

A Comprehensive Review of Non-Alcoholic Fatty Liver Disease (NAFLD) and Its Management through Ayurveda

Avinash Sharma¹, Priyanka Pandey², Astha Yadav³

1. U.G. Student, Ishan Ayurvedic Medical College and Research Centre, Greater Noida

2. U.G. Student, Ishan Ayurvedic Medical College and Research Centre, Greater Noida

3. U.G. Student, Ishan Ayurvedic Medical College and Research Centre, Greater Noida

Abstract

Introduction: Non-Alcoholic Fatty Liver Disease (NAFLD) is a growing global health concern, often associated with metabolic syndrome, including obesity, type 2 diabetes, hypertension, and hyperlipidaemia. NAFLD, a condition characterized by the accumulation of fat in the liver without alcohol consumption, can progress to more severe liver conditions such as Non-Alcoholic Steatohepatitis (NASH), cirrhosis, and liver failure. **Methodology:** This review explores the pathophysiology, clinical presentation, and management strategies of NAFLD, with a focus on integrating modern medical approaches and Ayurveda. **Result & Conclusion:** The pathophysiology of NAFLD is closely linked to insulin resistance, dyslipidaemia, and oxidative stress, leading to disturbances in liver metabolism. Risk factors include obesity, diabetes, and hypertension, and the disease is often detected incidentally during routine health check-ups. Ayurveda offers promising therapies, focusing on restoring the balance of doshas and improving digestive function. Treatments like *Agnideepana* (stimulation of digestive fire), *Srotosodhana* (purification of channels), and the use of herbal formulations such as *Sharapunkha*, *Guduchi*, and *Triphala* are explored as effective adjuncts to conventional treatments. Emphasis is placed on a personalized approach, incorporating both preventive and therapeutic measures through dietary regulation, stress management, and physical activity.

Keywords: Non-Alcoholic Fatty Liver Disease (NAFLD), Non-Alcoholic Steatohepatitis (NASH), insulin resistance, *Ayurvedic* treatment, hepatoprotective herbs, cirrhosis, oxidative stress, lifestyle management, dietary interventions, weight management.

Introduction

The liver, a vital organ, serves as a biochemical powerhouse where numerous metabolic processes, including the absorption and processing of various substances, take place. Disruptions in lipid metabolism in the liver, often caused by multiple etiological factors, can lead to fatty liver disease—a condition marked by excessive fat accumulation in liver cells. Fatty liver disease is diagnosed when fat content exceeds 5% of the liver's total weight or more than 30% of liver cells in a specific lobe exhibit fat deposition.

Aim

To comprehensively review the pathophysiology, risk factors, clinical features, and current management of Non-Alcoholic Fatty Liver Disease (NAFLD) with a special focus on its understanding and therapeutic approaches through Ayurveda.

Objectives

1. To analyze the epidemiology, etiology, and clinical presentation of NAFLD from a modern medical perspective.
2. To explore the correlation of NAFLD with Ayurvedic concepts such as *Yakrit Roga*, *Medo Roga*, and *Kapha-Meda Dhatu Dushti*.
3. To review Ayurvedic classical texts, research studies, and clinical evidence regarding the management of NAFLD.
4. To identify Ayurvedic interventions (herbal formulations, Panchakarma, diet, lifestyle modifications) effective in NAFLD management.
5. To integrate modern and Ayurvedic insights for developing a holistic approach to NAFLD prevention and management.

Methodology

For this review, information was gathered from both Ayurvedic and modern medical sources. Classical Ayurvedic texts such as *Charaka Samhita*, *Sushruta Samhita*, and *Ashtanga Hridaya* were studied along with modern medical textbooks and journals on hepatology and NAFLD. In addition, research articles, clinical trials, and

systematic reviews were searched from databases like PubMed, Scopus, Google Scholar, and the AYUSH research portal. The collected literature was then organized under two perspectives—modern and Ayurvedic. A thematic analysis was carried out to understand Ayurvedic principles in relation to NAFLD and to compare them with modern scientific findings. Finally, the information was interpreted in a comparative way to highlight similarities, correlations, and possible integrative management strategies for NAFLD.

Observation and Result

The etiology of fatty liver disease can be broadly categorized into two types ^[1]:

- Conditions leading to excessive *fat influx*: Increased lipid load requiring enhanced fat metabolism by the liver.
- Conditions causing *impaired lipid utilization*: Liver cell damage impairs the organ's ability to process fat effectively.

