DOI: https://doi.org/10.36094/sc.v89.2024.Non-Alcoholic_Fatty_Liver_Disease.Sharma_Panja.150

ARTICLE

Sci. and Cult. 90 (5–6) : 150-153 (2024)

NON-ALCOHOLIC FATTY LIVER DISEASE (NAFLD) AND AYURVEDA

SANJEEV SHARMA[1] AND ASIT PANJA[2]

Non-alcoholic fatty liver disease (NAFLD) is a condition with excessive liver fat deposition along with insulin resistance (IR). It is growing cause of liver injury globally and is present in developed and developing countries with more prevalence in the western countries. Histologically it is defined as steatosis in >5% of hepatocytes (liver cells)[1]. Non-alcoholic fatty liver (NAFL) and non-alcoholic steatohepatitis (NASH) are the two distinct conditions with entirely different outcomes and prognosis. Non-alcoholic steatohepatitis (NASH) covers a broad spectrum of severities, including liver fibrosis and cirrhosis which may lead to hepatocellular carcinoma (HCC)[2]. To diagnose the NAFLD it is mandatory to exclude the secondary causes and alcohol consumption. The maximum limit for the alcohol consumption is P30g per day for men and P20g for women[3]. In a person the alcohol consumption above these limits is an indication towards the alcoholic fatty liver disease (AFLD) or alcoholic steato-hepatitis (ASH). However, the damage to the liver due to alcohol depends uponmany other co-factors like type of alcohol, duration of exposure, genetic pre-disposition and consuming patterns. But patients consuming alcohol in less dose as mentioned above may land in NAFLD due to metabolic risk factors which are more prominent causes than the alcohol[4]. Liver biopsy is the best method to confirm the diagnosis.

Prevalence

NAFLD is estimated to be 25% globally, with higher prevalence in the Middle East and South America with 55.5%–59.7% prevalence in diabetics, 64.6%–95% in obese persons and 73% in metabolic syndrome[5,6,7]. Africa shows the lowest prevalence of NAFLD[8]. The prevalence of NASH is estimated to be 1.5%–6.5% and is considered the most common cause of chronic liver disease and liver transplantation[9].In India the prevalence of NAFLD and asymptomatic rise in liver enzymes is commonly found in adults and paediatric population. NAFLD increases with the increasing age[10].In adults the prevalence of prediabetes is 19-22%, diabetes 15-19%, and metabolic syndrome 30% and is at rise in rural and urban populations[11, 12] NAFLD is expected to increase in India owing to the life style and dietary habits. There must be a policy for the NAFLD screening by testing the liver enzymes and ultrasound. All individuals having steatosis should be screened for metabolic syndrome and independent liver enzymes.

Pathogenesis

NAFLD is the commonest cause of liver injury which travels from simple accumulation of fat in the hepatocytes to non-alcoholic Steato-hepatitis (NASH), ballooning of the hepatocytes, liver inflammation, fibrosis, cirrhosis leading to hepato-cellular carcinoma. First step in this direction is fat deposition in the liver for which three mechanisms have been identified a. increased lipolysis in the visceral adipose tissue responsible for about 59% of liver fat, b. activation hepatic DNL (de-novo lipogenesis) shares about 26% liver fat accumulation and c. high calorie or fat rich diet is

1 Vice-Chancellor,
2 Professor, Department of Samhita and Siddhanta, National Institute of Ayurveda, Jaipur, Rajasthan
e-mail: sanjeeviniamch@gmail.com

responsible for 15% of liver fat deposit[13]. Simple fat deposition is considered as a benign condition however its journey to NASH is complex one and is the result of the interplay of liver and many other organs. It involves the liver cells both parenchymal and non-parenchymal and signals from organs like adipose tissue, muscles and gut. Intestinal microbiota (dysbiosis) plays an important role in liver fat genesis, inflammation and fibrosis. Finally, the hepatic stellate cells are activated resulting into the excessive synthesis and deposition of ECM (extracellular matrix)[14]. In this whole process the insulin resistance (IR) plays a crucial role as it makes adipose tissue resistant to the antilipolytic effect of insulin resulting into the triglyceride breakdown forming the free fatty acid and glycerol. These are taken by the liver and stored as triglycerides. As a result of IR the higher levels of insulin modulate the liver fat metabolism by increasing the triglyceride synthesis[15]. High dietary fat and high sugars intakeand western diets are held responsible for liver fat (NAFLD), cardio-vascular disease and metabolic syndrome or metabolic diseases. High fat accumulation in the liver disturbs the liver lipid environment and causes the cell organelle dysfunction (dysfunction of endoplasmic reticulum and mitochondria), NASH development, cell injury leading to death[16,17].

