resistance, oxidative stress, dyslipidemia, endocrine imbalance, extracellular matrix remodeling, and metabolic syndrome¹⁰. Recent biomedical studies demonstrate that these interconnected mechanisms contribute significantly to obesity, type 2 diabetes mellitus, non-alcoholic fatty liver disease, hypothyroidism, cardiovascular diseases, osteoarthritis, respiratory disorders, and neurodegenerative diseases¹¹.

Obesity, for example, is now recognized as a chronic inflammatory disease characterized by excessive adipose tissue accumulation, altered lipid metabolism, increased production of pro-inflammatory cytokines, oxidative stress, and insulin resistance¹². These pathological characteristics closely parallel the classical Unani description of excessive *Balghami* temperament, in which diminished metabolic heat and excessive coldness and moisture promote abnormal tissue deposition and impaired physiological function. Similar conceptual correlations can be observed in dyslipidemia, where abnormal lipid accumulation and impaired lipid transport resemble the Unani concept of altered humor composition¹³.

Hypothyroidism also demonstrates several features traditionally attributed to abnormal *Balgham*, including reduced metabolic activity, fatigue, weight gain, cold intolerance, constipation, cognitive slowing, dry skin, and fluid retention¹⁴. The reduction in basal metabolic rate observed in hypothyroidism closely resembles the Unani concept of diminished *Hararat-e-Ghariziyah*, leading to incomplete digestion and excessive formation of pathological phlegm¹⁵.

Likewise, type 2 diabetes mellitus, metabolic syndrome, and non-alcoholic fatty liver disease share common pathological pathways involving insulin resistance, chronic inflammation, hepatic lipid accumulation, mitochondrial dysfunction, and oxidative stress. These mechanisms may be interpreted within the Unani framework as manifestations of persistent *Balghami* predominance resulting from defective digestion, hepatic dysfunction, and impaired humoral transformation¹⁶.

Respiratory diseases also illustrate the enduring relevance of the *Balgham* concept. Classical physicians associated abnormal phlegm with excessive mucus production, airway obstruction, chronic cough, bronchial inflammation, and breathing difficulties. Modern respiratory medicine similarly recognizes mucus hypersecretion, chronic inflammation, and immune dysregulation as central features of chronic bronchitis, asthma, and chronic obstructive pulmonary disease¹⁷.

Growing scientific interest in traditional medicine has encouraged researchers to re-evaluate ancient medical theories using contemporary biomedical methodologies. Rather than considering humoral concepts as merely historical constructs, many investigators now view them as holistic physiological models that may provide valuable insights into complex chronic diseases involving multiple interacting metabolic, inflammatory, endocrine, and immunological pathways¹⁸.

The integration of classical Unani wisdom with evidence-based biomedical research has important implications for preventive medicine, personalized healthcare, and integrative therapeutic strategies. Understanding *Ghair Tabayi Balgham* through both traditional and contemporary perspectives may facilitate improved disease prevention, early diagnosis, lifestyle modification, dietary interventions, and development of novel evidence-based Unani therapeutics^{19,20}.

Therefore, the present review aims to comprehensively examine the concept of *Ghair Tabayi Balgham* (abnormal phlegm) in light of classical Unani literature and contemporary biomedical evidence. Particular emphasis is placed on its etiopathogenesis, classification, disease associations, and potential role in the development of metabolic, endocrine, cardiovascular, respiratory, musculoskeletal, neurological, and gastrointestinal disorders. By bridging ancient humoral theory with modern scientific understanding, this review seeks to provide an updated framework for future research and evidence-based integration of Unani medicine into contemporary healthcare.

Pathogenesis of *Ghair Tabayi Balgham* and Its Correlation with modern biomedical mechanisms

The pathogenesis of *Ghair Tabayi Balgham* (abnormal phlegm) represents one of the fundamental concepts of disease development in the Unani system of medicine¹. Classical Unani scholars considered health to depend upon the harmonious production, transformation, and distribution of the four humors (*Akhlat*). Any disturbance in digestive efficiency, humoral maturation, or temperament (*Mizaj*) results in the formation of

abnormal humors capable of producing disease². Among these, *Ghair Tabayi Balgham* is regarded as one of the most important pathogenic factors responsible for numerous chronic disorders, particularly those associated with metabolic dysfunction, obesity, endocrine abnormalities, respiratory illnesses, and degenerative diseases³.

Although described more than a millennium ago, many mechanisms underlying *Ghair Tabayi Balgham* demonstrate remarkable similarities with contemporary concepts of chronic low-grade inflammation, metabolic syndrome, oxidative stress, endocrine dysfunction, immune dysregulation, and impaired cellular metabolism³. Understanding these parallels provides an opportunity to integrate traditional Unani principles with modern biomedical science.

Formation of Ghair Tabayi Balgham according to Unani Medicine

According to Unani philosophy, food undergoes a sequential process of digestion (*Hazm*) at four levels: gastric digestion (*Hazm-e-Ma'idī*), hepatic digestion (*Hazm-e-Kabidī*), vascular digestion (*Hazm-e-Urooqī*), and tissue digestion (*Hazm-e-Aza*). Each stage transforms nutrients into increasingly refined forms until they become suitable for tissue nourishment⁵.

