

Review Article

Integrating Unani principles in the understanding and management of non-alcoholic fatty liver disease: a review

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ABSTRACT

Non-Alcoholic Fatty Liver Disease (NAFLD) is a major cause of chronic liver dysfunction globally, affecting nearly 25% of the world's population. In India, its prevalence ranges from 9% to 32%, with higher occurrence among individuals who are obese or have diabetes mellitus, insulin resistance, hyperlipidaemia, or a sedentary lifestyle. NAFLD encompasses a wide pathological spectrum, beginning with simple hepatic steatosis and potentially progressing to non-alcoholic steatohepatitis (NASH), cirrhosis, and hepatocellular carcinoma. The disease is strongly associated with mechanisms such as insulin resistance, disturbed lipid metabolism, oxidative stress, inflammation, and hepatic fibrosis. Despite extensive research, modern medicine currently lacks a definitive pharmacological therapy, which has led to growing interest in traditional medical systems, including Unani medicine. According to Unani principles, NAFLD referred to as Ghair Khamri Tashahhum-e-Kabid arises from derangement of the hepatic temperament (Mizaj) and imbalance of humors, particularly an excess of Balgham and Sauda. This imbalance results in obstruction and accumulation of morbid matter within the liver. Common clinical features include fatigue, a feeling of heaviness in the right hypochondrium, impaired digestion, and changes in temperament. Management in Unani medicine aims to restore humoral balance through Ilaj-bil-Ghiza (dietotherapy), Ilaj-bit-Tadbeer (regimental therapy), and Ilaj-bil-Dawa (pharmacotherapy). Several Unani medicinal plants, such as Afsanteen (*Artemisia absinthium*), Darchini (*Cinnamomum zeylanicum*), and Mako (*Solanum nigrum*), possess hepatoprotective, antioxidant, and anti-inflammatory properties that are relevant to the management of NAFLD. Thus, Unani medicine offers a holistic conceptual framework for understanding liver disorders analogous to NAFLD. Integrating classical Unani knowledge with contemporary scientific research on metabolic and herbal mechanisms may provide effective preventive and therapeutic approaches. However, further clinical studies are required to validate the efficacy and safety of Unani interventions in the management of NAFLD.

Keywords: NAFLD, Ghair khamri tashahhum-e-kabid, Warne kabid, Unani medicine, Hepatoprotective herbs

INTRODUCTION

Non-Alcoholic Fatty Liver Disease (NAFLD) refers to a broad spectrum of liver disorders characterized by excessive fat accumulation in the liver in the absence of

significant alcohol consumption, typically defined as less than 20 g/day for women and less than 30 g/day for men. This spectrum includes simple hepatic steatosis, steatosis with inflammation known as non-alcoholic steatohepatitis (NASH), and advanced stages such as cirrhosis.¹ NAFLD

encompasses varying degrees of liver pathology with distinct clinical outcomes. Simple accumulation of triglycerides within hepatocytes, termed hepatic steatosis, represents the most benign end of the disease spectrum. In contrast, cirrhosis and primary liver cancer constitute the most severe and clinically concerning outcomes. The likelihood of progression to cirrhosis is very low in individuals with isolated steatosis, also referred to as non-alcoholic fatty liver (NAFL). However, the risk increases significantly when steatosis is accompanied by hepatocellular injury, cell death, and inflammatory infiltration, defining NASH. It is estimated that at least 25% of adults with NAFLD have NASH. Furthermore, NASH is a heterogeneous condition that may regress to simple steatosis or normal liver histology, remain stable for extended periods, or progressively worsen with increasing fibrosis, ultimately leading to cirrhosis (stage 4 fibrosis).²

ETIOLOGY

NAFLD is strongly associated with obesity, dyslipidemia insulin resistance and type 2 diabetes mellitus, so may be considered to be the hepatic manifestation of the Metabolic syndrome.

Metabolic factor

Obesity and insulin resistance

Central obesity and insulin resistance primarily contribute to NAFLD. Insulin resistance leads to increased free fatty acid influx into the liver, promoting triglyceride accumulation and hepatic steatosis.³

Type 2 diabetes and dyslipidemia

Elevated blood glucose and lipid levels worsen inflammation and fat accumulation in the liver, increasing the risk of progression to NASH and cirrhosis.

