

Yoga as an Alternative Therapy in the Prevention and Management of Metabolic Disorder: A Review

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ABSTRACT

Metabolic disorders a group of health conditions including such as obesity, diabetes type 2, and cardiovascular diseases continue to be major health challenges in the global community(Hayden, 2023). The characteristic features of metabolic disorders such as insulin resistance, dyslipidemia, and low-grade inflammation(Kuppusamy, Wankhar, et al., 2021; Mansyur et al., 2020). Sedentary lifestyles, unhealthy diets, and pre-disposition to metabolic diseases have emerged as some of the endangering factors that have made the efficiency of metabolic diseases a worrying trend(Gasmi et al., 2021). Studies on these complementary and other forms of medicine are increasing because other allopathic therapies like drugs and medicines have not been very effective in managing these disorders. Yoga is a mind-body exercise, practiced over decades as a traditional Indian method, which has gained attention in recent years as an additional therapy for metabolic disorders(Venkatesh et al., 2020). Yoga is a practice where physical postures or gestures are synchronized with moral beliefs, breath control, and meditation for the improvement of one's bodily, mental, and spiritual health(Zafeiroudi, 2021). Recent research discloses that yoga practitioners who exercise regularly may lower the odds of developing metabolic dysfunction, such as obesity, insulin resistance, dyslipidemia, hypertension and other various disorders. This could be a result of an improvement in glycemic control, enhanced insulin sensitivity, reduced stress and inflammation.

Methodology

A review literature search was done to obtain relevant papers on the influence of yoga on various metabolic conditions. The keywords used for this search was Google Scholar. This comprehensive review of the impact of yoga on metabolic health was conducted using various search terms, including "yoga," "metabolic disorders," "obesity," "diabetes," "cardiovascular diseases," "dyslipidemia,"

"pranayama," "mental health," "sleep quality," and "women disorders". The search included case reports, randomised controlled trials, systematic reviews, and meta-analyses. Studies involving human participants of any age group were considered, provided they had primary data, clear methodology, and statistical analysis. Exclusions included non-yoga-focused studies, non-peer-reviewed articles, editorials, opinion pieces, anecdotal evidence, studies published in languages other than English, animal studies, and those lacking primary data or robust methodological rigor.

Synthesis of findings

A qualitative synthesis of the results from the included research was performed. A meta-analysis was not possible because of the variability in research designs, interventions, and outcome measures. Rather, the data regarding yoga's impact on metabolic health was compiled using a narrative synthesis technique. The synthesis was arranged according to the particular metabolic disease or health issue that was being discussed, with a focus on the potential processes by which yoga may impact metabolic health.

Ethical consideration

Since this is a review of previously published work, ethical clearance was not needed. Nonetheless, by truthfully summarising the results of the first research and admitting the review's limitations, reporting ethics were upheld.

Holistic Approaches to Metabolic Health: Insights from Yoga and Related Practices

Pranayama and Metabolic Health

Bhramari pranayama, also known as the Humming Bee Breath, is a yoga breathing technique that involves making a humming sound while exhaling (Kuppusamy et al., 2018). Regular practice can improve lung function, lung capacity, and efficiency, increasing oxygen intake and respiratory health (Jagadeesan et al., 2022). The calming nature of this breathing technique can reduce stress levels, further supporting metabolic health (Maheshkumar et al., 2022). Research on healthy adolescents found significant increases in lung capacity and efficiency, supporting improved oxygenation and metabolic processes, and ultimately enhancing overall metabolic health. Furthermore, another research demonstrated that Bhramari Pranayama improved speed of reaction in adolescents significantly (Kuppusamy et al., 2020). Enhanced cognitive function through yoga practice can indirectly support improved lifestyle choices, crucial for managing metabolic disorders. Additionally, a systematic

review of Bhramari Pranayama's health impacts verified its advantages for cardiovascular and respiratory function, stress reduction, and general well-being. These findings support its inclusion in programs aimed at preventing and managing metabolic disorders.

Furthermore, Chronic high blood pressure damages blood vessels, reducing brain flow, leading to conditions like vascular dementia, white matter lesions, and cognitive decline, and promoting Alzheimer's disease. Sheetal Pranayama, a meditation practice, may enhance cognitive function in individuals with high blood pressure by promoting relaxation, reducing stress, and improving blood flow to the brain. Previous randomized controlled study confirmed that Sheetal Pranayama improved cognitive function in hypertensive patients. Cognitive improvements can enhance self-management of metabolic disorders(Jagadeesan et al., 2021).