This complex metabolic process depends upon adequate *Hararat-e-Ghariziyah* (innate heat), proper digestive strength (*Quwwat-e-Hazima*), normal hepatic function, and balanced temperament³. When any component of this system becomes impaired, digestion remains incomplete, resulting in the production of immature or abnormal humors instead of healthy blood and tissues.

Classical physicians described several factors responsible for the formation of *Ghair Tabayi Balgham*, including^{2,5}:

Classical Unani physicians described several etiological factors responsible for the formation of *Ghair Tabayi Balgham* (abnormal phlegm)¹. Foremost among these is *Su'e-Hazm* (weak digestive power), which results in incomplete digestion and the production of improperly processed humors. Impaired hepatic metabolism further disrupts the maturation and refinement of humors, while diminished *Hararat-e-Ghariziyah* (innate heat) reduces the body's capacity to transform nutrients into healthy humoral constituents². Dietary habits also play a significant role, particularly the excessive consumption of cold, moist, fatty, heavy, and difficult-to-digest foods, which promote excessive phlegm production³. Lifestyle-related factors, including physical inactivity, a sedentary routine, and excessive daytime sleep, contribute to sluggish metabolism and the accumulation of abnormal humors⁵. Classical scholars also recognized the influence of psychological stress, advancing age, and the constitutional predominance of a *Balghami* (phlegmatic) temperament, all of which predispose individuals to excessive phlegm formation⁶. In addition, prolonged exposure to cold and humid environmental conditions was believed to aggravate phlegmatic disorders by enhancing the cold and moist qualities of the body⁷. Collectively, these factors impair normal humoral

maturation and metabolism, resulting in the accumulation of thick, viscous, and poorly metabolized phlegm⁶. Over time, this abnormal phlegm infiltrates different organs and tissues, obstructs physiological functions, disturbs normal homeostasis, and contributes to the development of a wide range of acute and chronic diseases⁷.

Weak Innate Heat and reduced metabolic activity

One of the most important concepts in Unani pathogenesis is *Hararat-e-Ghariziyah*, the innate biological heat responsible for digestion, metabolism, tissue nutrition, and maintenance of life⁵. Classical scholars believed that every metabolic transformation depends upon adequate *Hararat*. Reduction of innate heat slows digestion, promotes incomplete metabolism, and favors excessive production of Balgham².

Modern biomedical science recognizes a remarkably similar phenomenon and reduced metabolic activity is characteristic of several disorders including:

Contemporary biomedical science recognizes pathological mechanisms that closely parallel the Unani concept of diminished *Hararat-e-Ghariziyah* (innate heat) and the subsequent formation of *Ghair Tabayi Balgham* (abnormal phlegm)^{1,2}. Reduced metabolic activity is a hallmark of several chronic conditions, including hypothyroidism, obesity, metabolic syndrome, aging, sarcopenia, and chronic inflammatory disorders. In these conditions, mitochondrial function is compromised, leading to decreased cellular energy production, reduced adenosine triphosphate (ATP) synthesis, diminished basal metabolic rate, impaired lipid oxidation, and defective glucose utilization²¹. As metabolic efficiency declines, excess nutrients are preferentially stored rather than oxidized for energy, resulting in increased adiposity, dyslipidemia, insulin resistance, and ectopic lipid deposition in organs such as the liver, skeletal muscle, and pancreas²². Persistent metabolic dysfunction is further aggravated by oxidative stress, chronic low-grade inflammation, hormonal imbalance, and impaired cellular signaling, all of which contribute to disease progression²³. These interconnected metabolic disturbances exhibit striking conceptual similarities to the Unani description of weakened innate heat, which fails to adequately digest, transform, and mature humoral substances, leading to the accumulation of thick, viscous, and poorly metabolized pathological phlegm⁶. Thus, modern biomedical evidence provides a plausible scientific framework that supports the traditional Unani understanding of abnormal phlegm as a manifestation of impaired metabolic homeostasis and an important contributor to the pathogenesis of several chronic metabolic diseases⁷.

Chronic Low-Grade Inflammation

Chronic low-grade inflammation is now recognized as a fundamental pathological mechanism underlying the development and progression of numerous non-

communicable diseases, including obesity, type 2 diabetes mellitus, cardiovascular disease, non-alcoholic fatty liver disease, osteoarthritis, and metabolic syndrome²⁴. Unlike acute inflammation, which is a rapid and self-limiting protective response to injury or infection, chronic low-grade inflammation persists for prolonged periods and is characterized by continuous activation of the innate immune system and sustained production of pro-inflammatory mediators²⁵. Major inflammatory biomarkers involved in this process include tumor necrosis factor-alpha (TNF- α), interleukin-6 (IL-6), interleukin-1 β (IL-1 β), C-reactive protein (CRP), and monocyte chemoattractant protein-1 (MCP-1)²⁶. These inflammatory cytokines disrupt insulin signaling pathways, impair endothelial function, alter lipid metabolism, promote oxidative stress, and dysregulate immune responses, thereby contributing to progressive tissue damage and metabolic dysfunction. Persistent inflammation also accelerates adipose tissue dysfunction, endothelial injury, fibrosis, and organ degeneration, ultimately increasing the risk of multiple chronic disorders²⁷.