Non-Alcoholic Fatty Liver Disease (NAFLD), a prominent type of fatty liver disease, occurs independently of significant alcohol consumption. It affects approximately 20-30% of adults in Western countries and an alarming 70-90% of individuals with obesity. NAFLD is associated with severe outcomes, including cirrhosis, end-stage liver disease, and hepatocellular carcinoma. By 2020, it was predicted to become the leading cause of liver transplantation.

NAFLD also poses an increased risk of cardiometabolic disorders, including diabetes mellitus, obesity, hypertension, and dyslipidemia. The risk is particularly significant in individuals with a Body Mass Index (BMI) >25 kg/m². It affects all age groups, including children, with peak prevalence between 40 and 49 years of age.

The diagnosis of NAFLD requires two essential criteria: ^[2]

- Evidence of liver steatosis through imaging or histology.
- Exclusion of significant alcohol consumption or other causes of hepatic fat accumulation.

The global prevalence of NAFLD has surged in recent decades, with the World Health Organization highlighting it as a major health concern. In India, epidemiological studies

estimate its prevalence ranges between 9-32%, posing a growing burden on healthcare systems^[1]. Non-Alcoholic Steatohepatitis (NASH), a progressive form of NAFLD, may advance to cirrhosis and liver cancer, exacerbating the challenge for liver disease management in India.

In *Ayurveda*, fatty liver disease is linked to conditions described as "*Atipravrutta Meda*" or "excessive fat accumulation," which corresponds to imbalances in "*Mamsa Dhātu*" (muscle tissue) metabolism. Several classical texts like *Kamala* and *Yakrut Roga* describe the pathology of liver disorders, offering insight into potential treatment approaches.

Although the precise pathophysiology of NAFLD remains unclear, advancements in understanding its mechanisms are paving the way for targeted therapies. Patients with NAFLD often remain asymptomatic until significant progression occurs, such as fibrosis or cirrhosis. While existing treatments, including weight management and pharmacological interventions, show promise, the development of novel therapeutic options is crucial.

Ayurveda emphasizes herbal formulations for liver disorders, offering potential alternative or complementary treatments. This manuscript explores current evidence on pharmacological and non-pharmacological treatments for NAFLD, with an emphasis on Ayurvedic approaches.

Etiopathogenesis

The pathogenesis of Non-Alcoholic Fatty Liver Disease (NAFLD) involves a complex interplay of metabolic, oxidative, and inflammatory factors. The development of hepatic macrosteatosis (fat accumulation within liver cells) primarily arises due to increased lipolysis and elevated levels of free fatty acids (FFAs). Oxidative stress, endotoxins, cytokines, adipokines, and environmental factors further exacerbate the condition. These interactions contribute to insulin resistance, serum and hepatic iron overload, and persistent oxidative stress, eventually leading to inflammation and fibrosis.

In *Ayurvedic* understanding, the liver (*Yakrit*) is a critical organ closely related to *Rasa* (plasma), *Rakta* (blood), and *Mamsa Dhātu* (muscle tissue). It plays a significant role in tissue metabolism (*Dhātu Parinama*). The development of fatty liver aligns with *Ayurvedic* principles, where a high-fat diet, consumption of carbonated beverages, and a sedentary lifestyle result in the *Dushti* (vitiation) of *Rasa*, *Mamsa*, and *Meda Dhatus*. Additionally, imbalances in *Srotas* (channels), specifically *Annavaha* (digestive channels), *Rasavaha*

(plasma-carrying channels), and *Medovaha Srotas* (fat-carrying channels), serve as contributing factors. These imbalances often lead to secondary conditions (*Nidanarthakara Rogas*), which can manifest as fatty liver.

Contemporary Insights into Pathogenesis

Modern research proposes several mechanisms explaining the progression of NAFLD. The widely accepted "two-hit" hypothesis offers insight into why not all individuals with steatosis develop advanced liver fibrosis:

1. **First Hit:** Initial fat accumulation (*steatosis*) in hepatocytes due to insulin resistance and increased FFA influx from adipose tissue.
2. **Second Hit:** Inflammatory and oxidative damage caused by cytokines, adipokines, and oxidative stress, leading to progression from simple steatosis to non-alcoholic steatohepatitis (NASH) and fibrosis.