Dysbiosis and Gut-Liver Axis

Human microbiota is composed of large number of microorganisms (including archaea, viruses, phages, yeast, and fungi) with more than 1000 bacterial species. Various components of the gut are having different microbiome and depends on many factors and physiological requirements[18]. Many factors like diet, antibiotics, alcohol etc can alter the gut microbiota. This gut flora maintains symbiosis with the host and is important for immunity as well as for energy metabolism. It has been established that gut flora has a close relationship with liver metabolism and gut dysbiosis can result into NAFLD. Dysbiosis causes the excess synthesis of SCFAs (short chain free fatty acids) and directly influences the lipid metabolism.It also results into the leakiness of the gut barrier resulting into the passage of bacteria or their products into the portal circulations leading into the progression of the NAFLD.

Diagnosis

NAFLD is an asymptomatic condition and usually diagnosed when investigating for other diseases. Mainly there are three types investigations: blood tests, imaging studies and liver biopsy. Blood tests include complete blood count, iron studies & haemoglobin estimation, liver function tests & liver enzymes, fasting blood sugar and lipid profile. Imaging studies which can be done are ultrasound, MRI and elastography (fibroscan) and MRI assisted elastography. If NASH is required to be ruled out then liver biopsy is the only best test available.

Management Principles

Management of the NAFLD depends on the stage of the disease as well as on the assessment of the risks[19]. Main approaches for the management of NAFLD are; 1. Modifications in diet (calorie restricted diet – 600 calories less than daily requirement) targeted >7% to > 9% loss of body weight reduces steatosis, ballooning and hepatic inflammation. Mandate is to avoid saturated fats, simple carbohydrates and sweetened drinks aim to lose >10% body weight and maintain loss. 2. Exercises & increased physical activities and to minimise total sedentary time. This minimises the insulin resistance and improves the liver enzymes and reduces the liver fat. There should be an aim to walk 10,000 steps daily with aerobics. 3. Pharmacotherapy which includes selected prescription of Orlistat (enteric lipase inhibitor) improves ALT and steatosis. Another prescription drug is Pioglitazone which should be used very carefully and is not a primary treatment of NASH and generally should be used first line of treatment when BMI is greater >50 kg/M^2. It improves insulin sensitivity and lipid profile. Vitamin E is another pharmacotherapeutic agent which improves steatohepatitis[20].

Ayurvedic Management Principles of NAFLD

Ayurveda has its own principles of understanding the etiopathology of the diseases and their treatments. NAFLD although is the disease condition where *yakruta* (liver) is affected and results into *yakrutodara* yet the disease can be attributed to *agnimandya* occurs due to *mithya-ahar avihara* and *pragyapradha. Agnimandya* is inclusive of poor digestion, poor or disturbed absorption, disturbed metabolism and excretory mechanism. *Yakruta* is the seat of *pitta dosha* and many other metabolic processes take place in it. When *yakruta* gets affected the *agni (jathragni, dhatwagni and bhutagni)* gets deranged which results into many diseases which we generally call as non-communicable diseases (NCDs). Hence, treatment of NAFLD is very essential to prevent NCDs. Ayurveda has potentials to not only manage NAFLD but to reverse it and bringing the liver into normal state. Protocol of *santarpanottha* diseases with required modification is useful to manage the NAFLD.

Preventive Aspects

Following must be avoided.

.....स्निग्धैर्मधुरैर्गुरुपिच्छिलै:। नवान्नैर्नवमद्यैश्च मांसैश्चानूपवारिजै:।।

गोरसैर्गौडिकैश्चान्नै:पैष्टिकैश्चातिमात्रश:। चेष्टाद्वेषी दिवास्वप्नशय्यासनसुखे रत:।। - Cha.Su.23/3-4

Food articles with excess unctuous, sweet, heavy and viscous substances, freshly harvested food grains, wines with the flesh of wetland and aquatic animals with cow's milk and its products, the products of gur (jaggery) and with articles prepared of flour, dislikes movements (lazy) mean one should remain physically active, day-sleeping, over-indulgence in lounging and lying in soft beds (luxurious and mattress) are to be avoided.