Environmental and lifestyle factors

Dietary patterns

High intake of simple carbohydrates, saturated fats, and processed foods contributes to caloric imbalance, leading to weight gain and liver fat accumulation.⁴

Physical inactivity

Sedentary lifestyles exacerbate obesity and insulin resistance, increasing the risk of NAFL.

Sleep deprivation

Inadequate sleep is linked to metabolic disturbances, including insulin resistance and weight gain, which can contribute to NAFLD development.

Drugs and toxins

Certain drugs, such as tamoxifen, diltiazem, Glucocorticoids, Amiodarone, and methotrexate, have been implicated in drug-induced fatty liver. Additionally, exposure to environmental toxins like phosphorus and certain hepatotoxins can lead to liver fat accumulation.⁶

Genetic predisposition

PNPLA3 gene variant

The I148M polymorphism in the PNPLA3 gene is strongly associated with NAFLD severity. This variant impairs triglyceride breakdown, leading to fat accumulation in hepatocytes.^{6,7}

Medical conditions

Polycystic ovary syndrome

Women with polycystic ovary syndrome are at increased risk of NAFLD due to associated metabolic disturbances.

Obstructive sleep apnoea

This condition is linked to insulin resistance and liver fat accumulation.

Hypothyroidism and hypopituitarism

Endocrine disorders can contribute to metabolic abnormalities, increasing NAFLD risk.^{6,8}

EPIDEMIOLOGY

The prevalence of NAFLD in India shows wide regional variation, ranging from 8.7% in rural areas of West Bengal to as high as 53.5% in Chandigarh. Most studies conducted in urban populations have reported a higher prevalence compared with those from rural regions. A systematic review and meta-analysis by Shalimar et al reported a pooled prevalence of 38.6% among adults and 35.4% among children. Among paediatric NAFLD cases, 63.4% were found to be obese.

One major limitation in interpreting epidemiological data on NAFLD in India is that many studies have been hospital-based, making them susceptible to referral bias. A large community-based prevalence study by Duseja et al reported fatty liver in 55.1% of participants, with a median age of 34 years. However, this study included nearly 1,000 participants, of whom only three were female, limiting the generalizability of the findings to the broader community.

A retrospective histopathological analysis of liver biopsies from 1,000 patients diagnosed with NAFLD by Rastogi et al revealed that more than 60% had a NAFLD Activity Score (NAS) ≥ 5 , consistent with definite NASH, along with significant fibrosis ($\geq F2$). Furthermore, an interim

analysis from the Indian Consortium on NAFLD (ICON-D) demonstrated that significant fibrosis was present in 36.3% of NAFLD patients, while cirrhosis was observed in 11%.

PATHOBIOLOGY

The major risk factors for NAFLD include obesity, type 2 diabetes mellitus, metabolic syndrome, and dyslipidemia. Other comorbid conditions associated with NAFLD include polycystic ovary syndrome, hypothyroidism, hypopituitarism, hypogonadism, and obstructive sleep apnoea. Two fundamental and interrelated pathogenic abnormalities in NAFLD are insulin resistance with compensatory hyperinsulinemia and elevated circulating levels of non-esterified fatty acids released from adipose tissue and subsequently taken up by hepatocytes. Excessive hepatic uptake of these fatty acids leads to macro vesicular steatosis, predominantly involving the centrilobular region of the liver. In addition, patients with NAFLD demonstrate increased hepatic de novo lipogenesis.

Although free fatty acids are efficiently esterified into neutral triglycerides within hepatocytes, the unesterified fraction is considered the principal mediator of hepatocellular injury through lipotoxic mechanisms. In the setting of hepatic steatosis, several factors contribute to hepatocyte injury, inflammation, and fibrosis, including oxidative stress, endoplasmic reticulum stress, apoptosis, adipocytokine imbalance, and activation of hepatic stellate cells. The primary sources of oxidative stress are mitochondria and microsomes. Adipocytokines that play a critical role in NAFLD pathogenesis include adiponectin and tumour necrosis factor-alpha (TNF- α).

The “two-hit” hypothesis has traditionally been proposed to explain NAFLD pathogenesis, wherein the first hit leads to hepatic steatosis and a subsequent second hit promotes progression to steatohepatitis. However, current understanding suggests that disease progression results from hepatocellular injury caused by multiple concurrent insults, including:

Oxidative stress due to free radical generation during fatty acid oxidation; direct lipotoxicity; gut-derived endotoxins; pro-inflammatory cytokine release (e.g., TNF- α); endoplasmic reticulum stress.