Although classical Unani scholars did not possess knowledge of cytokines or molecular inflammatory pathways, they consistently described *Ghair Tabayi Balgham* (abnormal phlegm) as a pathological humor that accumulates within tissues, obstructs physiological channels (*Sudad*), weakens the functional integrity of organs, and gradually initiates chronic disease processes^{1,5}. According to classical Unani literature, prolonged retention of abnormal phlegm disturbs humoral equilibrium, impairs tissue nutrition, and predisposes individuals to progressive systemic disorders². This traditional concept closely parallels the contemporary understanding of chronic low-grade inflammation, in which persistent inflammatory mediators gradually damage tissues, impair metabolic homeostasis, and promote the onset and progression of chronic diseases³. Therefore, the Unani concept of abnormal phlegm may be interpreted as an early holistic description of the chronic inflammatory and metabolic disturbances that are now well established in modern biomedical science⁴.

Oxidative Stress

Oxidative stress is a fundamental pathological process that arises when the generation of reactive oxygen species (ROS) exceeds the capacity of endogenous antioxidant defense systems to neutralize them. Under physiological conditions, ROS are produced in controlled amounts and play essential roles in cellular signaling, immune defense, and metabolic regulation²⁸. However, excessive ROS production or diminished antioxidant activity results in oxidative damage to cellular components, including lipid peroxidation, DNA damage, protein oxidation, endothelial dysfunction, mitochondrial injury, and accelerated cellular aging²⁹. Persistent oxidative stress disrupts normal cellular homeostasis, impairs mitochondrial energy production, promotes chronic inflammation, and contributes to apoptosis and tissue degeneration³⁰. Consequently, oxidative stress has emerged as a key pathogenic

mechanism in numerous chronic diseases, including obesity, type 2 diabetes mellitus, cardiovascular disease, hypothyroidism, non-alcoholic fatty liver disease, rheumatoid arthritis, and neurodegenerative disorders such as Alzheimer's disease¹⁶.

From the Unani perspective, oxidative stress can be conceptually correlated with the deterioration of normal humoral quality resulting from defective digestion, impaired metabolism, and the accumulation of harmful metabolic waste products (*Fuzlat*)¹. Classical Unani scholars emphasized that efficient humoral maturation depends upon the proper functioning of digestive organs, adequate *Hararat-e-Ghariziyah* (innate heat), and effective elimination of waste materials². When these physiological processes become impaired, waste products accumulate within the body, altering the qualitative characteristics of the humors and gradually transforming *Tabayi Balgham* (physiological phlegm) into *Ghair Tabayi Balgham* (abnormal phlegm)³. This pathological phlegm loses its protective functions and acquires disease-producing properties, eventually disrupting tissue nutrition, obstructing physiological pathways (*Sudad*), and impairing organ function⁴. Thus, the Unani concept of abnormal phlegm provides a holistic interpretation that closely parallels the modern understanding of oxidative stress as a consequence of defective metabolism, accumulation of toxic by-products, and progressive cellular injury underlying a wide range of chronic metabolic and inflammatory disorders⁵.

Insulin Resistance

Insulin resistance is widely recognized as the central pathogenic mechanism underlying metabolic syndrome and plays a pivotal role in the development of several cardiometabolic disorders³¹. Under normal physiological conditions, insulin facilitates cellular glucose uptake, promotes glycogen synthesis in the liver and skeletal muscles, enhances protein synthesis, suppresses lipolysis, and regulates lipid metabolism, thereby maintaining energy homeostasis. However, when peripheral tissues such as skeletal muscle, adipose tissue, and the liver become less responsive to insulin, these metabolic processes are significantly impaired³².

As insulin sensitivity declines, glucose uptake by peripheral tissues decreases, resulting in persistent hyperglycemia and compensatory hyperinsulinemia⁵. Simultaneously, insulin fails to adequately suppress lipolysis in adipose tissue, leading to increased release of free fatty acids into the circulation. Elevated free fatty acids promote hepatic triglyceride synthesis, contribute to ectopic fat deposition, and accelerate the development of hepatic steatosis²⁹. Progressive accumulation of visceral adipose tissue further exacerbates insulin resistance through the secretion of pro-inflammatory cytokines, adipokine imbalance, and chronic low-grade inflammation³⁰. Collectively, these metabolic abnormalities culminate in the development of type 2 diabetes mellitus, non-alcoholic fatty liver disease (NAFLD), dyslipidemia, hypertension, and other components of metabolic syndrome¹⁶.

