ISSN: 2322 - 0902 (P)
ISSN: 2322 - 0910 (O)

International Journal of Ayurveda and Pharma Research

Review Article

CONCEPTUAL UNDERSTANDING OF NON-ALCOHOLIC FATTY LIVER DISEASE

Ambika K[1], Mini V G[2], Vishnu Priya L R[3]*

[1]HOD & Professor, [2]Associate Professor, *[3]PG Scholar, Department of Kayachikitsa, Government Ayurveda College, Trivandrum, Kerala, India.

Article info

Article History:

Received: 29-07-2022

Revised: 08-08-2022

Accepted: 19-08-2022

KEYWORDS:

Non-alcoholic fatty liver disease, *Santharpanajanya vyadhi, Yakrit roga*.

ABSTRACT

Non-alcoholic fatty liver disease (NAFLD) encompasses a spectrum of liver pathology with different clinical prognoses; from the simple accumulation of triglycerides within hepatocytes (simple steatosis) to more progressive steatosis with associated hepatitis, fibrosis, cirrhosis, and in some cases hepatocellular carcinoma. Non-alcoholic fatty liver disease (NAFLD) is one of the leading causes of chronic liver injury across the world. It is also strongly related to other pathological conditions, including obesity, diabetes, cardiovascular diseases, and symptoms of metabolic syndrome. Ayurveda also vividly describes Liver Diseases in the context of *Kamala* (jaundice) and *Yakrit Roga* (liver diseases) in different classical texts. It can be interpreted as a *Santharpanotha Vyadhi* (disease which caused by taking excessive nourishing diet) with vitiation of *Kapha* and *Medas*, getting *Sthanasamsraya* in *Yakrit* (liver) which is *Rakthavaha-srothomoola* and *Pithasthana* (location of body humour *Pitha*).

This review will give a better knowledge of etiopathogenesis, as well as a therapeutic method for managing patients by breaking the pathogenesis chain. In this section, we explore the etiology and consequences of NAFLD, along with the therapeutic treatment to this prevalent condition.

INTRODUCTION

Non-Alcoholic Fatty Liver Disease is a growing epidemic worldwide, due to obesity and insulin resistance leading to liver accumulation of triglycerides and free fatty acids. Numerous risk factors for the development of NAFLD have been explained. Most have some form of metabolic derangement or insulin resistance at the core of its pathophysiology. NAFLD patients are at increased risk of liver-related as well as cardiovascular mortality, and NAFLD is rapidly becoming the leading indication for liver transplantation[1]. Estimates have been posited suggesting the incidence of NAFLD to be 20%-30% in Western countries and 5%-18% in Asia[2]. In the general Indian population, the prevalence of NAFLD disease is estimated to be around 9-32%, with a higher incidence rate amongst obese and diabetic patients [3].

Access this article online

Quick Response Code

https://doi.org/10.47070/ijapr.v10i8.2494

As a rule, the prevalence of NAFLD is higher in males and increases with increasing age and is influenced by the diagnostic methods and characteristics of the population, especially lifestyle habits. NAFLD is considered by many to be the hepatic manifestation of the 'metabolic syndrome', as it is characterized by obesity, type 2 diabetes, hypertension, hypertriglyceridemia, and low levels of high-density lipoprotein (HDL). Over 80% of subjects with metabolic syndrome have NAFLD[3]. Additionally, there has been a linear rise of NAFLD with that of diabetes and metabolic syndrome[4]. Currently, NAFLD represents the second most common reason to be listed for a liver transplantation[5]. Patients with Non-alcoholic fatty liver disease may have many non-specific symptoms before the diagnosis of the disease. Although the majority of patients are asymptomatic. The most common symptoms are fatigue, malaise, sharp or dull aching upper abdominal pain, and loss of appetite. Apart from these symptoms, the patient experiences symptoms like nausea, thirst, bloating, sleep disturbances. Diagnosing NAFLD requires the demonstration of increased liver fat in the absence of hazardous levels of alcohol consumption. The diagnosis of NAFLD is often made when abnormal liver

aminotransferases or features of fatty liver are noted during an evaluation performed for other reasons. NAFLD may also be diagnosed during the workup of vague right upper quadrant abdominal pain, hepatomegaly, or an abnormal appearing liver at the time of abdominal surgery[6]. At present, there are no FDA- approved therapies for the treatment of NAFLD. Thus, the current approach to NAFLD management focuses on treatment to improve the risk factors for NASH (i.e., obesity, insulin resistance, metabolic syndrome, dyslipidemia) [6].

