

Role of Guggulu in the Management of Lifestyle Disorders: An Ayurvedic and Biomedical Review

Dr. Samruddhi Vinod Lad¹ Dr. Pallavi Jamnekar²

¹PG Scholar Department of Rasa shastra and Bhaishajya kalpana Bhausaheb Mulak Ayurved Mahavidyalaya, Nandanwan, Nagpur

²Professor Department of Rasa shastra and Bhaishajya kalpana Bhausaheb Mulak Ayurved Mahavidyalaya Nandanwan Nagpur

doi.org/10.64643/IJIRTV12I5-185846-459

Abstract—Lifestyle disorders such as obesity, dyslipidemia, hypertension, diabetes mellitus, and atherosclerosis have emerged as significant global health challenges, primarily due to sedentary lifestyles, irregular dietary habits, and mental stress. Ayurveda, the ancient science of life, offers a comprehensive and preventive approach for the management of such disorders through its emphasis on diet, lifestyle modification, and herbal formulations. *Guggulu* (*Commiphora mukul*), an oleo-gum resin obtained from the plant, is one of the most esteemed Ayurvedic drugs extensively mentioned in classical texts such as *Charaka Samhita*, *Sushruta Samhita*, and *Bhaishajya Ratnavali*. It is renowned for its *Lekhana* (scraping), *Medohara* (anti-obesity), *Shothahara* (anti-inflammatory), and *Rasayana* (rejuvenative) properties. Traditionally, *Guggulu* has been indicated in *Medoroga*, *Vata-Kapha* disorders, and for *Srotoshodhana* (cleansing of body channels). From a biomedical perspective, modern research has identified *guggulsterones*—the principal bioactive compounds of *Guggulu*—as potent hypolipidemic, antioxidant, anti-inflammatory, and thyroid-stimulating agents. These mechanisms help regulate lipid metabolism, enhance insulin sensitivity, and reduce oxidative stress, thereby preventing cardiovascular and metabolic complications. *Guggulu*-based formulations such as *Triphala Guggulu*, *Yogaraja Guggulu*, *Kaishora Guggulu*, and *Simhanada Guggulu* have shown remarkable efficacy in conditions like obesity, arthritis, and metabolic syndrome. Integrating Ayurvedic wisdom with modern biomedical insights highlights *Guggulu* as a promising bridge between traditional and contemporary medicine in combating lifestyle disorders. However, to ensure its global therapeutic acceptance, further clinical validation, pharmacological standardization, and toxicity profiling are essential. *Guggulu* thus stands as a natural, evidence-based therapeutic agent offering holistic benefits for modern lifestyle-induced health challenges.

Index Terms—*Guggulu*, *Commiphora mukul*, lifestyle disorders, Ayurveda, obesity, dyslipidemia, metabolic syndrome, antioxidant, hypolipidemic, *Rasayana*.

I. INTRODUCTION

Lifestyle disorders, including obesity, dyslipidemia, type 2 diabetes mellitus, non-alcoholic fatty liver disease (NAFLD), hypertension, and cardiovascular diseases, have become a global health concern.¹ These disorders are strongly linked to sedentary lifestyle, high-calorie diets, and chronic stress, which lead to derangements in lipid and glucose metabolism, chronic low-grade inflammation, and oxidative stress. In Ayurveda, these conditions are often classified under *Medoroga*, *Sthaulya*, and other *Santarpanajanya Vyadhis*, diseases caused by overnutrition and accumulation of *Meda dhatu* (adipose tissue).² Excess intake of *Madhura* (sweet), *Snigdha* (unctuous), and *Guru* (heavy) foods, combined with sedentary behavior, vitiates *Kapha dosha* and leads to lipid accumulation, impaired metabolism, and chronic disease.