Interestingly, classical Unani physicians described a comparable clinical syndrome associated with the predominance of *Ghair Tabayi Balgham* (abnormal phlegm)⁵. According to Unani principles, excessive accumulation of abnormal phlegm impairs normal metabolic functions and results in obesity (*Saman-e-Mufrit*), lethargy, excessive sleep, reduced physical activity, sluggish digestion, increased body fat, and accumulation of thick, viscous humors within the body³³. These pathological changes gradually weaken organ function and predispose individuals to chronic metabolic disorders. Although Unani medicine explains these alterations through humoral imbalance rather than molecular mechanisms, the clinical manifestations closely resemble the metabolic consequences of insulin resistance recognized in contemporary biomedical science⁵.

Thus, despite differences in conceptual frameworks, both modern medicine and Unani medicine acknowledge that disturbances in metabolic regulation initiate a progressive cascade of physiological dysfunction, ultimately leading to obesity, diabetes, fatty liver disease, dyslipidemia, and cardiovascular complications⁵. This remarkable convergence supports the relevance of traditional Unani concepts in understanding chronic metabolic diseases from an integrative perspective¹.

Dyslipidemia and Lipid Accumulation

Abnormal lipid metabolism is one of the most important biomedical correlates of *Ghair Tabayi Balgham* described in Unani medicine¹⁶. Dyslipidemia, a hallmark of metabolic syndrome, is characterized by qualitative and quantitative abnormalities in circulating lipoproteins that significantly increase the risk of cardiovascular and metabolic diseases. The typical lipid profile includes elevated low-density lipoprotein (LDL) cholesterol, increased serum triglycerides, reduced high-density lipoprotein (HDL) cholesterol, and increased concentrations of very-low-density lipoproteins (VLDL). These alterations promote excessive lipid deposition in blood vessels and peripheral tissues, contributing to progressive organ dysfunction³⁴.

Insulin resistance plays a central role in the pathogenesis of dyslipidemia by increasing lipolysis in adipose tissue and enhancing the release of free fatty acids into the circulation³¹. The liver converts these free fatty acids into triglycerides and packages them into VLDL particles,

resulting in hypertriglyceridemia. Simultaneously, impaired lipid clearance and alterations in lipoprotein metabolism increase circulating LDL cholesterol while reducing the cardioprotective HDL fraction. This combination of elevated atherogenic lipoproteins and diminished HDL substantially increases cardiovascular risk³⁵.

Persistent dyslipidemia accelerates the development of atherosclerosis, a chronic inflammatory condition characterized by lipid accumulation within the arterial wall. Oxidized LDL cholesterol triggers endothelial dysfunction, inflammatory cell infiltration, and foam cell formation, ultimately leading to the formation of atherosclerotic plaques¹⁶. Progressive plaque growth narrows arterial lumens and reduces blood flow, predisposing individuals to coronary artery disease, ischemic stroke, and other cardiovascular complications. In addition, excessive hepatic triglyceride accumulation contributes to the development of non-alcoholic fatty liver disease (NAFLD), which is now recognized as the hepatic manifestation of metabolic syndrome³⁵.

The Unani concept of *Ghair Tabayi Balgham* closely parallels these pathological changes. Classical Unani scholars described abnormal phlegm as a thick, cold, and viscous humor that accumulates within tissues and blood vessels, impairing normal circulation and organ function⁵. They associated excessive *Balgham* with obesity (*Saman-e-Mufrit*), sluggish metabolism, poor digestion, excessive body fat, lethargy, and progressive obstruction of physiological channels (*Sudda*). Although these descriptions are based on humoral theory rather than molecular pathology, they remarkably resemble the modern understanding of lipid accumulation, impaired fat metabolism, and chronic metabolic disease³⁴.

Therefore, the pathological features of dyslipidemia and ectopic lipid deposition provide one of the strongest contemporary biomedical analogies for *Ghair Tabayi Balgham*⁶. Both Unani medicine and modern biomedical science recognize that abnormal accumulation of lipid-rich or viscous metabolic substances initiates a cascade of metabolic dysfunction, ultimately leading to obesity, fatty liver disease, atherosclerosis, cardiovascular disease, and other chronic metabolic disorders. This convergence strengthens the scientific relevance of the Unani concept within an integrative framework of metabolic health^{2,5}.

The relationship between classical Unani concepts and contemporary biomedical mechanisms can be summarized as follows:

Unani Concept	Modern Biomedical Correlation ^{5,6}
Weak Hararat-e-Ghariziyah	Reduced metabolic rate and mitochondrial dysfunction
Su'-e-Hazm	Digestive dysfunction and gut dysbiosis
Fasad-e-Akhlat	Metabolic derangement
Ghair Tabayi Balgham	Chronic low-grade inflammation and metabolic dysfunction
Sudad	Vascular, hepatic, and airway obstruction
Fuzlat accumulation	Toxic metabolites and oxidative stress
Balghami Mizaj	Obesity, insulin resistance, endocrine dysfunction
Quwwat-e-Mudabbira weakness	Immune dysregulation and impaired homeostasis

