



Review Article

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A REVIEW ON ETIOPATHOGENESIS OF NON-ALCOHOLIC FATTY LIVER DISEASE: AN AYURVEDIC PERSPECTIVE WITH REFERENCE TO YAKRUT ROGA

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ABSTRACT

Non-Alcoholic Fatty Liver Disease (NAFLD) represents a spectrum of chronic liver disorders ranging from simple steatosis (NAFL) to the more severe Non-Alcoholic Steato-Hepatitis (NASH), which may progress to Fibrosis, Cirrhosis, and Hepato Cellular Carcinoma. NAFLD has emerged as the most common chronic liver disease worldwide, with a global prevalence of approximately 25%, and shows strong association with Obesity, Type 2 Diabetes Mellitus, Dyslipidemia, and Metabolic Syndrome. The pathogenesis of NAFLD/NASH is complex and multifactorial, previously explained by the “two-hit hypothesis” and currently by the “multiple-hit hypothesis,” involving insulin resistance, free fatty acid accumulation, oxidative stress, mitochondrial dysfunction and inflammatory mediators. In Ayurveda, NAFLD can be correlated with Yakrut roga and understood as a Santarpanotha Vyadhi resulting from Kapha-Medo Dushṭi, Agnimandya, and Ama formation, leading to Srotorodha and Sthanamsraya in Yakrut. Although NAFLD is not directly described in classical texts, its etiopathogenesis can be interpreted using fundamental Ayurvedic principles. This review aims to analyze the Nidana and Samprapti of NAFLD/NASH through an integrative perspective, correlating modern risk factors with Ayurvedic concepts.

Keywords: Non-Alcoholic Fatty Liver Disease, NAFLD, Non-Alcoholic Steato Hepatitis, NASH Santarpanotha Vyadhi, Yakrut roga

INTRODUCTION

Non-Alcoholic Fatty Liver Disease (NAFLD) encompasses a spectrum of liver conditions ranging from the relatively benign Non-Alcoholic Fatty Liver (NAFL) to Non-Alcoholic Steato Hepatitis (NASH), which represents the more severe form. NAFLD can progressively advance to Liver Fibrosis, Cirrhosis, and in some cases, Hepato Cellular Carcinoma¹. In NAFLD, hepatic steatosis is present without evidence of inflammation, whereas in NASH, hepatic steatosis is associated with lobular inflammation and apoptosis that can lead to Fibrosis and Cirrhosis. In recent years the number of chronic liver diseases, including Non Alcoholic Fatty Liver Disease (NAFLD) has recorded steady growth, according to the World Health Organization. The worldwide prevalence of NAFLD is about 25%, ranging from 13% in Africa to 23% in Europe and 32% in the Middle East. The prevalence of NAFLD in Type 2 Diabetes Mellitus, Central Obesity, Dyslipidemia and the Metabolic Syndrome patients are 23%, 51%, 69% and 43% respectively². NAFLD can be correlated to Yakrut Roga (Liver diseases) in Ayurveda. Detailed description regarding the disease is not available in Ayurvedic classics. So here unique attempt has been made to understand the Nidana (etiology) and Samprapti (pathogenesis) of NAFLD on the basis of risk factors associated with NAFLD/NASH like Obesity, Hyperlipidemia, Type 2 Diabetes Mellitus and other Metabolic Syndrome.

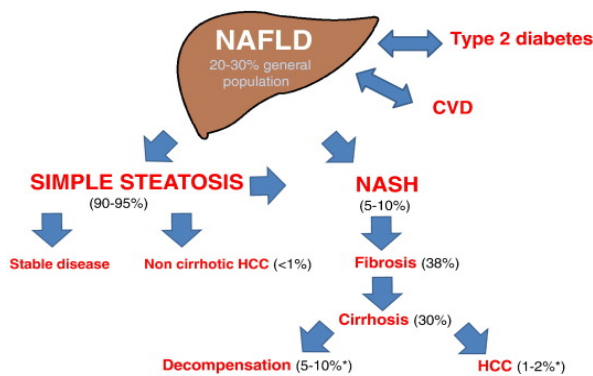
DISEASE REVIEW

Non-Alcoholic Fatty Liver Disease (NAFLD) is the most common chronic liver disease. It is defined as (a) there is evidence of Hepatic Steatosis, either by imaging or by histology and (b)