These injurious processes trigger immune-mediated hepatocellular damage and cell death, ultimately leading to hepatic stellate cell activation and the development of liver fibrosis.¹

CONCEPT OF FATTY LIVER IN UNANI SYSTEM OF MEDICINE

Although fatty liver disease is not described explicitly in classical Unani texts, Unani scholars have documented several hepatic disorders that closely resemble the modern

understanding of fatty liver disease. Firdaus et al describes the liver as the “house of blood,” located on the right side of the body. Like other vital organs, the liver possesses four intrinsic faculties (Quwwat): Quwwat-e-Jazibah (absorptive), Quwwat-e-Hazimah (digestive), Quwwat-e-Masikah (retentive), and Quwwat-e-Dafi’ah (expulsive). Proper hepatic function depends on the harmonious activity of these faculties.

Weakness of Quwwat-e-Jazibah impairs the liver’s ability to receive nourishment (ghiza), which in turn disrupts the function of the remaining faculties. When Quwwat-e-Masikah is weakened, retention of nourishment within the liver is compromised. Impairment of Quwwat-e-Hazimah leads to improper digestion of nourishment, resulting in fasad (corruption or putrefaction), while weakness of Quwwat-e-Dafi’ah prevents the expulsion of waste, causing Saqal-e-Ghiza (heaviness of food) to persist in the liver.

Any disturbance in these hepatic faculties results in derangement of the liver’s Mizaj (temperament), leading to the accumulation of Mawad-e-Fasidah (morbid matter). This pathological accumulation can be conceptually correlated with hepatic steatosis as understood in modern medicine.¹¹

MAHIYAT-E-MARZI

Unani scholars have described several pathological conditions that can be correlated with the modern concept of hepatic steatosis. These conditions are explained through disturbances in hepatic temperament, humoral imbalance, and dysfunction of innate faculties.

Su’-e-mizaj-e-kabid (derangement of hepatic temperament)

The normal temperament (Mizaj) of the liver is Har wa Ratab (hot and moist). Fatty liver disease is considered to arise from a Barid wa Ratab (cold and moist) derangement of hepatic temperament. The causes of Su’-e-Mizaj-e-Kabid include:

Consuming meals in close succession, i.e., eating before the complete digestion of the previous meal

Drinking Sard Pani (cold water) immediately after Riyazat (exercise), Hammam (bath), or Jima (coitus), which induces coldness in hepatic temperament.^{12,13}

A sedentary lifestyle leading to stagnation of metabolic processes. Excessive rest, oversleeping, and lack of physical activity.¹²⁻¹⁴

Obesity (saman-e-mufrit)

According to Unani principles, the liver is the source of Hararat-e-Ghariziyah (innate heat), which is distributed throughout the body via the blood. In cases of abnormal

obesity and bodily congestion (Imtila), this innate heat becomes diminished, resulting in hepatic overload and subsequent deposition of excessive fatty matter within the liver.^{14,15}

Accumulation of balgham (phlegmatic humor)

In Unani medicine, Waram-e-Kabid Barid (cold inflammation of the liver) is attributed to the accumulation of Balgham. Due to its cold and moist nature, Balgham accumulates in the liver when digestive processes are weakened. Systemic accumulation of phlegm leads to symptoms such as indigestion, flatulence, anorexia, and lethargy. Waram-e-Kabid Balghami bears close resemblance to the clinical features of fatty liver disease. Furthermore, accumulation of thick (Ghaleez) and viscous Balgham results in the formation of Suddah (obstruction) within the liver. Consumption of heavy and viscous diets (Ghaleez wa Kaseef Ghiza) and a sedentary lifestyle further promote such obstructions. The viscous Balgham tends to deposit within the Masamat, Mujari, and Uruq of the liver, thereby obstructing the normal flow of Akhlat (humors) and Ruh (vital spirit), ultimately disturbing hepatic metabolic function and leading to fatty liver disease.¹³

Role of quwwat-e-tabaiyah(natural faculty)

The liver is considered one of the A'za-e-Ra'eesah (vital organs) in Unani medicine. According to Buqrat (Hippocrates), much of human life depends upon the liver, which serves as the source of Quwwat-e-Tabaiyah. Through this faculty, essential functions such as digestion (Hazm), absorption (Jazb), retention (Imsak), and excretion (Daf'a) are carried out.¹⁶ Impaired digestion leads to the formation of abnormal Akhlat, which, instead of being properly assimilated or eliminated, accumulate in tissues such as the liver. Additionally, impairment of Quwwat-e-Dafi'ah hinders the elimination of waste humors, thereby promoting fatty deposition within the liver.¹⁴

Tashkheesi alamat of su-e-mijaz barid kabid

In unani system of medicine the diagnosis of the disease is made clinically with the help of nabz (examination of pulse), and baul wa baraz(examination of urine and stool).