Integrative Approaches for Seronegative Rheumatoid Arthritis

Seronegative rheumatoid arthritis is a subtype of the condition where blood tests do not reveal certain antibodies. Integrated naturopathy and yoga can help manage symptoms by addressing inflammation causes and promoting overall health and well-being. A case report demonstrated significant benefits of integrating naturopathy and yoga for managing seronegative rheumatoid arthritis. The patient underwent a 30-day treatment regimen that included daily 20-minute partial massages with lemongrass and gingelly oil, 5-minute infra-red radiation sessions on the hands and wrists, yoga therapy (Suksma Vyayama, Nadishoodhana Pranayama, and Bhramari Pranayama), and electro-acupuncture on specific bilateral points. The integrative therapies showed significant improvement in symptoms and reduced inflammatory markers, indicating their potential for treating chronic inflammatory conditions linked to metabolic disorders(Yogapriya Chidambaram et al., 2022).

Yoga and Mental Health in College Students

Mental health of college students is a developing concern due to academic stress, social interactions, and the transition to maturity(Arumugam et al., 2024). Previous Studies demonstrated that college students are more prone to develop anxiety, depression, and other mental health conditions. Holistic and integrative methods like yoga and naturopathy are included in campus wellness programs to promote students' mental health and well-being. A validated yoga and naturopathy protocol has shown promise in reducing mental health issues, leading to better lifestyle choices and health-promoting behaviors(Tewani et al., 2023). A SOAR study of e-learning and e-modules in medical education

stressed the importance of combining alternative medicine information, including yoga, into medical courses(Prabu Kumar et al., 2023). This can encourage a more complete approach to metabolic disorder treatment.

The Role of Yoga in Enhancing Sleep Quality

Quality sleep plays a crucial role in regulating hormones, maintaining a healthy weight, and supporting cognitive function(Prashanth et al., 2024). Various studies have also revealed that most people who do not have proper sleep are likely to be affected by chronic diseases that include diabetes, heart disease, and obesity(Jagadeesan et al., 2022; Narayanaswamy et al., 2021). Also, some researchers have shown that practicing meditation can help diminish insomnia symptoms and enhance the quality of sleep thus resulting in a relaxed state of mind and body during sleep(Venugopal, Boopalan, et al., 2023). A review of cyclic meditation practices indicated substantial improvements in sleep quality(Lakshmi et al., 2023). Since poor sleep is a risk factor for metabolic disorders, yoga's positive impact on sleep can play a critical role in overall metabolic health(Chandra et al., 2022; Selvameenakshi et al., 2022; Sheng et al., 2017).

Holistic Management of Obesity

Obesity is a public health concern that often comes with physiological and psychological issues like lack of self-confidence, negative perceptions of own body, and increased risk of getting psychological disorders of anxiety and depression(K. Maheshkumar et al., 2021; Selvameenakshi et al., 2022). Maintaining a healthy weight might be made more difficult by stigma and prejudice. Obesity treatment that incorporates holistic modalities such as yoga and naturopathy might benefit the patient's physical and mental health. With these techniques, self-care, stress reduction, and mindfulness may lessen the negative consequences of long-term stress, encourage better eating habits, and enhance emotional control(Boopalan, Vijayakumar, Ravi, Narayanasamy, et al., 2023; Thanalakshmi et al., 2020; Vijayakumar et al., 2023). One of the case reports has shown the effectiveness of this combined approach, with one case study showing that yoga and naturopathy for 20 days intervention can reduce psychological distress in obese patients and improve weight management.

Yoga for Polycystic Ovarian Syndrome (PCOS)

Polycystic Ovarian Syndrome (PCOS) is often linked to elevated cortisol levels, exacerbating symptoms like insulin resistance and weight gain(Benjamin et al., 2020; Benjamin et al., 2021; Benjamin et al.,

2023; Lakshmi et al., 2023). Yoga reduces cortisol in PCOS by promoting relaxation and activating the parasympathetic nervous system through deep breathing, meditation, and physical postures, thereby improving hormonal balance and reducing stress (Benjamin et al., 2023; Boopalan, Vijayakumar, Ravi, Kunjumon, et al., 2023). One of these meta-analyses on cortisol levels in polycystic ovarian syndrome (PCOS) confirmed these findings of that yoga could modulate stress hormones, aiding in the management of PCOS and associated metabolic issues (Vanitha et al., 2018; Venugopal, Deenadayalan, Ashokkumar, et al., 2022).

