

Ayurveda and Metabolic Dysfunction–Associated Steatotic Liver Disease (MASLD): An Integrative Preventive and Therapeutic Framework

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DOI No.: <https://doi.org/10.5281/zenodo.21350278>

Date of Acceptance: 15 Jun 2026

Date of Publication: 20 Jun 2026

Abstract

Background

Metabolic dysfunction–associated steatotic liver disease (MASLD), formerly known as non-alcoholic fatty liver disease (NAFLD), is currently the most common chronic liver disease worldwide and is closely associated with obesity, type 2 diabetes mellitus, dyslipidemia, and sedentary lifestyles ^[14–20] Despite advances in understanding disease mechanisms, effective pharmacological options remain limited, and lifestyle modification continues to be the cornerstone of management. ^[14,16]

Objective

To explore the Ayurvedic understanding of MASLD and evaluate its potential role in prevention and management through an integrative framework.

Materials and Methods

A narrative review was conducted using classical Ayurvedic texts including *Charaka Samhita*, *Sushruta Samhita*, *Ashtanga Hridaya*, *Madhava Nidana*, and *Bhavaprakasha*, along with contemporary literature retrieved from PubMed, Scopus, Google Scholar, DHARA, and the AYUSH Research Portal. ^[1–13]

Results

Ayurvedic concepts such as *Agni Mandya*, *Ama*, *Meda Dushti*, and *Yakrit Roga* exhibit significant conceptual overlap with contemporary mechanisms including insulin resistance, dyslipidemia, oxidative stress, chronic inflammation, and gut–liver axis dysfunction. ^[1–4,16,18–20] Lifestyle interventions, *Deepana-Pachana* therapies, *Shodhana* procedures, and *Rasayana* drugs demonstrate potential benefits in metabolic regulation and hepatoprotection.^[5–13]

Conclusion

Ayurveda provides a comprehensive preventive and therapeutic framework for MASLD by addressing metabolic dysfunction, digestive impairment, and lifestyle-related etiological factors. Integration of Ayurvedic principles with modern diagnostic approaches may improve long-term outcomes.

Keywords: MASLD, NAFLD, Yakrit Roga, Medoroga, Ayurveda, Gut–Liver Axis, Integrative Medicine

Introduction

Metabolic dysfunction–associated steatotic liver disease (MASLD) represents a spectrum of liver disorders characterized by excessive hepatic fat accumulation in individuals with underlying metabolic dysfunction.^[14–20] Previously termed non-alcoholic fatty liver disease (NAFLD), MASLD affects nearly one-third of the global adult population and is increasingly recognized as a major contributor to liver-related morbidity and mortality. ^[16,18]

The disease spectrum ranges from simple steatosis to metabolic dysfunction–associated steatohepatitis (MASH), progressive fibrosis, cirrhosis, and hepatocellular carcinoma. ^[14–20] Obesity, insulin resistance, type 2 diabetes mellitus, dyslipidemia, and sedentary lifestyle are recognized as major risk factors. ^[15–20] The absence of universally accepted pharmacological therapy highlights the importance of preventive and lifestyle-based interventions. ^[14,16]

Ayurveda offers a holistic perspective that correlates MASLD with *Medoroga* and *Yakrit Roga*.^[1–4] Disturbances in *Agni*, accumulation of *Ama*, vitiation of *Meda Dhatu*, and obstruction of bodily channels (*Srotorodha*) form the basis of disease development. ^[1–4] These concepts demonstrate remarkable similarities with modern understanding of metabolic dysfunction, lipid accumulation, inflammation, and gut–liver axis disturbances. ^[10–13]

The present review aims to explore the Ayurvedic interpretation of MASLD and highlight the potential of integrative approaches for its prevention and management.

Materials and Methods

This narrative review was conducted using classical Ayurvedic literature and contemporary scientific databases.