Nabz

According to Jurjani (zakheera khwarzam shahi) In Su-e-mijaz barid, nabz will be sust, and za'eef because according to Jurjani, buroodat causes weak quwwat-e-qalb.

Baul

According to Jurjani in Sue-mijaz barid the baul of patient will be whitish and watery. According to Khan et al

(Akseer -e-azam) the baul of the Sue-mijaz-barid kabid will be like washed water of meat.

Baraz

According to Jurjani the baraz of Su-e-mijaz barid kabid will be sometimes whitish and sometimes blackish and greenish.^{17,18}

Tashkheesi alamat of sudda-e-jigar

Waja-e-jigar (liver pain)

Due to sudda -e-jigar madda- e- fasida is trapped inside jigar which causes pain.

Baul safed wa panidar (whitish and watery baul)

Emphasises on Ghalba-e-buroodat which eventually signifies that the suddah is due to Balgham.

Bhuk ki kami (decreased appetite)

Due to weak amal-e-hazm of liver there is decrease of appetite.¹⁹

If suudah is present in blood vessels of liver then ghiza musaffa will not reach to liver, if suddah is present upper part of liver then there is excretion of same maddah in qarooarah(urine) as of suddah is made from. And if suddah is present at lower part of liver then there will be excretion of same maddah from stool as of suddah is made from.²⁰

MANAGEMENT OF NAFLD IN UNANI SYSTEM OF MEDICINE

In Unani medicine, the liver is a Shareef Uzw (vital organ). Just as the heart is the center of Quwwat-e-Haiwani and the brain is the center of Quwwat-e-Nafsani, the liver is the center of Quwwat-e-Tabaiyah, and Aza ki Ghiza (nutrition of organs) and Badan ki Parwarish (growth of body) depend on the liver. Any disruption in its Hazm and Akhlat affects the entire body. In every liver disease, all four Quwahs are considered, and any weak Quwah should be strengthened. There should be Tadeel (balance) in Su'-e-Mizaj and Tafteeh (dissolve) of Suddah, and for Tadeel-e-Jigar, the drugs used must have properties of Mufarrahat (fragrant), Mudirrat (diuretics), and Mufattihat (deobstruent). In Unani medicine, fatty liver disease can be managed through three main regimens:

Ilaj-bil-ghiza (dietotherapy)

Diet plays an important role in the management of NAFLD, as unhealthy dietary habits alter the temperament of the liver. Both starvation and overeating can cause Su'-e-Mizaj-e-Barid. Light and easily digestible foods should be prescribed, such as small bird soup, chicken soup, pulses, Sagodana Kheer (Metroxylansago gruel), Daliya (wheat gruel), Kishneez (Coriandrum sativum), and

Pudina (*Mentha piperita*). According Khan et al in Akseer-e-Azam, hot foods such as Biryan (fried) meat of Murgh (chicken), Chida/Teetar (partridge), and Bater (quail) are

beneficial. Patients should avoid oily, spicy, fatty, fried, and indigestible foods.²¹

Table 1: Adviya mufradat for NAFLD.