Obesity (*Siman Mufrit*) and the role of *Ghair Tabayi Balgham*

Obesity (*Siman Mufrit*) is a chronic multifactorial metabolic disorder characterized by excessive accumulation of body fat that adversely affects health and increases the risk of numerous non-communicable diseases, including type 2 diabetes mellitus, dyslipidemia, hypertension, cardiovascular disease, non-alcoholic fatty liver disease (NAFLD), and certain cancers^{5,34}. According to the World Health Organization, obesity has become a global public health challenge, with its prevalence increasing steadily due to unhealthy dietary habits, physical inactivity, urbanization, and genetic susceptibility³⁶. In contemporary medicine, obesity is recognized as a state of chronic low-grade inflammation associated with insulin resistance, adipose tissue dysfunction, oxidative stress, and endocrine imbalance⁵. These pathological changes disrupt normal energy homeostasis and contribute to metabolic syndrome and related complications.¹

In Unani medicine, obesity is described as *Siman Mufrit*, a condition resulting from excessive accumulation of fat and predominance of the *Balghami Mizaj* (phlegmatic temperament)³⁷. Classical Unani scholars, including Hippocrates, Galen, Al-Razi, Ibn Sina, and Akbar Arzani, attributed obesity to excessive production and accumulation of *Ghair Tabayi Balgham* (abnormal phlegm) caused by weakened digestive power (*Su'-e-Hazm*), diminished innate heat (*Hararat-e-Ghariziyah*), excessive intake of cold and moist foods, lack of physical activity, prolonged sleep, and sedentary habits⁵. They proposed that impaired digestion leads to incomplete transformation of food into healthy humors, resulting in the formation of abnormal, viscous phlegm that accumulates within tissues and promotes excessive fat deposition^{1,2}.

The Unani concept of *Ghair Tabayi Balgham* closely parallels several mechanisms described in modern biomedical research⁵. Reduced innate heat resembles a decreased basal metabolic rate and mitochondrial dysfunction, while defective digestion corresponds to impaired nutrient metabolism and altered gut microbiota. Furthermore, the accumulation of abnormal phlegm reflects excessive lipid storage, adipocyte hypertrophy, and chronic inflammation observed in obesity³⁴. Adipose tissue in obese individuals functions as an active endocrine organ, secreting pro-inflammatory cytokines such as tumor necrosis factor-alpha (TNF- α), interleukin-6 (IL-6), and leptin, while reducing the production of the anti-inflammatory adipokine adiponectin. These alterations contribute to insulin resistance, endothelial dysfunction, oxidative stress, and progressive metabolic impairment³⁸.

Clinically, obesity associated with *Ghair Tabayi Balgham* manifests as increased body weight, excessive sleep, lethargy, reduced physical activity, poor digestion, cold intolerance, breathlessness on exertion, and generalized weakness¹. These features closely resemble the manifestations of *Balghami* predominance described in classical Unani texts². The striking similarities between the traditional concept of abnormal phlegm and

contemporary understanding of obesity suggest that *Ghair Tabayi Balgham* may represent a holistic description of the metabolic, inflammatory, and endocrine disturbances underlying obesity³. Therefore, integrating Unani principles of dietary regulation (*Ilaj bil Ghiza*), lifestyle modification, regimenal therapy (*Ilaj bil Tadbeer*), and pharmacotherapy (*Ilaj bil Dawa*) with modern evidence-based interventions may provide a comprehensive strategy for preventing and managing obesity and its associated metabolic disorders⁴.

Hypothyroidism and the role of *Ghair Tabayi Balgham*

Hypothyroidism is one of the most common endocrine disorders, characterized by inadequate production of thyroid hormones, resulting in a generalized reduction in metabolic activity^{6,39}. The condition may be primary, secondary, or subclinical and is associated with autoimmune thyroid disease, iodine deficiency, thyroid surgery, radiation exposure, congenital abnormalities, and certain medications. Thyroid hormones regulate basal metabolic rate, thermogenesis, lipid metabolism, carbohydrate metabolism, protein synthesis, and cardiovascular function^{40,41}. Deficiency of these hormones leads to fatigue, weight gain, cold intolerance, constipation, dry skin, bradycardia, cognitive impairment, depression, menstrual irregularities, infertility, and dyslipidemia. If left untreated, hypothyroidism increases the risk of metabolic syndrome, cardiovascular disease, and reduced quality of life⁴².

Although hypothyroidism is not described as a distinct disease entity in classical Unani literature, many of its clinical manifestations closely resemble conditions associated with *Ghalba-e-Balgham* (predominance of phlegm) and *Ghair Tabayi Balgham* (abnormal phlegm)³⁹. According to Unani scholars, including Ibn Sina, Al-Razi, and Akbar Arzani, diminished *Hararat-e-Ghariziyah* (innate heat) weakens digestive and metabolic functions, resulting in incomplete transformation of food into healthy humors. Consequently, excessive and abnormal *Balgham* accumulates within the body, producing a cold and moist temperament (*Barid Ratab Mizaj*)¹. This pathological state manifests clinically as lethargy, sluggishness, excessive sleep, obesity, cold intolerance, poor appetite, constipation, edema, reduced physical activity, and mental dullness, features that closely parallel the clinical presentation of hypothyroidism⁴.