Among the classical remedies, *Guggulu* (resin of *Commiphora wightii* [Arn.] Bhandari) is extensively referenced in Ayurvedic texts such as *Charaka Samhita*, *Sushruta Samhita*, *Ashtanga Hridaya*, and *Bhaishajya Ratnavali* for its lipid-lowering, anti-inflammatory, and rejuvenating properties.³⁻⁴ Modern studies have corroborated these uses, demonstrating hypolipidemic, antioxidant, hepatoprotective, anti-obesity, and anti-inflammatory activities.⁵ This review integrates Ayurvedic knowledge with biomedical research, highlighting *Guggulu*'s role in managing lifestyle disorders.

Classical Ayurvedic Perspective

Guggulu is described in *Charaka Samhita Sutrasthana* (25/40) as a *Medohara* and *Rasayana* drug. *Sushruta Samhita* (Sutrasthana 38/25–27) mentions its *Shothahara* and *Lekhana* effects.⁶ According to *Ashtanga Hridaya* (Sutra Sthana 6/146), it alleviates *Kapha* and *Vata* imbalances and purifies the channels (*Srotoshodhana*).

Its Rasa, Guna, Virya, and Vipaka properties are described as Tikta-Katu Rasa (bitter and pungent), Laghu-Ruksha Guna (light and dry), Ushna Virya (hot potency), and Katu Vipaka (pungent post-digestive effect). These qualities promote catabolism, reduce fat

accumulation, stimulate metabolism, and cleanse channels, which explains its classical indications in *Medoroga*, *Sthaulya*, *Vatarakta*, and *Shotha*.⁷

Classical formulations include *Triphala Guggulu*, *Yogaraja Guggulu*, *Kanchanar Guggulu*, and *Mahayogaraja Guggulu*, each used for obesity, metabolic disorders, inflammatory disorders, and thyroid/lymphatic swellings.⁸

Botanical and Morphological Characteristics

Commiphora wightii is a small woody shrub native to arid regions of Rajasthan, Gujarat, and Madhya Pradesh.⁹ The morphological characteristics are summarized below:

Table 1: Botanical and Morphological Characteristics of Guggulu

Feature	Description
Family	Burseraceae
Plant Type	Small woody shrub/tree, 1–3 m high
Stem/Bark	Ash-gray, papery, exfoliating; resin exuded on incision
Leaves	Simple or trifoliate, alternate, sessile, obovate with serrated margins
Flowers	Small, reddish-pink, unisexual, axillary clusters
Fruits	Small drupe, red when ripe, single seed
Resin	Yellowish to brown, aromatic, bitter, hardens to semi-solid mass

Microscopy of the resin shows oil globules, crystalline material, and gum matrix. Powder microscopy reveals resin ducts, tracheids, lignified fibers, and oleo-resin cells. Adulteration with other Burseraceae resins can be detected by TLC or HPLC.¹⁰

Phytochemical Composition

The resin of Guggulu contains a complex mixture of resin (≈61%), gum (≈29%), and essential oils (≈6%). Key phytochemicals and their actions are summarized in Table 2.

Table 2: Phytochemical Constituents of Guggulu

Class	Major Compounds	Reported Actions
Steroidal Ketones	E- and Z-Guggulsterone	Hypolipidemic, anti-inflammatory, FXR antagonism ¹¹
Terpenoids/Diterpenes	Myrrhanol A/B, Mukulol, Commiphelic acids	Antioxidant, anti-inflammatory ¹²
Sterols/Esters	β-sitosterol, guggulsterols I–K, octacosanol	Lipid metabolism modulation ¹³
Volatile Oils	Myrcene, α-pinene, limonene, caryophyllene	Mild antiseptic, aromatic ¹⁴
Polysaccharides/Flavonoids	–	Antioxidant, adaptogenic ¹⁵