Drugs	Botanical name	Pharmacological action	Chemical constituent	Studies
Afsanteen	<i>Artemisia absinthium</i>	Muqawwi-e-meda (stomachic – strengthens digestion), munaqqi-e-meda (gastric cleanser), mudirr-e-baul (diuretic), mughalliz-e-mani (semen thickener), Muqawwi-e-jigar (hepatotonic – strengthens the liver)	Absinthin, anabsinthin artabsin, essential (volatile) oil, thujone (α -thujone, β -thujone), α -pinene, myrcene, Nerol, phellandrene, Cadinene, sesquiterpene lactones	The study had revealed that the test drug afsanteen has the potential to relieve some subjective and objective symptoms of fatty liver with no adverse effects. ²⁷
Darchini	<i>Cinnamomum zeylanicum</i>	Muqawwi-e-meda (stomachic – strengthens digestion), muqawwi-e-qalb (cardiotonic – strengthens the heart), muqawwi-e-a'za raisa munaffis-e-balgam	<i>Volatile (essential) oil components:</i> cinnamaldehyde, eugenol, cinnamyl acetate, benzaldehyde, linalool, B-caryophyllene, trans-cinnamyl alcohol, safrole <i>Non-volatile components:</i> mucilage, Tannins, resin, Procyanidins, catechins, Cinnamic acid, cinnamate, Flavonoids, polyphenols	The study suggests that taking 1500 mg cinnamon daily maybe effective in improving NAFLD Characteristics. ²⁸
Luk	<i>Coccus laca</i>	Muqawwi-e-qalb (cardiotonic – strengthens the heart), Muqawwi-e-a'asab (nervine tonic – strengthens the nerves), Muqawwi-e-dimagh (brain tonic), muqawwi-e-bah (aphrodisiac), daf-e-tashannuj (antispasmodic)	Laccaic acid A, laccaic acid B, laccaic acid C, laccaic acid D, laccaic acid E, shellolic acid, aleuritic acid (9,10,16trihydroxypalmitic acid), jalaric acid, butolic acid, wax, resin (major fraction), dye (laccaic acids), protein, water, Mineral salts	Unani drugs used in this study may provide the much-needed holistic management of NAFLD and its associated co-Morbidities. ²⁹
Zarawand tawil	<i>Aristolochia longa</i>	Muhallil-e-waram (anti-inflammatory – reduces swelling), Mufatteh-e-sudad (deobstruent – clears blockages), Mudirr-e-haid (emmenagogue – stimulates menstruation), Daf-e-samoom (antidotal – expels poisons), jali (detergent – cleanses wounds or skin)	Aristolochic acids (I, II, III, IV), aristolactams, aristolochene, Aristolic acid, aristosin, dihydro-aristolochic acid, magnoflorine, B-sitosterol, stigmasterol, Campesterol, tannins, resins, Essential oil (volatile oil fraction)	Study results demonstrated beneficial effects of A. Longa and A. Malaccensis treatment in Pb-induced oxidative stress and tissue damage in liver. ³⁰
Gul-e-surkh	<i>Rosa damascene</i>	Muqawwi-e-qalb (cardiotonic – strengthens the heart), Mufarreh (exhilarant – uplifts mood) astringent (qabiz contracts tissues), muqawwi-e-meda (stomachic – improves digestion), musaffi-e-khoon (blood purifier)	Citronellol, geraniol, nerol, Phenylethyl alcohol, linalool, Nonadecane, heneicosane, Farnesol, eugenol, citral (trace), stearoptene (solid portion of rose oil)	Rosa damascena meaningfully improves liver function in NAFLD. ³¹

Continued.