From a biomedical perspective, hypothyroidism is characterized by reduced basal metabolic rate and impaired mitochondrial oxidative metabolism, leading to decreased energy production and increased accumulation of body fat^{41,42}. The reduction in thyroid hormone activity also alters lipid metabolism, causing elevated serum cholesterol, low-density lipoprotein (LDL), and triglyceride levels while promoting oxidative stress and endothelial dysfunction. Chronic low-grade inflammation, increased circulating inflammatory cytokines, and insulin resistance further contribute to metabolic disturbances in hypothyroid patients⁴³. These mechanisms are conceptually similar to the Unani

description of weakened innate heat leading to defective metabolism and accumulation of abnormal phlegm throughout the body⁴.

The role of *Ghair Tabayi Balgham* in hypothyroidism may therefore be interpreted as a systemic metabolic dysfunction characterized by impaired digestion, reduced tissue metabolism, excessive moisture, and accumulation of pathological humors^{4,41}. Classical Unani physicians believed that this abnormal phlegm obstructs normal physiological processes (*Sudad*), weakens organ function, and predisposes individuals to chronic diseases. Similarly, modern endocrinology recognizes that prolonged thyroid hormone deficiency disrupts carbohydrate, lipid, and protein metabolism, increasing the risk of obesity, dyslipidemia, non-alcoholic fatty liver disease, cardiovascular disease, and metabolic syndrome. The close correlation between these concepts highlights the relevance of traditional humoral theory in explaining complex endocrine disorders⁴².

Management of hypothyroidism from an integrative perspective should focus on correcting the underlying metabolic imbalance through dietary modification (*Ilaj bil Ghiza*), regular physical activity, improvement of digestive function, and appropriate pharmacological therapy^{4,39}. In Unani medicine, therapies aimed at reducing excessive *Balgham*, strengthening *Hararat-e-Ghariziyah*, and restoring humoral balance may complement conventional thyroid hormone replacement, although robust clinical studies are needed to establish their efficacy and safety^{41,42}. Thus, the Unani concept of *Ghair Tabayi Balgham* provides a holistic framework that closely aligns with contemporary understanding of the metabolic and inflammatory mechanisms involved in hypothyroidism, offering opportunities for integrative approaches to prevention and management^{43,44}.

Non-Alcoholic Fatty Liver Disease (NAFLD) and the role of *Ghair Tabayi Balgham*:

Non-alcoholic fatty liver disease (NAFLD) is one of the most prevalent chronic liver disorders worldwide and is characterized by excessive accumulation of triglycerides in hepatocytes in the absence of significant alcohol consumption⁴⁵. The disease encompasses a spectrum ranging from simple hepatic steatosis to non-alcoholic steatohepatitis (NASH), fibrosis, cirrhosis, and hepatocellular carcinoma. NAFLD is strongly associated with obesity, insulin resistance, type 2 diabetes mellitus, dyslipidemia, and metabolic syndrome, making it the hepatic manifestation of systemic metabolic dysfunction. The pathogenesis of NAFLD is complex and involves insulin resistance, altered lipid metabolism, oxidative stress, mitochondrial dysfunction, chronic low-grade inflammation, gut microbiota dysbiosis, and genetic susceptibility¹. These factors promote excessive hepatic lipid accumulation, inflammatory cytokine release, and progressive liver injury⁴.

Although NAFLD is not explicitly described in classical Unani literature, its clinical features and underlying mechanisms closely resemble the pathological effects of *Ghair Tabayi Balgham* (abnormal phlegm)⁵. According to

Unani scholars, the liver (*Kabid*) is the principal organ responsible for the formation and maturation of the four humors (*Akhlat*)⁶. Proper hepatic function depends on adequate *Hararat-e-Ghariziyah* (innate heat) and efficient digestive processes. Weakness of hepatic metabolism, impaired digestion (*Su'e-Hazm*), excessive consumption of cold and moist foods, sedentary lifestyle, and predominance of *Balghami Mizaj* (phlegmatic temperament) result in the production of abnormal phlegm. This pathological humor accumulates within the liver and other tissues, leading to impaired organ function and chronic disease¹⁶.

The Unani concept of *Ghair Tabayi Balgham* demonstrates remarkable similarity to the modern pathophysiology of NAFLD. Reduced innate heat corresponds to diminished hepatic metabolic activity and mitochondrial dysfunction, while defective humoral transformation resembles impaired lipid oxidation and excessive triglyceride synthesis⁴⁶. Similarly, the accumulation of abnormal phlegm parallels hepatic steatosis, in which excessive fat deposition disrupts normal liver architecture and function. Modern studies have shown that adipose tissue-derived inflammatory cytokines, including tumor necrosis factor-alpha (TNF- α) and interleukin-6 (IL-6), together with oxidative stress and insulin resistance, contribute to hepatocellular injury and progression from simple steatosis to steatohepatitis and fibrosis^{16,46}. These mechanisms are conceptually consistent with the Unani description of pathological humors causing tissue damage, obstruction (*Sudad*), and gradual deterioration of organ function⁵.