there are no causes of secondary hepatic fat accumulations such as significant alcohol consumption, use of steatogenic medication or hereditary disorders². A disease practically unheard of three decades ago, is now considered as one of the most common causes of chronic liver disease in industrialized world. Approximately 20% of individuals with NAFLD have NASH, and some cases may progress to Cirrhosis and Hepato Cellular Carcinoma (HCC)^{3,4}. The precise etiology of NAFLD is unknown, but there is a strong association with Obesity, Insulin Resistance Syndrome and Dyslipidemia⁵. Initial theory for pathogenesis of NASH was based on a 2- hit hypothesis. The first hit, hepatic triglyceride accumulation or steatosis, increased susceptibility of the liver to injury mediated by second hits, such as inflammatory cytokines/ adipokines, mitochondrial dysfunction and oxidative stress, which in turn lead to steatohepatitis and/or fibrosis. Free Fatty Acid (FFA) plays an important role in the pathogenesis of NAFLD. In Obesity and Insulin Resistance, there is an increased influx of FFA to the liver. These FFA either undergo beta-oxidation or are esterified with glycerol to form triglycerides, leading to hepatic fat accumulation. NAFLD is characterized by the accumulation of triglycerides, which are formed from the esterification of FFA and glycerol within the hepatocyte. FFAs arise in the liver from three distinct sources; lipolysis (the hydrolysis of FFA and glycerol from triglyceride) within the adipose tissue, dietary sources and de novo lipogenesis (DNL). In contrast, FFA may be utilized either through beta oxidation, re-esterification to triglycerides and storage as lipid droplets, or packaged and exported as Very Low-Density Lipoprotein (VLDL). Hence hepatic fat accumulation can occur as a result of increased fat synthesis, increased fat delivery, decreased fat export and decreased fat oxidation⁶. Patients with NAFLD frequently

experience fatigue, right upper quadrant discomfort, anorexia, sleep disturbances, lethargy and malaise. The disease may progress to Cirrhosis, which represents late-stage scarring of the liver⁷.

The ancient medical wisdom –Ayurveda also vividly described Liver Diseases in the context of Kamala (Jaundice) and Yakrut Roga (diseases of liver) in different classical texts. These concepts can be applied to understand Fatty Liver also. It can be interpreted as a Santarpanotha Vyadhi (diseases due to excessive nourishment) with Kapha-Medo Dushti (vitiation of phlegm and adipose tissue) getting Sthanasamsraya (localization) in Yakrut (liver) which is Raktavaha Sroto Moola and Pittasthana. The causative factor can be understood as Agnimandya (weak digestive fire) leading to Ama (indigestion), which is reflected in Dhatwagnimandya (weak digestive fire at tissue level) and Bhootagnimandya.



AYURVEDIC CONCEPT OF YAKRUT

The word Yakrut (Liver) is derived from the root ‘Kr’ with the prefix ‘Ya’ and suffix Tuk.i.e.Yakrut is the organ that controls all the functions. Yakrut is a black coloured Mamsa Vissha (fleshy organ) situated inferiorly to Hridaya (Heart) on right side of the body⁸. According to Acharya Susruta, Yakrut originates from Sonitha (blood)⁹. VridhaVagbhata opines that Yakrut develops from Rakta (blood) and Vayu (air)¹⁰. The six Bhavas that constitute Garbha (foetus) are Mathruja, Pithruja, Sathwaja, Satmyaja, Atmaja and Rasaja. Yakrut has its origin from Mathruja bhava¹¹.Yakrut is Pittasthana (site of bile), serving as the seat of Ranjaka Pitta and the moolasthana (root) of Raktavaha Srotas^{12, 13}(blood carrying channel).