Life style modification and Food

- प्रायो रूक्षान्नसेवनम - Cha.Su.23/9
- प्रशातिका प्रियङ्गुश्च श्यामाकायवका यवा:। जूर्णाह्वा: कोद्रवा मुद्गा: कुलत्थाश्चक्रमुद्गका:।।
- आढकीनां च बीजानि पटोलामलकै: सह। भोजनार्थं प्रयोज्यानि पानं चानु मधूदकम।
- अरिष्टांश्चानुपानार्थे मेदोमांसकफापहान Cha.Su.21/25-26
- व्यायामश्चोपवासश्चधूमाश्च स्वेदनानि च।। Cha.Su.23/8
- व्यायामनित्योजीर्णाशी यवगोधूमभोजन:| - Cha.Su.23/25
- व्योषं विडङ्गं शिगरूणि त्रिफलां कटुरोहिणीम बृहत्यौ द्वे हरिद्रे द्वे पाठामतिविषां स्थिराम।।१९।।

  हिङ्गु केबुकमूलानि यवानीधान्यचित्रकान सौवर्चलमजाजीं च हपुषां चेति चूर्णयेत।।२०।।

  चूर्णतैलघृतक्षौद्रभागा: स्युर्मानत: समा:| सक्तूनां षोडशगुणो भाग: सन्तर्पणं पिबेत।।२१।।

  प्रयोगादस्य शाम्यन्ति रोगा: सन्तर्पणोत्थिता:|Cha.Su.23/19-22

Diet consisting mostly of dry foods, *Prashatika (praśātikā)*, Italian millet *sanwa* millet, wild barley, barley, great millet, common millet, green gram horse-gram, *Cakramudgaka*, the seed of pigeon-pea mixed with wild snake-gourd and *Emblic myrobalan* should be used as food followed by hydromel as drink such wines as are eliminative of fat, flesh and *Kapha*. Exercise, fasting, smoking and sudation are beneficial. Daily exercise or eating only after the previous meal has been digested, and regular intake of barley and wheat and consumption of Ayurveda food recipe like *Vyoshadi saktu* are also effective.

Principles of Treatment

A. Langhana

B. Rukshana

C. Shodhana

Langhana in the form of lagu-ashana(light & restricted diet) and rukshan processes are mentioned in the previous two subheadings namely preventive aspects and lifestyle modification in the form of avoidable and adoptable foods and activities.

Aushadha Yoga

- सक्षौद्रश्चाभयाप्राश:Cha.Su.23/8
- त्रिफलारग्वधंपाठांसप्तपर्णंसवत्सकम
  मुस्तंसमदनंनिम्बंजलेनोत्क्वथितंपिबेत।। Cha.Su.23/10
- तक्राभयाप्रयोगैश्चत्रिफलायास्तथैवचंअरिष्टानांप्रयोगैश्चCha.Su.23/17

The *Chebulic myrobalan* with honey, decoction prepared by boiling, in water, the three myrobalans, purging cassia, Patha and Dita bark, along with *Kurchi*, nutgrass, emetic nut and *Neem* is to be taken as portion and buttermilk and *Chebulic myrobalans* or of the three myrobalans or of the medicated wines

Sodhana

As in some conditions the features of bahudosha are observed so sodhana is the treatment of choices in that situation.

- बहुदोषस्यलिङ्गानितस्मैसंशोधनंहितम।
  ऊधवंचैवानुलोमंचयथादोषंयथाबलम्। Cha.Su 16/16

For sodhana purpose considering the situation (doshavastha and bala of the patient) either nitya-sodhana or vidhivat sodhana could be implemented .

For 'Nitya sodhana' Abhaya (Chebulic myrobalan), Triphalacan be used daily as per the condition of patient.Snehana (Tikta-ghrita) purvakavidhivatsodhana in every month could be adopted in the patient having good agnibala and sharirbala.

- शस्तमुल्लेखनंतत्र विरेको रक्तमोक्षणम्। Cha.Su.23/8

Emesis, purgation, letting of blood are to be done according to condition of patient as purification therapy. ❐

References

1. European Association for the Study of the Liver (EASL), European Association for the Study of Diabetes (EASD)

and European Association for the Study of Obesity (EASO) Journal of Hepatology 2016 vol. 64 j 1388–1402.