Ayurvedic Sources

Charaka Samhita,^[1] *Sushruta Samhita*,^[2] *Ashtanga Hridaya*,^[3] *Madhava Nidana*,^[4] *Bhavaprakasha*,^[5] and *Sharangadhara Samhita*.^[6]

Electronic Databases

PubMed, Scopus, Google Scholar, AYUSH Research Portal, and DHARA were searched using the keywords MASLD, NAFLD, fatty liver, *Ayurveda*, *Yakrit Roga*, *Medoroga*, *Panchakarma*, *Rasayana*, and Integrative Hepatology.

Results

Ayurvedic and Modern Correlation of MASLD

Ayurveda describes disorders arising from excessive nourishment and sedentary habits under *Santarpanajanya Vyadhi*.^[1-4] *Medoroga* develops due to *Agni Mandya*, resulting in impaired metabolism and abnormal accumulation of *Meda Dhatu*.^[1-4] Persistent metabolic imbalance subsequently affects the *Yakrit*, producing manifestations comparable to MASLD.^[10-13]

Table 1. Correlation Between Ayurvedic Concepts and MASLD

Ayurvedic Concept	Description	Modern Correlation
<i>Agni Mandya</i>	Impaired metabolism	Insulin resistance
<i>Ama</i>	Toxic metabolites	Oxidative stress and endotoxemia
<i>Meda Dushti</i>	Abnormal fat metabolism	Dyslipidemia and obesity
<i>Srotorodha</i>	Channel obstruction	Microvascular dysfunction
<i>Yakrit Roga</i>	Liver pathology	MASLD/MASH
<i>Santarpanajanya Vyadhi</i>	Overnutrition disorders	Metabolic syndrome

Gut–Liver Axis: An Integrative Perspective

Modern research identifies the gut–liver axis as a major contributor to MASLD progression.^[16,18–20] Dysbiosis increases intestinal permeability, facilitating translocation of endotoxins and inflammatory mediators to the liver.^[16,19]

Ayurveda similarly attributes liver disease to *Agni* dysfunction and *Ama* accumulation originating in the gastrointestinal tract.^[1-4] Thus, restoration of digestive and metabolic balance becomes central to treatment.^[5-9]

Table 2. Gut–Liver Axis: Ayurvedic and Modern Perspectives

Modern Concept	Ayurvedic Equivalent
Dysbiosis	<i>Agni Vaishamya</i>
Increased gut permeability	<i>Ama</i> formation
Endotoxemia	<i>Ama</i> circulation
Chronic inflammation	<i>Dosha Dushti</i>
Metabolic dysfunction	<i>Agni Mandya</i>

Therapeutic Approaches

Ayurvedic treatment aims to correct the root pathology through *Deepana*, *Pachana*, *Shodhana*, and *Rasayana therapies*^[5–9]

Table 3. Ayurvedic Interventions in MASLD

Intervention	Purpose	Potential Modern Effect
<i>Nidana Parivarjana</i>	Elimination of causes	Risk factor modification
<i>Deepana-Pachana</i>	Improve digestion	Metabolic regulation
<i>Virechana</i>	Shodhana therapy	Reduction of inflammatory load
<i>Basti</i>	Metabolic correction	Gut microbiome modulation
<i>Guduchi</i>	Rasayana	Hepatoprotective action
<i>Amalaki</i>	Rasayana	Antioxidant/Immuno modulatory activity
<i>Katuki</i>	Yakrit stimulant	Hepatoprotection
<i>Punarnava</i>	Metabolic support	Anti-inflammatory effect

Table 4. Important Ayurvedic Drugs in MASLD

Drug	Ayurvedic Action	Reported Pharmacological Activity	Reference
<i>Guduchi</i>	<i>Rasayana</i>	Hepatoprotective, antioxidant	[5,7]
<i>Amalaki</i>	<i>Rasayana</i>	Antioxidant, lipid lowering	[5,7]
<i>Katuki</i>	<i>Yakrit-Uttejaka</i>	Hepatoprotective	[5,7]
<i>Punarnava</i>	<i>Shothahara</i>	Anti-inflammatory	[5,7]
<i>Yashtimadhu</i>	<i>Rasayana</i>	Hepatoprotective	[5,7]
<i>Triphala</i>	<i>Rasayana</i>	Metabolic regulation	[5,7]
<i>Arogyavardhini Vati</i>	<i>Medohara</i>	Hepatoprotective	[6,11]