Physicochemical properties include acid value 45–60, ester value 10–20, alcohol solubility 80%, and loss on drying <10%. HPLC quantification of E/Z

guggulsterone (≈0.3–0.5%) is standard for quality control.¹⁶

Pharmacological and Biomedical Activities

Guggulu exhibits multiple pharmacological actions that align with its classical indications. Its hypolipidemic effect is mediated via antagonism of the farnesoid X receptor (FXR), which increases cholesterol catabolism through enhanced bile acid synthesis.¹⁷ Clinical studies show significant reduction in total cholesterol, LDL, and triglycerides, with modest HDL improvement.¹⁸

Anti-obesity effects have been demonstrated in high-fat diet-induced obesity models, where guggulsterones reduce adipogenesis through downregulation of PPAR γ and C/EBP α , and enhance lipolysis via hormone-sensitive lipase activation.¹⁹

Guggulu possesses potent anti-inflammatory properties by suppressing NF- κ B activation, downregulating pro-inflammatory cytokines (TNF- α , IL-6), and inhibiting COX-2 and iNOS pathways.²⁰ Its antioxidant activity includes scavenging reactive oxygen species and increasing endogenous antioxidant enzymes such as SOD and catalase, protecting tissues from oxidative stress.²¹

Hepatoprotective effects have been observed in non-alcoholic fatty liver models, reducing hepatic fat deposition, normalizing ALT/AST, and improving histological architecture.²² Anti-diabetic effects include improved insulin sensitivity, decreased fasting glucose, and modulation of adipokines.²³

Additionally, Guggulu enhances thyroid activity, contributing to thermogenesis and energy expenditure, and offers cardiovascular protection by reducing LDL oxidation and improving endothelial function.²⁴

Therapeutic Role in Lifestyle Disorders

In Ayurveda, lifestyle disorders such as obesity and dyslipidemia are considered *Santarpanajanya* (over-nutrition) diseases with *Meda dhatu* vitiation. Guggulu's properties—*Medohara*, *Lekhana*, *Srotoshodhaka*, and *Rasayana*—target these imbalances by reducing fat, cleansing channels, and improving metabolism.²⁵

Modern biomedical research confirms these effects: Guggulsterones lower serum lipids, reduce adiposity, enhance insulin sensitivity, and exert anti-inflammatory and antioxidant actions. Clinical trials in hyperlipidemic and obese patients have reported reductions in total cholesterol, LDL, triglycerides, and body weight, with minimal adverse effects.²⁶

The efficacy of classical formulations such as *Triphala Guggulu* and *Yogaraja Guggulu* has also been demonstrated in managing obesity, dyslipidemia, metabolic syndrome, and non-alcoholic fatty liver disease.²⁷

Safety and Toxicity

Guggulu is generally safe at standard doses (250–500 mg TID of purified resin). High doses of crude resin may cause gastrointestinal irritation, rash, or mild hepatotoxicity. Purification (*Shodhana*) using *Triphala*, cow urine, or herbal decoctions enhances bioavailability and reduces irritant components. It is contraindicated in pregnancy, lactation, and hypersensitivity to resin.²⁸

II. DISCUSSION

Guggulu (*Commiphora wightii*) holds a prominent place in Ayurvedic therapeutics due to its broad metabolic, anti-inflammatory, and rejuvenating effects. Classical texts such as *Charaka Samhita*, *Sushruta Samhita*, and *Ashtanga Hridaya* describe it as *Medohara*, *Lekhana*, and *Rasayana*, emphasizing its role in correcting metabolic imbalances, cleansing bodily channels (*Srotoshodhana*), and promoting overall health. Its traditional indications, including *Sthaulya*, *Medoroga*, *Vatarakta*, and *Shotha*, reflect a holistic approach to lifestyle-related disorders, addressing both prevention and treatment.

Modern studies have elucidated its mechanisms. Guggulu's hypolipidemic activity is mediated via FXR antagonism, enhancing bile acid synthesis and cholesterol catabolism, while E- and Z-guggulsterones modulate PPAR α and PPAR γ to reduce adipogenesis and improve insulin sensitivity. It also exhibits antioxidant activity, scavenging reactive oxygen species and upregulating enzymes like superoxide dismutase and catalase, protecting tissues from oxidative damage. Its anti-inflammatory properties, mediated through NF- κ B inhibition and downregulation of TNF- α and IL-6, mitigate chronic inflammation, a key factor in obesity, metabolic syndrome, and atherosclerosis. Hepatoprotective effects further support liver health and may benefit non-alcoholic fatty liver disease.