Descriptions of *Yakrit*- related diseases are minimum in Ayurveda. The common disease is *Yakritodara* [7]. A direct description of fat metabolism and thus induced liver diseases are not seen in Ayurveda classics. From this, we can infer that NAFLD may not be a common disease in the classical period due to various reasons. In the later period, Bhavamisra in his work Bhavaprakasa explained liver disorders under *Pleeha yakruth adhikara*. It denotes the possibility of a higher incidence of liver diseases later on, after the *Samhita* period.

Nidana

Etiological components of NAFLD can be explained under; *Beejadushti (*genetic factors*), Aharaja Hetu* (dietary habits), *Viharaja Hetu* (habit factors), and *Manasika Hetu* (psychogenic factors).

***Beejadushti* (Genetic factors):** According to Charaka, which part of *Beejabhaga* is affected; the corresponding part will be affected in the offspring [8]. *Beejadushti* purposes the individual to the disease by inherent *Medo dhatwagni mandhya* and defective origin of *Rasavaha srothas* and acts as the site of *Srothovaigunya* that lead to subsequent *Sthanasamsraya* under favourable circumstances. Even if a man is taking normal food and following a normal lifestyle, he may get affected with fatty liver disease due to particular genetic makeup.

***Aharaja Hetu* (Dietary factors):** Non-Alcoholic Fatty Liver Disease is one of the non-communicable diseases that leads to metabolic syndrome and insulin resistance. Excessive ingestion of foods having the qualities like *Snigdha, Guru, Pichila, Seeta*, and *Madhura amla lavana rasa* results in disorders related to *Kapha* and *Medas.* In the present era, dietary risks include diets low in intake of fruits, vegetables, legumes, whole grains, nuts/seeds, milk, fiber, calcium, seafood omega-3 fatty acids, and polyunsaturated fatty acids, as well as high intake of red meat, processed meat, sugar-sweetened beverages, trans fatty acids, and sodium [9].

***Viharaja hetu* (Habit factors):** Persons who dislike any kind of activity (*Cheshtadveshi*), abstain from any kind of exercise (*Mruja vyayama varjanam*), habituate day sleep, comfort in a single posture in one place for long (*Eka sthana asana rati*) will lead to an increased state of *Kapha, Medas* and *Kleda* in the body[10]. Physical inactivity causes a local reduction of plasma triglyceride uptake into muscle and a decrease in high-density lipoprotein cholesterol concentration. It has been shown to reduce sympathetic activity, increase insulin resistance and lipogenesis, reduce lipid oxidation, and reduce glucose oxidation in humans [11].

***Manasika Hetu* (Psychogenic factors):** As per Charakacharya, even though the food is taken in proper quantity, according to *Ahara Vidhivisheshayathana*, will not be digested properly if the person is affected by worry, grief, anger, unhappiness, and lack of sleep. There is a relationship between *Rasavaha srothodushti* and these *Manasika nidanas*. The resultant *Rasa dhatwagni mandhya* leads to the *Dushti* of *Rasa dhatu* and subsequent *Dhatus*. The major risk factors for *Rasa dhatwagni mandhya* reflect in the *Yakrit/Pitha sthana* as the accumulation of *Dushta kapha* and *Medas* which is in the *Prasaravastha* in view of *Shadkriyakala* according to Susruthacharya.

Poorvaroopa* and *Roopa

NAFLD hardly exhibits signs or symptoms, especially in the initial stages. Hence it is usually detected during casual blood investigation or a routine examination or the workup of any other disease. Its presentation can be manifested independently or in association with some disorder. Therefore, NAFLD can be considered as an initial stage of *Agni* derangement which leads to several metabolic diseases like *Prameha, Sthoulya* etc. However, symptoms like *Srama, Klama, Tiktasyatha, Hrillasa, Urdwa Udara Soola, Ajeerna,* and *Adhmana* can be seen

***Samprapti* (Pathogenesis) of NAFLD According to Ayurveda**

Kapha meda pradhana aharas

I *paka* **→** ***Amasaya***

Madhura avasthapaka
Formation of *Ama Rasa dhatu*

→ ***Yakrit (Sthanasamsraya)***

Ranjana* of *Ama rasa

Srothorodha* and *Dosha Chaya
in *Yakrit* due to *Guru, Atisnigdha pichila ama*

Ama Rakta dhatu
(distributing all over body)

Medo dhatwagni mandhya
associated with the above pathology
(Stage 1)
→ ***Kapha – Meda chaya* in *Srothomoola***
(Steatosis)