Antenatal Yoga for Pregnant Women

Antenatal yoga is specifically developed to help pregnant women throughout their pregnancy and prepare them for labor and delivery. This practice involves gentle stretching, breathing exercises, and relaxation techniques to assist pregnant women maintain physical and emotional health throughout this transitional period. It may assist with typical pregnancy symptoms like back pain and swelling, as well as provide mental support and stress reduction (Ravinder et al., 2022). A systematic review and meta-analysis demonstrated that antenatal yoga effectively reduced the intensity of labor pain (Boopalan, Vijayakumar, Ravi, Kunjumon, et al., 2023; Venugopal, Deenadayalan, Maheshkumar, et al., 2022). While primarily beneficial for maternal health, these findings suggest that yoga can positively influence physiological stress responses, relevant to metabolic health.

Type 2 Diabetes

A recent case report suggests that lifestyle modifications like regular physical activity, healthy eating, and stress reduction techniques like yoga can help achieve remission in Type 2 Diabetes (Tripathi et al., 2023; Venkateswaran, 2020; Venugopal, Venkateswaran, et al., 2022). Yoga positively influences physiological stress responses, reduces insulin resistance, improves blood sugar control, and enhances overall well-being (Venugopal, Geethanjali, et al., 2022; Venugopal et al., 2020; Venugopal, Yogapriya, et al., 2023).

Yoga for Children's Health and Well-being

As children regulate remote learning, increasing screen time, and restricted physical exercise, the advantages of yoga become even more crucial (Vidyashree et al., 2019). Yoga stimulates children's awareness, focus, and emotional control in addition to helping them keep physically active and lowering stress (Kuppusamy, Ramaswamy, et al., 2021). By including yoga in their daily routine, children may

establish lifetime healthful habits that benefit their entire well-being(Kathiresan et al., 2021; Kumar et al., 2024; Moorthy et al., 2021; Moorthy et al., 2023). During the COVID-19 epidemic, an experimental report on yoga for children highlighted the practice's importance for maintaining mental and physical well-being(Prabu et al., 2021; Venugopal et al., 2020; Venugopal, Venkateswaran, et al., 2022). Early adoption of yoga may create lifetime habits that promote metabolic health(Narayanaswamy et al., 2021; Ravi et al., 2022; Santhi et al., 2022; Thanalakshmi et al., 2024).

Integrative Therapies for Multiple Sclerosis

Multiple sclerosis (MS) is an autoimmune disorder that causes symptoms like exhaustion, muscle weakness, and improper coordination. Foot reflexology, an acupressure treatment, may reduce symptoms by activating foot nerves, boosting blood circulation, reducing muscular tension, and promoting relaxation(Deenadayalan et al., 2024). This therapy could also improve metabolic health and manage pain in MS patients. A comprehensive analysis of foot reflexology for individuals with multiple sclerosis revealed promising advantages in managing symptoms. Yoga and reflexology, which are integrative techniques, may enhance standard therapy for metabolic and neurological health.

Yoga for Sinusitis

A sinus headache is a common condition resulting from inflammation and distension of the sinuses, often affecting the forehead, cheeks, and eye area. Apart from conventional remedies like over-the-counter analgesics and painkillers, alternative therapies such as yogic breathing exercises called Vatakarma Kapalbhathi may also help cure sinus headaches(Ravi et al., 2023). By using powerful exhalations via the nose, this method helps enhance circulation, cleanse the sinuses, and may even lessen headache symptoms. Additionally, Yoga alleviates sinusitis-induced behavioural issues by improving relaxing and lowering stress through practices like deep breathing and meditation(Bagya et al., 2018; Wankhar et al., 2024; Wooten et al., 2020). These methods lower cortisol levels, which in turn regulate the immune reaction and reduce inflammation(Jerrin et al., 2021; Ks et al., 2023; Vanitha et al., 2018). Improved blood circulation and fluid flow from yoga movements help clear nose pressure and relieve symptoms. Additionally, yoga's focus on mindfulness and breath awareness fosters mental clarity and emotional balance, supporting general well-being in sinusitis patients. Previous studies confirmed

Research on yoga's impact on sinusitis-induced psychological comorbidities found significant benefits. Alleviating psychological distress can support overall metabolic health(Balakrishnan et al., 2024).