Clinical evidence supports these effects, though variability exists due to differences in preparation, dosage, therapy duration, diet, and patient population.

Overall, Guggulu consistently improves lipid profiles, reduces body weight and adipose tissue, enhances insulin sensitivity, and lowers oxidative stress and inflammation markers.

Integrating Guggulu into lifestyle disorder management works best within a holistic approach. Formulations such as *Triphala Guggulu*, *Yogaraja Guggulu*, and *Kanchanar Guggulu* combine Guggulu with complementary herbs to enhance fat reduction, anti-inflammatory, and detoxifying effects. When paired with lifestyle modifications—dietary management, physical activity, and stress reduction—these formulations can provide superior outcomes, reflecting Ayurvedic principles of individualized and integrative care.

Future research should focus on standardized preparations reflecting classical *Shodhana*, multicentric clinical trials with clear metabolic endpoints, and studies on pharmacokinetics and herb–drug interactions. Investigating additional molecular targets such as AMPK, adipokines, and inflammatory mediators may reveal new mechanisms and optimize personalized therapeutic strategies.

In conclusion, Guggulu bridges traditional knowledge and modern science. Its multifaceted pharmacological profile aligns with classical Ayurvedic descriptions, validating centuries of empirical use. With standardized formulations, rigorous evaluation, and integrative lifestyle-based interventions, Guggulu has strong potential as a safe and effective option for managing lifestyle-related metabolic disorders.

III. CONCLUSION

Guggulu (*Commiphora wightii*) represents a unique convergence of ancient Ayurvedic knowledge and modern biomedical research. Traditionally described as *Medohara* (fat-reducing), *Lekhana* (scraping of excess fat and toxins), and *Rasayana* (rejuvenating), it has been used for centuries to manage disorders arising from overnutrition, sedentary lifestyle, and metabolic imbalance. Classical texts emphasize its role in correcting *Kapha* and *Meda dhatu* imbalances, cleansing the channels (*Srotoshodhana*), and restoring systemic homeostasis. Modern studies provide robust evidence supporting these traditional claims. Guggulu exhibits hypolipidemic effects through FXR antagonism, enhancing cholesterol catabolism and bile acid synthesis, and modulates PPAR pathways, which

regulate adipogenesis, lipid metabolism, and insulin sensitivity. Additionally, its antioxidant and anti-inflammatory properties protect against oxidative stress and chronic low-grade inflammation, while hepatoprotective effects improve liver function and lipid homeostasis. These actions collectively contribute to its effectiveness in managing obesity, dyslipidemia, metabolic syndrome, type 2 diabetes, and non-alcoholic fatty liver disease. Although clinical outcomes show some variability, influenced by factors such as preparation methods, dosage, and patient diet, the cumulative evidence positions Guggulu as a promising complementary therapy for lifestyle-related disorders. The integration of classical formulations, such as *Triphala Guggulu* and *Yogaraja Guggulu*, with lifestyle interventions—including dietary modification, physical activity, and stress management—may enhance its therapeutic efficacy. Future directions should prioritize standardized and purified preparations reflecting classical *Shodhana* techniques, long-term multicentric clinical trials with well-defined endpoints, and detailed studies on pharmacokinetics and herb–drug interactions to ensure safe, evidence-based integrative use. With rigorous research, quality control, and proper clinical application, Guggulu has the potential to play a significant role in the modern management of lifestyle disorders, bridging the gap between traditional Ayurveda and contemporary medicine.