Pitha anubandha
(Stage2)
→ ***Kapha – Meda chaya***
with *Paka*
(Steatohepatitis)

Vata anubandha
(Stage 3)
***(Vata vridhi and Vaigunya*)**
→ ***Sopha, Roukshya* in *Yakrit***
(Fibrosis)

Vata Prakopa
(Stage 4)
→ ***Soshana* of *Yakrit***
(Cirrhosis)

Samprapthi ghatakas

- ***Dosha:*** *Kapha pradhana tridosha*
- ***Dooshya:*** *Rasa, Rakta, Meda*
- ***Agni:*** *Jataragni, Medodhatwagni*
- ***Srothas:*** *Rasavaha Srothas, Raktavaha Srothas, Medovaha Srothas*
- ***Srotodushti:*** *Sangam, Vimarga gamanam*
- ***Roga marga:*** *Abhyanthara*
- ***Utbhava sthanam :*** *Amasaya*
- ***Vyaktha sthanam:*** *Yakrit*
- ***Agni:*** *Mandam*

DIAGNOSIS

The presence of NAFLD has been suspected in those presenting with abnormal liver blood tests or evidence of fatty changes on ultrasound. However, the full spectrum of NAFLD (from simple steatosis to steatohepatitis, cirrhosis, and liver-related morbidity) can also be present with normal liver tests.

Diagnostic practice varies widely and includes clinical, biochemical, and radiographic tests. There is no single diagnostic blood test for NAFLD. Elevations of serum ALT and AST are modest, and usually less than twice the upper limit of normal. ALT levels fall as hepatic fibrosis increases. AST:ALT ratio of <1 is seen in NASH and it reverses (AST:ALT> 1) as the disease progresses towards cirrhosis, meaning that steatohepatitis with advanced disease may be present even in those with normal-range ALT levels. Other laboratory abnormalities that may be present include non-specific elevations of GGT, low-titer antinuclear antibody (ANA) in 20–30% of patients, and elevated ferritin levels [12].

Currently, liver biopsy remains the gold standard for NAFLD diagnosis but it is impractical as a diagnostic tool because it is invasive & expensive and also majority of the patients are not willing to do the same. Fatty liver can also be detected using computed tomography (CT). Fat has a lower attenuation than water using X-ray-based techniques; this makes the liver appear darker on images and, by measuring the radiodensity, fat can be quantified (in Hounsfield units). Through its widespread diagnostic use, CT has become the largest source of radiation to many populations. Given that fatty liver usually has a benign clinical course and that there are alternative imaging techniques without radiation. On this basis, CT was not formally evaluated as a technique for the detection or quantification of fat within the liver[13]. Magnetic Resonance Spectroscopy (MRS) is accepted by many as the most accurate non-invasive method to quantify liver fat. However, MRS has important limitations as it is time-consuming to perform, requires expertise to analyze, and is generally available only at academic centres[14]. Magnetic resonance imaging derived proton-density-fat-fraction (MRI-PDFF) is a quantitative imaging biomarker that enables accurate, repeatable and reproducible quantitative assessment of liver fat over the entire liver.[15] Ultrasound is most often used as it is widely available, easy to perform, less expensive and provides a qualitative assessment of hepatic fat content, as the liver appears 'bright' due to increased echogenicity. Hepatic steatosis at 5% or more is the accepted histological definition of grade 1 steatosis; steatosis at less than 5% is considered normal.

Table 1: Grading of NAFLD in USG on the basis of macro vesicular steatosis

Grade	Macro vesicular steatosis
Grade 0 (Normal)	up to 5% of cells
Grade 1	5-33 %
Grade 2	34-66 %
Grade 3	≥67%

Management

There is no single intervention that is proven to be effective in the treatment of NAFLD. The main goals of treatment are to improve steatosis and to prevent the progression of the disease. Intense lifestyle modification and treatment of the risk factors are the cornerstones of disease management. Medical and surgical interventions serve as second-line treatments[16]. Many studies indicate that lifestyle modification can improve serum aminotransferases and hepatic steatosis, with loss of at least 3–5% of body weight improving steatosis. Being a disease associated with insulin resistance and metabolic syndrome, insulin-sensitizing agents are expected to alter the pathophysiological mechanisms of NAFLD. Metformin and the thiazolidinedione group of antidiabetic agents are the most studied medications in this group. Drugs for weight loss like Orlistat, Lorcaserin, Naltrexone, Phentermine, etc, are useful in the treatment. For normalising blood cholesterol statins have been opted. To counter oxidative stress, antioxidants like N- acetylcysteine, and Vitamin E is the drug of choice[6].