Drugs	Botanical name	Pharmacological action	Chemical constituent	Studies
Makoy	Solanum nigrum	Muqawwi-e-kabid (hepatotonic – strengthens the liver), Munaqqi-e-kabid (liver detoxifier), musaffi-e-khoon (blood purifier), muhallil-e-waram (anti-inflammatory), mild musakkin (sedative)	Solanine, solanigrine, Solamargine, α -solanine, β -solanine, quercetin, Kaempferol, rutin, apigenin Glycosides, dulcamaric acid Gallic acid, caffeic acid Tannins, proteins, carotenoid Vitamin c, fatty acids (linoleic, oleic, palmitic acids)	Solanum nigrum extract can be used to develop health-food products for preventing NAFL disease. ³²
Raiwandchini	Rheumamodi	Mushil (purgative – promotes bowel movement), Muqawwi-e-meda (stomachic – strengthens the stomach), Munaqqi-e-meda wa kabid (detoxifies stomach and liver), musaffi-e-khoon (blood purifier), daf-e-tafun (antiseptic)	Emodin, chrysophanol, Rhein Aloe-emodin, physcion Anthraquinone glycosides, Sennosides A, B (trace in some species), gluco-rhein, Gluco-emodin, gluco-aloe-emodin, gallotannins, Ellagitannins, flavonoids Kaempferol, quercetin, pectin Starch, calcium oxalate, volatile compounds, Resinous matter	Ethanol extract of rheum emodi shown antidyslipidemic effect in a study. ³³
Mastagi	Pistacia lentisicus	Muqawwi-e-meda (stomachic), daaf-e-nafkh (carminative – relieves gas), qabiz (astringent), muqawwi-e-asab (nervine tonic), mujaffif (desiccant – dries moisture)	A-pinene, β -pinene, myrcene Limonene, masticadienonic acid, oleanolic acid, ursolic acid, resin and other components, masticonic acids, Polymeric resins, essential oil, Tannins, alcohol-soluble resins	Number of significant Pharmacological effects i.e. muqawwi-i-mi'da (stomachic), Kāsir-i-riyāh (carminative), muqawwi-i-jigar (hepato Tonic) and qābiḍ (astringent). ³⁴
Zaffran	Crocus sativus	Mufarreh (exhilarant – mood enhancer), muqawwi-e-qalb (cardiotonic), muqawwi-e-bah (aphrodisiac), musaffi-e-khoon (blood purifier), mudirr-e-tams (emmenagogue)	Crocin, crocetin, picrocrocin, Safranal, linalool, geraniol Citral (trace), kaempferol, Quercetin, carbohydrates, Proteins, vitamins (trace)	This study suggested that saffron extract and crocin supplements have hepatoprotective effect against non-alcoholic fatty liver disease and HFD-induced liver damage. ³⁵
Badiyan	Fonaeculum vulgare	Mufatteh-e-sudad (deobstruent), muqawwi-e-meda (stomachic), daafi-e-riyah (carminative), mudir-e-baul (diuretic)	Anethole, fenchone, Estragole, Limonene, α -pinene Bpinene myrcene, quercetin Kaempferol, rutin, Coumarins	Fennel seed extract and its active compound TA are able to protect the liver against diabetes-induced hepatic injury in rats, probably via hypoglycemic and antioxidant effects. ³⁶

Table 2: Unani formulations for NAFLD.

Compound formulations	Ingredients	Main actions
Majoon afsanteen	Afsanteen (artemisia absinthium), Berge kasni (cichorium intybus), Berge badiyan (fennel leaves), Berge pudina (mentha), Ajwain (trachyspermum ammi), Saunf (foeniculum vulgare), Ab (water)	Musakkhin (calorific). ³⁷
Qurs-e-ghafis	Ghafis (agrimonia eupatoria), Sumbul ut teeb (nardostachys jatamansi / jatamansi), Zarawand mudahraj (aristolochia rotunda), Ustukhuddus (lavandula stoechas / lavender), Filfil siyah (black pepper), Sandal safaid (white sandalwood), Sugar syrup – as binder, Acacia gum – optional binder	Mufattih (deobstruent). ³⁷
Qurs-e-luk	Luk maghsool (washed liquorice / glycyrrhiza glabra), Asl-us-soos (liquorice root powder) – sometimes combined with above, Bansa (adhatoda vasica leaves), Ustukhuddus (lavandula stoechas / lavender), Unnab (ziziphus jujuba) – used in decoction, Sapistan (cordia dichotoma) – used in decoction, Sugar / qand safaid – as binder	Muqawwi-e-jigar (hepatoprotective). ^{38,39}
Jawarish-e-jalinoos	Amla (phyllanthus emblica), Zanjabeel zingiber officinale, Dana heel khurd, Amomum subulatum, Darcheeni cinnamomum zeylanicum, Asaroon asarum europaeum, Saqmonia convolvulus, Scammonia, Qand safaid saccharum officinarum)	Muqawwi-e-meda (stomach strengthening), hazim (carminative)
Majoon dabidulward	Sana makki — (cassia angustifolia), Gul-e-surkh — (rosa damascene), Amla — (Phyllanthus Emblica), Turbud safaid — (operculina turpethum), Post halela — (terminalia chebula), Asl-us-soos — (glycyrrhiza glabra)	Muqawwi-e-jigar (hepatic tonic), Mushil-e-safra (purgative of bile)
Sikanjabeen bazoori	Ushaq — (dorema ammoniacum), Shahtara — (fumaria parviflora), Kasni — (cichorium intybus), Badyan (illicium verum), Kishneez (coriandrum sativum), Sirka (not a plant; commonly made from fermented apple (malus domestica) or grapes (vitis vinifera), Sugar saccharum officinarum (sugarcane)	Muqawwi-e-kabid (liver strengthener), mudir-e-baul. (diuretic). ⁴⁰

Ilaj-bit-tadbeer (regimentaltherapy)