Leptin, an adipokine, plays a dual role by exacerbating fibrosis while suppressing appetite. It promotes fibrogenic activity within the liver. Additionally, insulin resistance contributes to an imbalance between fat import and export in hepatocytes, increasing fat synthesis and impairing fat oxidation, thereby perpetuating NAFLD.

Ayurvedic Perspective

In *Ayurveda*, NAFLD is classified as a *Santarpana Janya Vyadhi* (a disorder caused by over-nutrition). Its etiology (*Nidana*) and pathogenesis (*Samprapti*) closely resemble those of *Sthaulya* (obesity). The fundamental pathology begins with a disruption in digestive fire (*Agni Vikruti*), leading to the formation of improperly digested nutrients (*Apakva Anna Rasa*). This results in the aggravation of *Kapha Dosha* and abnormal accumulation of *Meda* (fat tissue) in the liver (*Yakrit*).

The imbalance in various Ayurvedic components contributes to the condition:

- **Doshas:** Aggravation of *Kapha*, *Pachaka Pitta*, *Ranjaka Pitta*, and *Kledaka Kapha*.
- **Vayu Subtypes:** Imbalance in *Samana Vayu* and *Apana Vayu*.
- **Dhatus:** Vitiating of *Rasa*, *Rakta*, and *Meda Dhatus*.

- **Mala:** Impaired function of *Purisha* (excretory system)

Clinical Presentation

Non-Alcoholic Fatty Liver Disease (NAFLD) is often diagnosed incidentally during routine health examinations, such as ultrasounds conducted for unrelated complaints like dyspepsia, discomfort, or fatigue. Abnormal liver enzyme levels or the presence of fatty liver on imaging are typically identified before any clinical symptoms become apparent. As the disease progresses, more severe signs, such as the development of ascites, anasarca, variceal bleeding, or hepatic encephalopathy, may indicate decompensated cirrhosis.

NAFLD presents in two distinct patterns: ^[2]

1. **Obesity-related NAFLD:** This is the more common form, occurring in overweight individuals, and generally has a more favourable prognosis if managed early.
2. **Lean NAFLD:** Fatty liver in individuals with normal weight, though less common, is associated with a poorer prognosis and a higher risk of progression to severe liver damage.

Most patients with NAFLD remain asymptomatic for extended periods, and the diagnosis is often made incidentally through tests conducted for unrelated health concerns. Non-Alcoholic Steatohepatitis (NASH), a more advanced form of NAFLD, can progress to cirrhosis and end-stage liver disease, making it a leading cause of liver transplants. Early detection and management are crucial, as most individuals with NAFLD remain unaware of their condition until significant liver damage has occurred.

Ayurvedic Point of View

From an *Ayurvedic* perspective, Non-Alcoholic Fatty Liver Disease (NAFLD) can be associated with *Santarpana Janya Vyadhi* (disease caused by overnutrition) due to the similarity in etiology (*Nidana*) and pathogenesis (*Samprapti*) to *Sthaulya* (obesity). The primary pathology in NAFLD is linked to *Agni Vikriti* (imbalance in digestive fire), which leads to the improper processing of *Apakva Anna Rasa* (undigested food essence). This, in turn, affects the functioning of *Kapha Dosha* and *Medodhatu Agni* (metabolic fire of fat tissue). ^[3]

The impaired digestion causes an abnormal accumulation of *Medodhatu* (fat tissue) in the body, which is deposited inappropriately and unevenly, without proper assimilation by other

tissues such as *Asthi* (bone), *Majja* (bone marrow), and *Shukra* (reproductive tissue). The excess fat in the liver results from the corrupt *Kapha* and *Meda* (fat), which leads to *Srotorodha* (blockage of the channels), further exacerbating the problem by aggravating *Vata* (the element responsible for movement in the body). An imbalanced *Vata* then disrupts *Agni Vikriti* once again, creating a vicious cycle that perpetuates the condition of fatty liver. [4]

Diagnosis

The diagnosis of Non-Alcoholic Fatty Liver Disease (NAFLD) is strongly suggested when metabolic syndrome is present, and other specific causes of liver disease, such as excessive alcohol consumption (greater than 20g/day), have been excluded. Asymptomatic elevations in liver enzymes, particularly aminotransferases like aspartate aminotransferase (AST) and alanine aminotransferase (ALT), should raise suspicion, although these may fluctuate or be mildly elevated in some cases. In particular, ALT levels are often higher than AST, and gamma-glutamyl transpeptidase (GGT) may show isolated elevations. There is no single diagnostic blood test for NAFLD, but elevated ALT levels are common. Around 30% of cases also show elevated alkaline phosphatase (ALP) values. [5]