NIDANAS OF NAFLD

The concepts of Ayurveda and concept of modern medicine are different in relation to etiological and pathological basis of diseases. Hence while considering diseases, Ayurveda gives more emphasis to the physiological homeostasis of the body in terms of Dosha-Dushyas. NAFLD cannot be directly equated with any single disease entity in Ayurveda; therefore, its Nidana (etiology) and Samprapti (pathogenesis) have been analyzed based on associated risk factors such as Obesity, Hyperlipidemia, Type 2 Diabetes Mellitus and Metabolic Syndrome. It can be considered as Santarpanotha Vyadhi (diseases due to excessive nourishment) and Nidanans of Santarpanotha Vyadhi (etiologies of diseases due to excessive nourishment), Atisthoulya (Obesity) and Prameha (Diabetes Mellitus) may be considered as the Nidanans (etiologies) of NAFLD

NIDANA OF SANTHARPANOTHA JANYA VIKARAS

Diseases developed due to the excessive nourishment of body are known as Santarpanotha Vyadhi. According to Acharya Charaka, excessive intake of Atisnigdha (Unctuous food items), Atimadhura (sweet items), Atiguru (heavy), Atipicchila (slimy), Navanna (newly harvested grains), Navamadya (newly prepared alcohol), Anupa and Varija Mamsa (flesh of animals lives in marshy land), Gorasa and Guda (milk and jaggery), Divaswapna (day sleep), Sayyaasana Sukha (sedentary life style) are the Nidanans of Santarpanotha Vyadhis¹⁴.

Nidana of Atisthoulya

Excessive intake of Guru (heavy), Madhura (sweet), Sita (cold), Snigdha (unctuous) food items, Atisampoorana (over eating), Avyayama (lack of exercise), Avyavaya (lack of sexual intercourse), Divaswapna (day sleep), Harshanithyatwa (happy life), Achintana (lack of over thinking), Beejaswabhaba (hereditary) are the Nidanans of Atisthoulya (Obesity) according to Charaka Acharya¹⁵.

Nidana of Prameha

Excessive intake of Swadu (sweet), Amla (sour), Lavana (salty), Snigdha (unctuous), Guru (heavy), Picchila (slimy), Sita (cold) food items, excessive intake of Navadhanya (newly harvested grains), Sura (alcoholic beverages), Anupa Mamsa (meat of animals lives in marshy areas), Ikshu (sugarcane), Guda (jaggery), Gorasa (milk and buttermilk) and regimens like Ekasthana Asana (sedentary life style) are the main Nidanans of Prameha (Diabetes Mellitus) described in Ashtanga Hridaya¹⁶.

SAMPRAPTI OF NAFLD

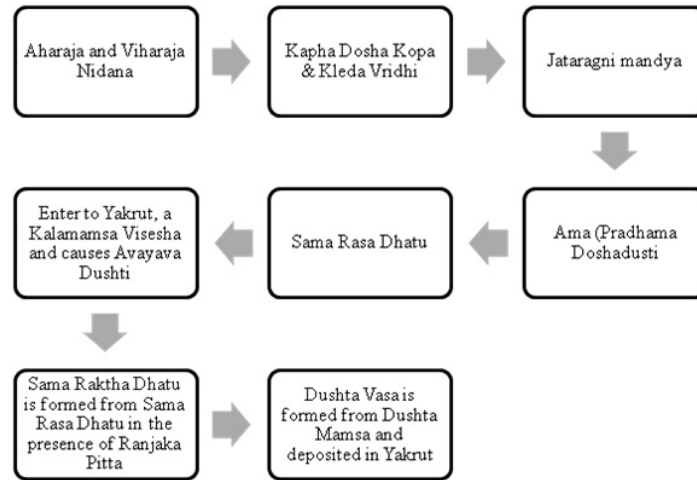
Due to the Aharaja (Food) and Viharaja (regimen) Nidana Sevana, Kapha Dosha Kopa (vitiation of phlegm) and Kleda Vrudhi (increase of moisture content) occurred in the body. This leads to Jataragnimandya (impairment of digestive fire) and Ama (stage of indigestion) formation. Ama is the Pradhama Dhatu Dushti (vitiation of first Dhatu) i.e., Rasadushti (vitiation of chyle). The formed Rasa Dhatu (chyle) is in Sama (partially digested) condition. This Sama Rasadhatu (partially digested chyle) entered into Yakrut (liver) and Rakta Dhatu (blood) is formed by the help of Ranjaka Pitta (bile located in liver). So the formed Rakta Dhatu (blood) was Sama Rakta Dhatu (deformed blood) and Rakta Dhatvagnimandya (impaired digestive fire in the level of blood) also happened. Yakrut (liver) is the Kalamamsavissha (blackish fleshy organ) and Vasa (fat) is the Sudha Mamsasya Sneha (fat of good muscle tissue). Due to the presence of Sama Raktadhatu (deformed blood) the site which undergoes vitiation was Yakrut (liver). Thus Mamsadhatu Dushti (vitiation of muscle tissue) occur. So the resultant Vasa (fat) formed from this Dushta Mamsa (deformed muscle tissue) was Dushta Vasa (deformed fat). After a long duration, Medo Dhatvagnimandya (vitiation of digestive fire residing in adipose tissue) occurred and thus Dushita Medodhatu (deformed adipose tissue) formed and deposited in the Yakrut (liver).