Clinically, patients with NAFLD commonly present with obesity, central adiposity, fatigue, dyspepsia, abdominal discomfort, elevated liver enzymes, dyslipidemia, and impaired glucose metabolism, features frequently associated with *Balghami* predominance in Unani medicine⁴⁶. From an integrative perspective, management should emphasize weight reduction, dietary modification, regular physical activity, and improvement of hepatic metabolism through lifestyle interventions. Unani therapeutic principles aimed at reducing excessive *Balgham*, strengthening digestive and hepatic functions, and restoring humoral balance may complement contemporary evidence-based management of NAFLD⁴⁵. Therefore, the concept of *Ghair Tabayi Balgham* provides a holistic framework that closely aligns with modern understanding of NAFLD as a metabolic and inflammatory liver disease and highlights the potential for integrative strategies in its prevention and treatment^{5,46}.

Polycystic Ovary Syndrome (PCOS) and the role of *Ghair Tabayi Balgham*

Polycystic ovary syndrome (PCOS) is the most common endocrine and metabolic disorder affecting women of reproductive age, with a global prevalence ranging from 6% to 20%, depending on the diagnostic criteria used⁴⁷. It is characterized by hyperandrogenism, chronic anovulation, menstrual irregularities, polycystic ovarian morphology, infertility, obesity, insulin resistance, and metabolic dysfunction. In addition to reproductive complications, women with PCOS have an increased risk

of type 2 diabetes mellitus, dyslipidemia, metabolic syndrome, cardiovascular disease, and non-alcoholic fatty liver disease (NAFLD)⁴⁸. The pathogenesis of PCOS is multifactorial, involving genetic predisposition, insulin resistance, chronic low-grade inflammation, oxidative stress, endocrine dysregulation, and altered adipokine secretion. These interconnected mechanisms contribute to ovarian dysfunction, impaired follicular maturation, and excessive androgen production⁵.

Although PCOS is not described as a distinct clinical entity in classical Unani literature, many of its manifestations closely resemble disorders attributed to *Ghalba-e-Balgham* (predominance of phlegm) and *Ghair Tabayi Balgham* (abnormal phlegm)⁴⁹. According to Unani scholars, the reproductive system depends on balanced humoral composition, adequate *Hararat-e-Ghariziyah* (innate heat), and normal hepatic metabolism for the production of healthy blood and reproductive fluids⁴. Weak digestive power (*Su'e-Hazm*), excessive intake of cold and moist foods, sedentary lifestyle, obesity, and predominance of *Balghami Mizaj* lead to the formation of abnormal phlegm, which accumulates within the body and interferes with normal ovarian and uterine functions⁵. This pathological state is associated with obesity, menstrual disturbances, infertility, excessive vaginal discharge, lethargy, and reduced reproductive capacity, clinical features that closely parallel those observed in women with PCOS⁴⁸.

From a biomedical perspective, insulin resistance plays a pivotal role in the pathogenesis of PCOS by increasing circulating insulin levels, which stimulate ovarian androgen production and suppress hepatic synthesis of sex hormone-binding globulin (SHBG)⁴⁹. The resulting hyperandrogenism disrupts follicular development and ovulation, leading to menstrual irregularities and infertility. Furthermore, chronic inflammation, oxidative stress, mitochondrial dysfunction, and adipose tissue-derived cytokines such as tumor necrosis factor-alpha (TNF- α) and interleukin-6 (IL-6) exacerbate endocrine and metabolic abnormalities⁵⁰. These mechanisms closely resemble the Unani concept of diminished innate heat, impaired metabolism, and accumulation of *Ghair Tabayi Balgham*, which weakens physiological functions and promotes chronic disease¹.

Clinically, women with PCOS frequently present with obesity, central adiposity, irregular menstruation, anovulation, infertility, acne, hirsutism, fatigue, insulin resistance, and dyslipidemia. Many of these features are consistent with the characteristics of *Balghami* predominance described in classical Unani texts⁴⁸. From an integrative perspective, management should focus on weight reduction, dietary regulation, regular physical activity, improvement of digestive and hepatic function, and restoration of humoral balance. Lifestyle modification remains the cornerstone of therapy, while evidence-based pharmacological treatment may be complemented by appropriate Unani interventions aimed at reducing excessive *Balgham* and strengthening metabolic function⁴⁹. Thus, the concept of *Ghair Tabayi Balgham* provides a holistic explanation for the metabolic, endocrine, and reproductive disturbances

observed in PCOS and supports the integration of traditional Unani principles with contemporary biomedical approaches for comprehensive disease management.⁴⁷

Osteoarthritis and the role of *Ghair Tabayi Balgham*

Osteoarthritis (OA) is the most common degenerative joint disorder and a leading cause of pain, disability, and reduced quality of life among older adults. It is characterized by progressive degeneration of articular cartilage, subchondral bone remodeling, synovial inflammation, osteophyte formation, and loss of joint function⁵². The prevalence of osteoarthritis increases with advancing age, obesity, joint injury, genetic predisposition, and mechanical stress. Although traditionally considered a wear-and-tear disease, current evidence indicates that osteoarthritis is a complex disorder involving chronic low-grade inflammation, oxidative stress, metabolic dysfunction, and altered cartilage homeostasis⁵³. Pro-inflammatory cytokines, including tumor necrosis factor-alpha (TNF- α), interleukin-1 β (IL-1 β), and interleukin-6 (IL-6), stimulate the production of matrix metalloproteinases (MMPs), leading to degradation of extracellular matrix components such as collagen and proteoglycans, ultimately resulting in cartilage destruction and joint dysfunction⁵⁴.