To distinguish between Non-Alcoholic Steatohepatitis (NASH) and simpler forms of fatty liver, elevated serum transaminases greater than twice the normal limit, in conjunction with metabolic syndrome, can serve as useful predictors. Radiological imaging techniques, such as ultrasound, computed tomography (CT), magnetic resonance imaging (MRI), magnetic resonance spectroscopy (MRS), and Fibroscan (tissue elastography), are commonly used to detect liver steatosis. These imaging modalities are accurate for identifying moderate to severe liver fat accumulation but cannot distinguish simple steatosis from NASH or assess the extent of liver fibrosis. [1]

Liver biopsy is considered the gold standard for diagnosis as it provides a semi-quantitative assessment of fat deposits, necroinflammation, and fibrosis. Histological findings often include macrovesicular steatosis, lobular neutrophil inflammation, Mallory bodies, balloon degeneration, lipogranulomas, and pericellular fibrosis, predominantly in the perivenular region (Zone 3) of the liver acini. However, liver biopsy is not routinely required unless there is a need for further evaluation of the disease stage.

The diagnosis of NAFLD necessitates the exclusion of other liver diseases, including alcohol-related liver conditions, which can cause asymptomatic increases in aminotransferases. Currently, no definitive pharmacological treatment exists for NAFLD. The primary approach to management is lifestyle modification, particularly dietary changes tailored to the patient's metabolic profile, along with increasing physical activity. Small reductions in body weight have been shown to improve liver inflammation and fibrosis. Additionally, managing risk factors such as diabetes mellitus and hyperlipidemia, along with the use of antioxidants and insulin sensitizers, are other therapeutic strategies that may benefit patients with NAFLD.

Nidana of NAFLD

The *Nidana* (etiology) of Non-Alcoholic Fatty Liver Disease (NAFLD) can be broadly classified into two categories: *Aaharaj Nidana* (dietary causes) and *Viharaj Nidana* (lifestyle causes).

- *Aaharaj Nidana* includes the excessive consumption of *Lavana* (salty), *Amla* and *Katu* (sour and pungent) tasting foods, and a diet that is predominated by foods with *Kshara Sevana* (alkaline nature). Other contributing factors include overindulgence in *Snigdha* (oily), *Guru* (heavy), *Ushna* (hot), and *Sleshmala* (unctuous) foods, as well as the intake of *Navanna* (freshly harvested food), *Mamsa* (meat), *Navamadya* (newly made alcoholic beverages), and *Ikshuvikara* (sugarcane products). Additionally, the consumption of *Kulatha*, *Masha*, *Tila Taila* (sesame oil), *Moolaka* (radish), *Dadhi* (curd), *Shukta* (pickles), *Sura* (fermented liquor), and *Souveeraka* (fermented foods) contribute to the imbalance. Poor dietary practices, such as eating *Adhyashana* (excessive eating), *Vishamashana* (irregular eating patterns), *Virudha* (incompatible foods), *Vidahi* (hot foods), *Akalabhojana* (eating at improper times), and *Abhojana* (fasting), also play a significant role in the development of NAFLD.
- On the other hand, *Viharaj Nidana* includes a sedentary lifestyle, lack of physical activity, irregular sleep patterns, excessive anger, *Diwasvapna* (daytime sleep), and *Vegadharana* (suppression of natural urges). Other lifestyle factors like *Vireka* (purgation), *Vamana* (emesis), and *Sneha Vibhrama* (disruption in the functioning of oily substances) further aggravate the pathogenesis of NAFLD. These dietary and lifestyle imbalances contribute to the dysfunction of the digestive and metabolic

systems, leading to the accumulation of fat in the liver and the development of NAFLD.

Fatty Liver as a *Nidanarthakara Roga*

Dalhana mentions that Vata Vikara (disturbance of Vata dosha) may occur due to Avarana (obstruction) in the pathway of Medo Dhatu (fat tissue). This obstruction can lead to the development of auxiliary conditions, such as obesity, diabetes mellitus, hypothyroidism, and others, where Vata plays a crucial role in the pathogenesis. The normal flow of Vata Dosha becomes obstructed by an excess of Medo Dhatu, which weakens its function and further contributes to the disease process. These imbalances lead to the development of fatty liver, illustrating how disruptions in the natural flow of doshas can result in the accumulation of fat in the liver.