Evidence from Contemporary Studies

Experimental and clinical studies suggest beneficial effects of Ayurvedic interventions on liver enzymes, lipid profile, insulin resistance, ultrasonographic grading of fatty liver, and quality-of-life parameters. ^[11–13] Herbs such as *Guduchi*, *Amalaki*, *Yashtimadhu*, *Katuki*, and *Punarnava* possess antioxidant, anti-inflammatory, lipid-lowering, and hepatoprotective properties. ^[5,7]

However, available evidence remains limited by small sample sizes, heterogeneity of formulations, and short follow-up duration. ^[11–13]

Discussion

MASLD is increasingly recognized as a multisystem metabolic disorder rather than merely a liver disease. ^[14–20] Contemporary pathogenesis involves insulin resistance, lipotoxicity, mitochondrial dysfunction, oxidative stress, chronic inflammation, and gut microbiota alterations. ^[16,18–20]

Ayurveda explains a similar sequence through *Agni Mandya* leading to *Ama* accumulation, *Meda Dushti*, and eventual *Yakrit* involvement^[1–4] The conceptual convergence between the two systems is noteworthy and supports the development of integrative management strategies. ^[10–13]

Lifestyle modification remains the cornerstone of treatment in both systems.^[14–16] Modern medicine advocates calorie restriction, weight reduction, Mediterranean-style diets, and regular exercise, whereas Ayurveda emphasizes *Nidana Parivarjana*, *Pathya Ahara-Vihara*, *Dinacharya*, and physical activity.^[1–4] Among *Panchakarma* procedures, *Virechana* is particularly relevant due to its role in eliminating aggravated *Pitta* and *Kapha* and improving metabolic balance.^[6] *Basti* may influence gut health and systemic metabolism, while *Raktamokshana* has been described for inflammatory conditions^[2,6] *Rasayana* therapy represents another important area. *Guduchi*, *Amalaki*, and *Yashtimadhu* have demonstrated antioxidant and hepatoprotective activities that may support liver regeneration and delay fibrosis progression.^[5,7–9]

Safety remains an important consideration. Since many MASLD patients receive statins, antidiabetic agents, and antihypertensive medications, potential herb–drug interactions should be carefully monitored.^[11–13] Standardization of herbal formulations and robust pharmacovigilance systems are essential for wider acceptance of integrative approaches.

Although preliminary findings are encouraging, current Ayurvedic evidence is constrained by methodological limitations. Future multicenter randomized controlled trials employing standardized interventions and objective endpoints such as MRI-PDFF, transient elastography, fibrosis scores, and metabolic biomarkers are necessary.^[12–20]

Conclusion

MASLD has emerged as one of the most important chronic liver diseases of the modern era.^[14–20] Ayurveda provides a comprehensive framework through the concepts of *Agni Mandya*, *Ama*, *Meda Dushti*, and *Yakrit Roga*.^[1–4]

Therapeutic strategies including *Nidana Parivarjana*, *Pathya Ahara-Vihara*, *Deepana-Pachana*, *Shodhana* therapies, and *Rasayana* interventions address both disease prevention and progression.^[5–9] The convergence of Ayurvedic principles with modern concepts such as insulin resistance, chronic

inflammation, and gut–liver axis dysfunction supports the rationale for integrative care. ^[10–20] Combining modern diagnostic precision with Ayurvedic preventive and regenerative strategies may offer a more holistic and sustainable approach to MASLD management. Nevertheless, rigorous scientific validation remains essential before widespread clinical implementation. ^[12–20]

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