In Unani medicine, osteoarthritis is comparable to conditions such as *Waja' Al-Mafasil*, *Tahajjur Al-Mafasil*, and *Taqashshuf Al-Mafasil*, in which the predominance of *Ghair Tabayi Balgham* (abnormal phlegm) is considered a major pathogenic factor⁵³. Classical Unani physicians, including Ibn Sina, Al-Razi, and Akbar Arzani, described that weakening of *Hararat-e-Ghariziyah* (innate heat) and impaired digestion (*Su'e-Hazm*) lead to the production of abnormal, viscous phlegm. This pathological humor accumulates in joints and surrounding tissues, causing obstruction (*Sudad*), stiffness, pain, swelling, restricted movement, and gradual degeneration of joint structures. Individuals with a *Balghami Mizaj* (phlegmatic temperament) are considered more susceptible to musculoskeletal disorders because of the predominance of coldness and moisture, which impair normal tissue nutrition and repair⁵³.

The Unani concept of *Ghair Tabayi Balgham* demonstrates significant similarities with the contemporary understanding of osteoarthritis⁵. Obesity, one of the major risk factors for OA, promotes systemic inflammation through increased secretion of adipokines and inflammatory cytokines, accelerating cartilage degradation. Similarly, oxidative stress and mitochondrial dysfunction impair chondrocyte survival and extracellular matrix synthesis, leading to progressive joint degeneration. These mechanisms closely parallel the Unani concept of diminished innate heat, defective metabolism, and accumulation of pathological phlegm within the joints. Moreover, the classical description of *Sudad* corresponds to impaired synovial fluid dynamics and reduced nutrient diffusion to articular cartilage, both of which contribute to cartilage deterioration and loss of joint function⁵⁵.

Clinically, osteoarthritis presents with joint pain that worsens with activity, morning stiffness lasting less than 30 minutes, crepitus, reduced range of motion, tenderness, and progressive functional limitation⁵². From a Unani perspective, these manifestations reflect the accumulation of abnormal *Balgham* and weakening of musculoskeletal tissues. Management should therefore focus on reducing excessive body weight, improving digestion, enhancing physical activity, and restoring humoral balance⁵³. Unani therapeutic approaches, including *Ilaj bil Ghiza* (dietotherapy), *Ilaj bil Tadbeer* (regimenal therapy) such as massage, exercise, and *Hijama* (cupping), and *Ilaj bil Dawa* (pharmacotherapy) using anti-inflammatory and *Muhallil-e-Waram* (resolvent) herbal medicines, may complement conventional treatment aimed at pain relief and preservation of joint function^{55,56}. Thus, the concept of *Ghair Tabayi Balgham* provides a holistic framework that aligns with current knowledge of the metabolic, inflammatory, and degenerative mechanisms involved in osteoarthritis and supports an integrative approach to its prevention and management^{5,57}.

Conclusion

The concept of *Ghair Tabayi Balgham* (abnormal phlegm) occupies a central position in the Unani understanding of disease pathogenesis and provides a comprehensive framework for explaining the development of numerous chronic metabolic and inflammatory disorders. Classical Unani scholars recognized that impaired digestion (*Su'-e-Hazm*), weakened *Hararat-e-Ghariziyah* (innate heat), and disturbed humoral balance lead to the formation and accumulation of abnormal phlegm, which disrupts normal physiological functions and predisposes individuals to disease. Contemporary biomedical research demonstrates remarkable parallels between these traditional concepts and modern mechanisms, including insulin resistance, chronic low-grade inflammation, oxidative stress, mitochondrial dysfunction, endocrine imbalance, and altered lipid metabolism. These shared mechanisms underlie common disorders such as obesity, hypothyroidism, dyslipidemia, type 2 diabetes mellitus, non-alcoholic fatty liver disease, polycystic ovary syndrome, and osteoarthritis. Integrating the Unani concept of *Ghair Tabayi Balgham* with current biomedical evidence offers a holistic perspective on disease prevention and management by emphasizing dietary regulation, lifestyle modification, restoration of metabolic balance, and personalized therapeutic interventions. Although conceptual similarities are compelling, further experimental studies, molecular investigations, and well-designed clinical trials are essential to validate the biological basis of *Ghair Tabayi Balgham* and evaluate the efficacy of Unani interventions. Such evidence will strengthen the scientific foundation of Unani medicine and promote its integration into evidence-based, patient-centered healthcare for the prevention and management of chronic non-communicable diseases.

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