In other hand, due to the Nidanaseva (etiological factors) Kapha Dosha Kopa (vitiation of phlegm) leads to Medo Dhatuvridhi (increase of adipose tissue) because of Asraya Asrayi Bhavatwa. This formed Medodhatu (adipose tissue) is in Vaikrita (deformed) stage. The Ahararasa (chyle) carries this Vaikrita (deformed), Abhishyandi (secretary), Picchila (slimy), and Guru (heavy) Medodhatu (adipose tissue) all over the body. Due to the Manda Guna of this vitiated Medodhatu Srotorodha occurs in Dhamanias. This formed Medhodhatu (adipose tissue) reaches Yakrut (liver) through Rakta(blood) and starts accumulation.

SAMPRAPTI GHATAKAS

Table 1: Samprapti Ghatakas

Dosha: Tridosha	Udbhava Sthana: Amasaya
Dushya: Rasa, Raktha, Mamsa, Medas	Sanchara Sthana : Rasayani
Agni: Jataragni, Dhatvagni	Vyaktha Sthana : Yakrut
Srotas: Rasa, Raktha, Mamsa, Medovaha srotas	Vyadhi Swabhava :Chirakari
Sroto dushti: Sanga	



LAKSHANAS

The specific Lakshanas (clinical features) of the disease is not described separately in our classics. Lakshanas such as Sadam (malaise), Tandra (fatigue), Glani (sleepiness), Alasya (lethargy), Yakrut Vyadha (right upper quadrant discomfort), Aruchi (anorexia), Hrit Daha (heartburn), Amlodgara (sour belching), Anannabhilasha (loss of appetite), Marutamoodata (belching and flatulence) and Daurbalya (general debility) may be present.

CHIKITSA

As fatty infiltration can be considered as a Santarpanotha Vyadhi, Apararpana chikitsa (non-nourishing treatment) should be adopted. It is attained mainly by Nidana Parivarjana (avoidance of cause) and Samprapti Vighatana (breakage of pathogenesis). Avoidance of Kapha Dushtikara and Medo Dushtikara Ahara Vihara (food and regimens which causes vitiation of phlegm and adipose tissue) is included under Nidana Parivarjana. Usage of Agni Deepana (stimulating digestive fire), Ama Pachana (antioxidant) and Lekhana (scraping) drugs are selected for Samprapti Vighatana. Mridu Virechana (mild purgation) is used as Sodhana therapy because the Asrayasthana of the disease is Yakrut (liver) which is Raktavaha Srotomoola.

CONCLUSION

NAFLD can be considered as a Santarpanotha Vyadhi arising from Agnimandya and Kapha Medo Dushti due to improper diet and lifestyle. Samprapti of NAFLD starts with Ama formation, Rasa, Rakta and Mamsa Dhatu Dushti and culminating in Medo Dhatvagnimandya. Due to this Medo Dhatvagnimandya vitiated Medo Dhatu is accumulated in Yakrut. Considering NAFLD as a Santarpana janya vyadhi, Apararpana Chikitsa should be adopted. It can be attained through Nidana Parivarjana and Samprapti Vighatana.

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