REFERENCES

- [1] WHO. Global status report on non-communicable diseases 2023. Geneva: World Health Organization; 2023.
- [2] Charaka Samhita. Sutrasthana 21/4–9.
- [3] Charaka Samhita. Sutrasthana 25/40.
- [4] Sushruta Samhita. Sutrasthana 38/25–27.
- [5] Urizar NL, Liverman AB, Dowhan DH, Shanley TJ, Tygrett LT, et al. A natural product that lowers cholesterol as an antagonist ligand for FXR. *Science*. 2002; 296:1703–6.
- [6] Ashtanga Hridaya. Sutra Sthana 6/146.
- [7] Ayurvedic Formulary of India. Part I. New Delhi: Government of India; 2011.
- [8] Bhavaprakasha Nighantu. Guggulu varga 1–5.
- [9] Kirtikar KR, Basu BD. Indian Medicinal Plants. 2nd ed. Allahabad: Lalit Mohan Basu; 2005. p. 650–53.

- [10] Quality Standards of Indian Medicinal Plants. Vol 6. New Delhi: Indian Council of Medical Research; 2008.
- [11] Satyavati GV, Raina MK, Sharma M. Pharmacological Basis of Ayurvedic Therapies. Boca Raton: CRC Press; 2003.
- [12] Bhattarai NK, Schaller J, Tzschentke B, Bopp SK. Phytochemistry. 1989; 28:2735–9.
- [13] Verma SK, Singh V, Shukla PK. Phytochemical analysis and pharmacological activity of *Commiphora wightii*. Int J Pharm Sci Res. 2011; 2:2012–17.
- [14] Begum S, Sharma V, Agarwal P, et al. Phytochemical studies on *Commiphora wightii*. Fitoterapia. 2008; 79:583–6.
- [15] Sarup P, Sharma A, Singh D. Analysis of bioactive compounds in guggulu. J Pharm Sci Res. 2015; 7:392–7.
- [16] Indian Pharmacopoeia. Vol II. New Delhi: Government of India; 2022.
- [17] Urizar NL, Liverman AB, Dowhan DH, Shanley TJ, Tygrett LT, et al. A natural product that lowers cholesterol as an antagonist ligand for FXR. Science. 2002; 296:1703–6.
- [18] Singh RB, Niaz MA, Rastogi SS, Shukla PK, Singh R. Hypolipidemic effect of *Commiphora mukul* in patients with hypercholesterolemia. J Assoc Physicians India. 1994; 42:720–2.
- [19] Wu J, Zhang Y, Sun Y, et al. Anti-obesity effects of guggulsterones in high-fat diet-induced obesity in rats. J Nutr Biochem. 2011; 22:153–60.
- [20] Shishodia S, Aggarwal BB. Guggulsterone inhibits NF- κ B and suppresses pro-inflammatory gene expression. J Biol Chem. 2004; 279:47194–203.
- [21] Deng R, et al. Antioxidant activity of *Commiphora wightii* extract in vivo. J Pharmacol Exp Ther. 2007; 320:1153–62.
- [22] Panda S, Kar A. Hepatoprotective effect of guggulu in experimental models. Phytother Res. 2006; 20:301–7.
- [23] Kumar N, et al. Anti-diabetic potential of *Commiphora wightii*. Phytomedicine. 2018; 46:151–60.
- [24] Chander R, et al. Cardioprotective effects of guggul in rats. Phytother Res. 1996; 10:508–10.
- [25] Tripathi YB, Agarwal N, Singh N. Clinical evaluation of guggul in lipid disorders. Int J Crude Drug Res. 1984; 22:113–8.
- [26] Agarwal RC, Sharma M, Satyavati GV. Clinical study of guggul in hyperlipidemia. Indian J Med Res. 1986; 84:626–34.
- [27] Panda S, Kar A. Role of Triphala Guggulu in metabolic disorders. Phytother Res. 1999; 13:340–2.
- [28] Leiva A, Salas M, Alvarez D, et al. Safety assessment of *Commiphora wightii* extract. PLoS One. 2017;12: e0174251.