At present, there are no FDA-approved therapies for the treatment of NAFLD. Ayurveda has immense potential in the management of Non-Communicable Diseases, and NAFLD is one among them. As fatty infiltration can be considered a *Santharpanajanya vyadhi*, *Apatharpana* treatment should be adopted. It can be attained by avoidance of etiological factors and by breaking the pathogenesis. The treatment should aim at the correction of *Agni,* digestion of *Ama*, alleviation of *Kapha*, *Lekhana* of the accumulated *Medas* and rejuvenation therapy.

***Nidana parivarjana*:** Avoidance of *Sleshma medokara ahara vihara* helps to reduce its incidence.

***Shodhana*:** *Virechana* is ideal; as *Asraya sthana* of the disease is *Yakrit* which is *Rakthavaha srothomoola*. As Non-alcoholic fatty liver disease is a *Santharpanajanya Vyadhi, Rooksha Virechana* using *Choornas, Kashayas* etc, should be given. *Virechana* is indicated in excessive *Dosha* accumulation and *Srothorodha*. It acts as *Agnideepana* and *Srothosodhana*.

***Samsamana*:** *Pachana, Deepana*, and *Rookshana* should be done in the first stage of *Amavastha* for pacifying the *Kapha* and *Ama* from the *Pithasthana.* Use of *Katu thiktha rasa* that becomes *Katu vipaka* may be

useful as these have *Sneha-meda-kleda-shoshana* properties. The use of *Lekhaneeya* drugs helps in the removal of *Sanchita ama* and accumulated fat from hepatocytes. *Medohara chikitsa* can also be adopted.

***Rasayana*:** As *Ama* is *Dhatuleena*, *Rasayana chikitsa* can also be adopted. *Rasayana* drugs having *Deepana, Pachana, Lekhana* property may be selected. *Triphala, Shilajathu, Guggulu* etc are good example for this.

Triphala - *Triphala* and its constituents show valuable hepato-protective activity. Extract of *Triphala* showed significant protection against acute liver toxicity induced by high doses of drugs and chemicals, which might be due to high levels of phenolic and polyphenolic compounds in these plants [17].

Guggulu- Oleogum resin of *Guggulu* is effective in reducing hyperlipidemia. Guggulsterone has been reported to reduce serum cholesterol, and triglyceride, and has cardioprotective action [18].

Pathya* and *Apathya

Pathya

Ahara – Having *Katu, Tiktha rasa, Laghu, Rooksha guna* etc. must be incorporated as a part of the diet.

Vihara – Adherence to regular *Vyayama* according to *bala* increases the power of digestion, lightness to the body, increases capacity to do work, removes excess fat, and provides stability.

Apathya

Ahara – Foods having *Guru, Snigdha* and *Pichila gunas* should be exempted. *Abhishyandi aharas* like *Dadhi, Ghrita, Navadhanya, Pishtanna* etc. should be avoided.

Vihara – Day sleep, suppression of natural urges.

CONCLUSION

NAFLD is rapidly becoming the most common liver disease worldwide. Due to the *Aharaja* and *Viharaja nidanas*, *Kapha doshakopa* (aggravation of phlegm) occurs in the body. This leads to *Jataragnimandhya* (reduced digestive fire) and the formation of *Ama* i.e., improperly formed *Rasadhatu*. This *Samarasa* circulates throughout the body by the action of *Vyanavayu*, reaches *Yakrit* for the process of *Dhatu parinama* since *Yakrit* is the seat of *Ranjaka pitha* and *Raktavaha-Srothomoola*. This causes *Avayavadushti* (vitiation of *Yakrit*). Since *Kapha* has very much affinity towards *Medodhatu,* it causes *Medodhatwagni mandhya* which leads to the formation of *Sama-Medas* and gets localized in the liver to cause NAFLD. Therefore, for the breaking of pathogenesis of NAFLD, *Deepana* (carminative)*, Pachana* (digestive)*, Kaphahara* (*Kapha* alleviating) and *Medohara* drugs (fat reducing) and *Rasayana* (rejuvenating) therapy for preventing further progression are essential.