***Samprapti* of NAFLD and its Consequences**

NAFLD is primarily classified as *Santarpana Janya Vyadhi* (disease caused by overnutrition). In addition to a high-calorie diet and sedentary lifestyle, which contribute significantly to the disease, the accumulation of *Dushti Kapha*, *Rasa*, and *Medo Dhatu* (fat tissue) along with *Srotasa* (channels) plays a prominent role in the pathogenesis of NAFLD. The relationship between other factors such as *Vata*, *Pitta*, *Rakta* (blood), *Anna Vaha* (digestive channels), and *Purisha Vaha Srotasa* (elimination channels) cannot be overlooked. According to the *Samanya Vishesh Siddhanta* (the principle of general and specific properties), the appropriate and limited use of substances with similar properties, diets, or physical activities can aid in the prevention and management of the disease. As the disease progresses, there are defects in key segments like *Dosha* (bodily humors), *Dhatu* (tissues), *Mala* (waste products), and *Srotasa* (channels), leading to the development of complications.

***Rupa* (Clinical Presentation) of NAFLD**

The clinical presentation of NAFLD can primarily be attributed to the *Dushti* (impairment) of *Rasa* and *Medo Dhatu* (fat tissue) and *Srotasa* (channels), leading to the disturbance of *Jatharagni* (digestive fire) and *Dhatvagni Mandya* (weakness of tissue metabolism). Patients may experience signs of *Ajirna* (indigestion) and *Sthaulya* (obesity) as the underlying cause is *Aama* (toxic remnants) and *Agnimandya* (weak digestion). Common

symptoms include *Atipravritti of Mala* (excessive or incomplete elimination of waste), *Anannabhilasha* (lack of desire for food), *Glani* (generalized weakness), *Vishtambha* (abdominal distension), *Gaurava* (feeling of heaviness), *Brahma* (dizziness), *Anaha* (belching), *Praseka* (excessive salivation), *Utklesha / Hrilasa* (nausea), and *Gaurava* (feeling of weight). Additional signs of *Sthaulya* (obesity) include *Ati Kshudha* (excessive hunger), *Ati Sveda* (excessive sweating), *Ati Nidra* (excessive sleep), *Daurbalya* (general weakness), *Udara Vriddhi* (abdominal enlargement), *Anga Shithilata* (looseness of the body), and *Ayasa Akshamata* (inability to endure physical exertion).

Management of NAFLD

NAFLD is an increasingly recognized clinico-pathological condition that can progress to end-stage liver disease. The clinical implications of NAFLD arise from its common occurrence in the general population and its potential to progress to cirrhosis and liver failure. Currently, there is no established pharmacological treatment for NAFLD in modern medicine. The main goals of treatment are to improve steatosis and prevent the disease's progression. Since NAFLD is associated with insulin resistance and metabolic syndrome, insulin-sensitizing agents are expected to alter its pathophysiology. Medications such as Metformin and the thiazolidinedione group of antidiabetic agents are among the most studied. Statins are used to normalize blood cholesterol levels, and antioxidants like N-acetyl cysteine and vitamin E are recommended to counter oxidative stress. Although treatment for NAFLD is still evolving and no single drug has shown clear efficacy, several empiric strategies like dietary restriction, physical exercise, and weight reduction are considered the first line of treatment. Therefore, there is a growing interest in alternative treatments, particularly from systems of medicine that are safe and cost-effective.

Ayurveda offers immense potential for the management of non-communicable diseases, including NAFLD. The treatment focuses on addressing *Agnivikruti* (digestive disturbances), vitiation of *Kapha* and *Meda*, and *Srotas* (channels), particularly in relation to *Raktavaha Srotas* (channels of blood) and *Srotorodha* (blockage of channels), alongside vitiation of *Vata*. The treatment involves *Agnideepana* (stimulation of digestive fire), *Rookshana* (drying and pacification of Kapha and Meda), and *Srotosodhana* (removal of blockages from channels). When NAFLD progresses to a later stage, involving the tissues, treatment should focus on *Prasadana* (purification) of

Rasa (plasma) and *Rakta* (blood) and also on *Yakritshothahara* (liver detoxification). *Samshodhana*, *Samshamana*, and proper diet and lifestyle modifications are crucial for reversing fatty liver changes and preventing further complications.