2. European Association for the Study of the Liver (EASL), European Association for the Study of Diabetes (EASD) and European Association for the Study of Obesity (EASO) Journal of Hepatology 2016 vol. 64 j 1388–1402.
3. V. Ratziu, S. Bellentani, H. Cortez-Pinto, C. Day, G. Marchesini. A position statement on NAFLD/NASH based on the EASL 2009 special conference. J Hepatol 2010; 53:372–384..
4. S. Bellentani, G. Saccoccio, F. Masutti, L.S. Croce, G. Brandi, F. Sasso, et al. Prevalence of and Risk Factors for Hepatic Steatosis in Northern Italy. *Ann Intern Med 2000*; 132:112–117.
5. Z.M. Younossi, P. Golabi, L. de Avila, et al. The Global Epidemiology of NAFLD and NASH in Patients with Type 2 Diabetes: a Systematic Review and Meta-analysis. *J Hepatol*. 2019; 71:793–801.
6. S. Bellentani, G. Saccoccio, F. Masutti, et al. Prevalence of and Risk Factors for Hepatic Steatosis in Northern Italy. *Ann Intern Med*. 2000; 132:112–117.
7. A. Goyal, H. Arora, S. Arora. Prevalence of Fatty Liver in Metabolic Syndrome. *J Fam Med Prim Care*. 2020;9:3246–3250.
8. Z.M. Younossi, A.B. Koenig, D. Abdelatif, Y. Fazel, L. Henry, M. Wymer. Global epidemiology of nonalcoholic fatty liver disease-Meta-analytic assessment of prevalence, incidence, and outcomes. *Hepatology*. 2016;64:73–84.
9. M. Zhai, Z. Liu, J. Long, *et al.* The Incidence Trends of Liver Cirrhosis Caused by Nonalcoholic Steatohepatitis via the GBD Study 2017. *Sci Rep*. 2021;11:5195.
10. Shalimar, Anshuman Elhencey et al. Prevalence of Non-alcoholic Fatty Liver Disease in India: A Systematic Review and Meta-analysis. Journal of Clinical and Experimental Hepatology, 2021;12:818-829
11. Y. Krishnamoorthy, S. Rajaa, S. Murali, T. Rehman, J. Sahoo, S.S. Kar. Prevalence of Metabolic Syndrome Among Adult Population in India: a Systematic Review and Meta-analysis. *PLoS One*. 2020;15.
12. P. Ranasinghe, R. Jayawardena, N. Gamage, N. Sivanandam, A. Misra. Prevalence and trends of the diabetes epidemic in urban and rural India: a pooled systematic review and meta-analysis of 1.7 million adults. *Ann Epidemiol*. 2021;58:128–148.
13. K.L. Donnelly, C.I. Smith, S.J. Schwarzenberg, et al. Sources of Fatty Acids Stored in Liver and Secreted via Lipoproteins in Patients with Nonalcoholic Fatty Liver Disease. *J Clin Invest*. 2005;115: 1343–1351.
14. Y. Koyama, D.A. Brenner. Liver Inflammation and Fibrosis. *J Clin Invest*. 2017; 127:55–64.
15. D.F. Vatner, S.K. Majumdar, N. Kumashiro, et al. Insulin-independent Regulation of Hepatic Triglyceride Synthesis by Fatty Acids. *Proc Natl Acad Sci U S A*. 2015; 112:1143–1148.
16. J.G. Fan, H.X. Cao. Role of Diet and Nutritional Management in Non-alcoholic Fatty Liver Disease. *J Gastroenterol Hepatol*. 2013; 28(Suppl 4):81–87.
17. H.J.Flint, K.P. Scott, P. Louis, et al. The Role of the Gut Microbiota in Nutrition and Health. *Nat Rev Gastroenterol Hepatol*. 2012; 9:577–589.
18. F. Backhed, R.E. Ley, J.L. Sonnenburg, et al. Host-bacterial Mutualism in the Human Intestine. *Science*. 2005; 307:1915–1920.
19. Q.M. Anstee, S. McPherson, C.P. Day. How Big a Problem is Non-alcoholic Fatty Liver Disease? BMJ 2011; 343:d3897.
20. J.K. Dyson, et al. Frontline Gastroenterology 2014; 5:277–286. doi:10.1136/flgastro-2013-100404.