REFERENCES

1. World J Hepatol. 2017 Jun 8; 9(16): 715–732; Published online 2017 Jun 8. doi: 10.4254/wjh. v9.i16.715
2. Sayiner M, Koenig A, Henry L, Younossi ZM; Epidemiology of Nonalcoholic Fatty Liver Disease and Nonalcoholic Steatohepatitis in the United States and the Rest of the World. Clin Liver Dis. 2016; 20: 205–214.
3. Sanjay Kalra, Manoj Vithalani, Gurjeet Gulati, C M Kulkarni, Yogesh Kadam, James Pallivathukkal, Brahmananda Das; Study of prevalence of nonalcoholic fatty liver disease (NAFLD) in type 2 diabetes patients in India (SPRINT) PMID: 24772746
4. Calzadilla Bertot L, Adams LA. The Natural Course of Non-Alcoholic Fatty Liver Disease. *Int J Mol Sci.* 2016; 17: pii: E774.
5. Patel V, Sanyal AJ, Sterling R. Clinical Presentation and Patient Evaluation in Nonalcoholic Fatty Liver Disease. Clin Liver Dis. 2016; 20: 277–292.
6. L Kasper, L Hauser, S Fausi, L Longo, Loscalzo, J Jameson, Harrison's Principles of Internal Medicine. 19th ed. Vol. 2. USA: The McGraw-Hill Companies; chapter 364 pg: 2056
7. Acharya Vagbhata, Ashtangahridayam, Prof.K Srikantha Murthy, English translation Chowkambha Krishnadas Academy. 2016 Nidanasthana, Chapter 12; Pg 118, Sloka 28.
8. Charaka: Charaka Samhita, Sareera sthana 4/30, Varanasi Choukhamba Surbharati Prakashan; 2011.
9. James M. Paik, Seema Mir, Saleh A. Alqahtani, Youssef Younossi, Janus P. Ong, Zobair M. Younossi; Dietary Risks for Liver Mortality in NAFLD: Global Burden of Disease Data; hepatology communications; First published: 08 July 2021 https://doi.org/10.1002/hep4.1707
10. Charaka: Charaka Samhita, Nidana sthana 4/6, Varanasi Choukhamba Surbharati Prakashan; 2011.
11. R. Scott Rector, John P. Thyfault; Does physical inactivity cause Non-alcoholic fatty liver disease?; Journal of applied physiology; 01 DEC 2011 https: //doi.org/10.1152/japplphysiol.00384.2011
12. Stanley Davidson, Davidson's Principles and Practice of Medicine. (23 ed.), Elsevier; c2018, chapter 22 pg 884.
13. National Guideline Centre (UK). Non-Alcoholic Fatty Liver Disease: Assessment and Management. London: National Institute for Health and Care Excellence (UK); 2016 Jul. (NICE Guideline, No. 49.) 6, Diagnosis of NAFLD. Available from: https: //www.ncbi.nlm.nih.gov/books/NBK384715/
14. Reeder, Scott B, and Claude B Sirlin. "Quantification of liver fat with magnetic resonance imaging." Magnetic resonance imaging clinics of North America vol. 18, 3 (2010): 337-57, ix. doi:10.1016/j.mric.2010.08.013

15. Caussy, Cyrielle et al. "Noninvasive, Quantitative Assessment of Liver Fat by MRI-PDFF as an Endpoint in NASH Trials." Hepatology (Baltimore, Md.) vol. 68, 2 (2018): 763-772. doi:10.1002/hep.29797.
16. Pappachan JM, Babu S, Krishnan B, Ravindran NC. Non-alcoholic Fatty Liver Disease: A Clinical Update. J Clin Transl Hepatol. 2017; 5(4): 384-393. doi:10.14218/JCTH.2017.00013
17. Rasna G, Ankit G, Ram LS; Hepatoprotective Activities of Triphala and Its Constituents; International Journal of Pharma Research & Review, Jan 2015; 4(1): 34-55
18. Tripathi SN, Kishore P, Dwivedi LD, Gupta M; studies on guggulu, Delhi: Central Council for Research in Ayurveda & Siddha, Ministry of Health and Family Welfare, 1989; https://www.jaypeedigital.com/doi/JRAS/pdf/10.5005/jp-journals-10064-0016

Cite this article as:
Ambika K, Mini V G, Vishnu Priya L R. Conceptual Understanding of Non-Alcoholic Fatty Liver Disease. International Journal of Ayurveda and Pharma Research. 2022;10(8):94-99.
https://doi.org/10.47070/ijapr.v10i8.2494
Source of support: Nil, Conflict of interest: None Declared

***Address for correspondence**
Dr. Vishnu Priya L R
PG Scholar
Department of Kayachikitsa
Government Ayurveda College,
Trivandrum, Kerala.
Email:
vishnupriya2194@gmail.com