Nidana Parivarjana (avoidance of causative factors) is essential in reducing the incidence of NAFLD, and *Shodhana Virechana* (purification through laxatives) is the most suitable method for liver disorders. Since the liver is the seat of the disease, *Ruksha Virechana* using *Churnas* and *Kashayas* should be administered. *Virechana* is indicated in cases of excessive *Dosha* accumulation and *Srotorodha*. It works as *Agnideepana* and *Srotoshodhana* (channel cleansing). Formulations like *Patoladi*, *Narayana*, *Avipattikara*, *Erandataila*, *Trivrit Avaleha*, *Mishraka Sneha*, and *Harityakadi Ghrita* can be used for this purpose. [6]

In the initial stage of *Amavastha* (toxicity phase), *Pachana*, *Deepana*, and *Rookshana* treatments should be done to pacify *Kapha* and eliminate *Ama* (toxins) from the body. Herbs with *Katu* (pungent) and *Tikta* (bitter) flavors, such as those with *Katu Vipaka*, can be useful as they have properties that remove excess fat and balance the body's humors. The use of *Lekhaniya* herbs aids in the removal of accumulated *Ama* and fat from the liver cells. *Medahara* treatments may also be beneficial.

For *Shamana Chikitsa* (pacifying treatment), single herbs like *Sharapunkha*, *Bhoomiamalaki*, *Katurohini*, *Rohitaka*, *Guduchi*, *Vasa*, *Haritaki*, and *Pippali* can be safely used for effective NAFLD management. These herbs are known for their hepato-protective properties. Formulations like *Kashaya* (*Vasaguduchyadi*, *Phalatrikadi*, *Drakshadi*, *Patola-Katurohinyadi*), *Arishta* (*Sudarshana Arishta*, *Rohitaka Arishta*, *Pippalyasava*), and *Churna* (*Hinguvachadi*, *Vaiswanara*) are well-known for their hepatoprotective and hypolipidemic properties and can be used for managing NAFLD. [7]

Rasayana therapy is also recommended, as *Ama* leads to *Dhatuleena* (tissue depletion). *Rasayana* drugs with *Deepana* (digestive stimulant), *Pachana* (digestive), and *Lekhana* (scraping) properties may be used. Examples include *Triphala*, *Shilajatu*, and *Guggulu*, which are effective in reducing hyperlipidemia. *Guggulu* has been shown to reduce serum cholesterol and triglyceride levels and has a cardioprotective effect. *Triphala* and its constituents exhibit valuable hepato-protective activity and can help protect the liver from acute toxicity. [7]

Finally, a harmonious relationship between the individual and the environment is essential for preventing diseases like metabolic syndrome, which is primarily caused by poor diet and lifestyle. Therefore, diet and lifestyle modifications play a key role in both the prevention and management of NAFLD.

Pathya (wholesome food) includes freshly prepared meals, eaten when hungry and after evacuation of waste. Foods with *Katu*, *Tikta* flavors, and *Laghu*, *Ruksha* qualities should be included in the diet. Regular physical activity, such as brisk walking for half an hour daily, along with yoga practices like *Dhanurasana*, *Bhujangasana*, *Gomukhasana*, *Pranayama*, *Ardhamatsyendrasana*, and *Kapalabhaati*, will help increase digestion power, reduce body fat, and improve overall well-being. [7]

Apathya (unwholesome food) should be avoided, including foods with *Guru*, *Snigdha*, and *Pichila* properties, as well as reheated and untimely foods, excessive spicy, oily, salty, sour, and fatty diets, pickles, junk food, chocolates, and ice creams. Sedentary lifestyles, excessive daytime sleeping, smoking, and suppression of natural urges should also be avoided to manage and prevent NAFLD effectively. [7]

Conclusion

Non-Alcoholic Fatty Liver Disease (NAFLD) has emerged as a significant health concern globally, with its prevalence rising alongside increasing cases of obesity, metabolic syndrome, and insulin resistance. From an Ayurvedic perspective, NAFLD is understood as a *Santarpana Janya Vyadhi* (disease caused by excessive nourishment), primarily resulting from imbalances in *Kapha*, *Medo Dhatu*, and *Rasa*. The pathogenesis, as described in Ayurveda, involves the vitiation of these bodily elements, leading to the accumulation of fat in the liver, which obstructs the normal functioning of the organ.