In Unani medicine, Su'-e-Mizaj-e-Barid Kabid can be prevented through Tadbeer. Jalinoos recommended Riyazat (exercise) like brisk walking, which reduces BMI (body mass index) and maintains health. Allama Qashi also emphasized the role of Riyazat in managing Su'-e-Mizaj-e-Barid Kabid in his book Jami-ul-Hikmat.²²⁻²⁴

Ilaj-bil-dawa (pharmacotherapy)

Liver health can be preserved through Tadbeer-bil-Misl (resemblance) and Tadbeer-bil-Shabiyah (similarity), while disease expulsion is carried out through Tadbeer-bil-Zid (opposite therapy). Drugs are most effective when administered after Ghiza is absorbed from Medah and reaches the liver.²⁵ Depending on the site of pathology, Mushil (purgatives) and Mudir (diuretics) are used. If the pathology is on the Muqar (concave) surface, Mushil (purgatives) are given; if on the Muhaddab (convex) surface, Mudir (diuretics) are administered. The drugs

used in liver disorders should be finely powdered. In Unani medicine, various drugs are used to treat liver disorders including NAFLD, such as Mufattihat-e-Jigar (deobstruent), Mudirrat Jigar (diuretics), Mushilat (purgatives), Muhallilat (anti-inflammatory), and Musakhinaat (calorific).^{12,18,26}

DISCUSSION

NAFLD is a leading cause of chronic liver disease worldwide and is strongly associated with obesity, insulin resistance, type 2 diabetes mellitus, and metabolic syndrome. The disease encompasses a spectrum from simple steatosis to NASH, fibrosis, cirrhosis, and hepatocellular carcinoma. Current evidence indicates that insulin resistance-driven lipid accumulation, oxidative stress, inflammatory cytokines, mitochondrial dysfunction, and gut-derived endotoxins collectively contribute to disease progression, supporting the “multiple-hit” hypothesis.

Despite advances in understanding its pathogenesis, effective pharmacological therapies for NAFLD remain limited, and lifestyle modification continues to be the primary management strategy. In this context, traditional systems of medicine may offer complementary approaches. Although NAFLD is not explicitly described in classical Unani texts, hepatic conditions such as *Su'e-Mizaj-e-Kabid Barid*, *Saman-e-Mufrit*, and *Sudda-e-Jigar* conceptually resemble fatty liver disease. These conditions are attributed to deranged hepatic temperament, accumulation of morbid humors, and impaired hepatic faculties, which parallel modern concepts of metabolic dysfunction, lipid accumulation, and inflammatory liver injury. Unani management emphasizes a holistic approach through dietary regulation (*Ilaj-bil-Ghiza*), lifestyle modification including physical exercise (*Ilaj-bil-Tadbeer*), and pharmacotherapy (*Ilaj-bil-Dawa*). These principles align with contemporary recommendations focusing on caloric restriction, improved metabolic control, and physical activity. Several Unani single drugs and compound formulations have demonstrated hepatoprotective, antioxidant, anti-inflammatory, and lipid-modulating effects in experimental and limited clinical studies, suggesting potential benefit in NAFLD.

In conclusion, NAFLD is a complex metabolic disorder with limited conventional treatment options. The Unani system provides a comprehensive, lifestyle-oriented framework that may serve as an adjunct in NAFLD management. However, well-designed randomized controlled trials and standardization of formulations are essential to establish clinical efficacy and safety.

CONCLUSION

NAFLD is a prevalent condition linked to affluent societies, especially among obese individual, it is characterized by the accumulation of fat in the liver, often progressing through a spectrum from steatosis, to NASH, and eventually leading to cirrhosis and primary liver cancer. Fatty Liver Disease (FLD), a reversible condition caused by triglyceride accumulation in liver cells, is increasingly prevalent due to obesity, insulin resistance, and poor lifestyle habits. In Unani medicine, the liver is central to maintaining health through its vital powers and balanced temperament. Fatty liver aligns with conditions like *Sue Mizaj Kabid* and *Saman-e-Mufrit*, resulting from cold, moist derangements. Preventive Unani strategies include diet therapy (*Ilaj-bil-Ghiza*), regimental therapy (*Ilaj-bit-Tadbeer*), and herbal drugs (*Ilaj-bil-Dawa*) to restore humoral balance. This holistic approach emphasizes personalized lifestyle modifications and traditional remedies to manage and prevent liver dysfunction.

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