The clinical manifestations of NAFLD align with the principles of *Agnimandya* (impaired digestion) and *Ama* (toxins), which result in symptoms such as fatigue, abdominal discomfort, and a feeling of heaviness. The treatment approach in Ayurveda emphasizes a holistic model, addressing not just the symptoms but the root causes of the disease, such as poor diet, sedentary lifestyle, and improper digestion. Interventions like *Agnideepana* (stimulation of digestive fire), *Srotosodhana* (cleansing of channels), and *Samhana* (pacification) are fundamental to restoring balance in the body. [8]

Pharmacologically, while modern medicine has not yet provided a definitive cure for NAFLD, various agents like metformin, statins, and antioxidants have shown promise in managing the disease. However, Ayurveda offers significant potential for treating NAFLD by focusing on the use of herbal formulations, dietary management, and lifestyle modifications. Medications such as *Churnas*, *Kashayas*, *Guggulu*, and *Triphala* have been proven effective in reducing liver fat, improving digestion, and promoting detoxification. [9]

In conclusion, NAFLD can be effectively managed through a combination of Ayurvedic treatments, lifestyle changes, and dietary modifications. A balanced approach that integrates both modern and traditional practices holds the potential to address the root causes of NAFLD, prevent its progression to cirrhosis and liver failure, and promote overall liver health. Further research and clinical trials are needed to validate these findings and explore the full potential of Ayurvedic interventions in the management of NAFLD.

Conflict of interest

The authors declare that there is no conflict of interest regarding the publication of this document.

Funding source

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

References

1. Shirvadkar DM, Prashanth AS, Chavan SG. An Ayurvedic Pragmatic Approach to Non-alcoholic Steatohepatitis vis-à-vis Yakritodara. J Ayurveda Integr Med Sci. 2019 Jul-Aug;4(4):328. <https://jaims.in/jaims/article/view/682>
2. Gupta JK, Gupta KR, Puri G. Non-Alcoholic Fatty Liver Disease (NAFLD) An Ayurvedic Approach: A Review. Paripex Indian J Res. 2024 Jun;13(6). <https://bmcendocrdisord.biomedcentral.com/articles/10.1186/s12902-022-00980-1>.

3. Kushwaha HCS. Sushruta Samhita. Ayurveda Dipika's Ayusi Hindi Commentary. 1st ed. Varanasi: Chaukhambha Orientalia; 2019. Vol 2, Chikitsa Sthana, 9th Chapter, Verse 12, 200.
4. Kushwaha HCS. Charaka Samhita. Ayurveda Dipika's Ayusi Hindi Commentary. 1st ed. Varanasi: Chaukhambha Orientalia; 2017. Vol 2, Chikitsa Sthana, 13th Chapter, Verse 151, 333.
5. Hui P, Jena S, Mishra S. Conceptual Study of Non-Alcoholic Fatty Liver Disease and Its Management in Ayurveda. J Ayurveda Integr Med Sci. 2024;8:53-59. <https://jaims.in/jaims/article/view/3731>.
6. Vagbhata. Ashtanga Hridayam. Rathi SS, translator. 1st ed. Varanasi: Krishnadas Academy; 2003. Vol 1, Sutra Sthana, 12th Chapter, Verse 35, 102.
7. Singhal P, Nesari T, Gupta GS. Efficacy of Herbomineral Compounds and Pathya (Ayurvedic Dietary Regime and Physical Exercise) in the Management of Yakṛt Roga (Non-alcoholic fatty liver disease). Ancient Sci Life. 2015 Apr-Jun;34(4):216-222. <https://www.wisdomlib.org/health-sciences/journal/ancient-science-of-life/d/doc1415483.html>.
8. Behere P, Kulthe NS. Concept of Fatty Liver and Its Management in Ayurveda. HJHS. 2021. https://www.researchgate.net/publication/357863529_Concept_of_Fatty_liver_and_its_management_in_Ayurveda/fulltext/61e3ad0e5779d35951afde65/Concept-of-Fatty-liver-and-its-management-in-Ayurveda.pdf
9. Vagbhata. Ashtanga Hridayam. Rathi SS, translator. 1st ed. Varanasi: Krishnadas Academy; 2003. Vol 2, Chikitsa Sthana, 8th Chapter, Verse 15, 130