Yoga for Asthma Management

Yoga helps asthma by improving respiratory function through deep breathing techniques like pranayama, which increases lung capacity and reduces stress—a frequent cause of asthma attacks. Yoga poses (asanas) also improve chest opening and general lung function, while mindfulness techniques help people notice and handle symptoms early. Additionally, yoga may lower systemic inflammation, possibly improving lung sensitivity in asthma. These combined benefits make yoga a useful complementary treatment for improving lung health and quality of life in asthma control. A randomized control trial examining six months of yoga practice in asthma patients found significant improvements in quality of life. Better respiratory function and reduced stress through yoga can support overall metabolic health(Y. Chidambaram et al., 2022; Maheshkumar et al., 2020; Malarvizhi et al., 2019).

Yoga for Irritable Bowel Syndrome (IBS)

A common gastrointestinal condition that causes bloating, irregular bowel movements, and abdominal discomfort is called irritable bowel syndrome, or IBS. A case study on yoga and naturopathy for an IBS patient demonstrated improvements in psychological comorbidities and autonomic function. This highlights the interconnected benefits of yoga for digestive and metabolic health(Palanimurugan et al., 2024).

Yoga for Systemic Lupus Erythematosus (SLE)

Yoga helps people with Systemic Lupus Erythematosus (SLE) through several processes. It reduces stress, reducing cortisol levels and thereby modulating the immune reaction to decrease inflammation. Deep breathing and meditation improve parasympathetic activity, promoting calm and lowering pain perception. Gentle stretching improves flexibility and physical function, while general stress reduction aids in better sleep and alleviates worry and sadness. These benefits combined help handle SLE symptoms and improve patient well-being.. A previous research protocol for studying yoga's effects on systemic lupus erythematosus (SLE) patients aimed to explore potential benefits for this autoimmune disorder. Improved immune function through yoga can have positive implications for metabolic health(Shobana et al., 2022).

Pranayama for Breast Cancer Patients

By triggering the parasympathetic nervous system and boosting immunological function, pranayama helps patients with breast cancer by lowering stress and anxiety(Chandrasekaran et al., 2022). Enhancing tissue oxygenation promotes cellular well-being and increases the effectiveness of therapy. Additionally, pranayama increases lymphatic circulation, which facilitates cleansing. The relaxation response enhances life quality and aids in pain management(Lalitha, Anusha, et al., 2021; Mohan et al., 2021). Frequent practice promotes mental health, which is essential for managing cancer. Studies confirmed how stressed out people who practise yoga felt showed reduced stress levels, which is consistent with yoga's protective effects on metabolic health(Lognathan et al., 2019; Niva et al., 2021; Padmavathi et al., 2023). Additionally another study investigated impact of pranayama on sleep quality and exhaustion in breast cancer patients after radiation therapy revealed notable benefits. Yoga can improve overall metabolic health by promoting better sleep and reducing tiredness(Chakrabarty et al., 2015).

Yoga for Autism Spectrum Disorder (ASD)

Through lowering cortisol levels and balancing the HPA axis, yoga helps people with autism spectrum disorder (ASD) neurologically(Arvind et al., 2020; Chandra et al., 2022; Lalitha, Maheshkumar, et al., 2021; Sivakumar et al., 2020). Enhancing brain function and connection, it fosters neuroplasticity. Through the activation of the parasympathetic nervous system, yoga enhances sensory perception(Kumar et al., 2023; Maheshkumar et al., 2017; Ravi & Kuppusamy, 2023; Roy et al., 2018; Sekar et al., 2019). Better emotional control is achieved by balancing neurotransmitters such as dopamine and serotonin. Furthermore, through improved cerebral blood flow and oxygenation, yoga improves memory, attention, and cognitive function. One of the previous study showed there are notable benefits to yoga for children with autism spectrum disorder when it comes to short-term heart rate variability(Vidyashree et al., 2019). A healthier body can benefit from better autonomic function, which includes healthy metabolic processes(Kuppusamy et al., 2020; Kuppusamy Maheshkumar et al., 2021).

Conclusion

Yoga's diverse effects on metabolic health are highlighted by the reviewed research; these effects include improvements in lipid profiles, inflammatory markers, insulin sensitivity, and glycemic management. Chronic stress is closely associated with metabolic dysfunction, therefore yoga's capacity to alleviate stress via practices like pranayama and meditation is especially remarkable. In addition,

yoga's holistic approach to health takes into account both psychological and physiological factors, encouraging lifestyle modifications that aid in the long-term treatment of illnesses including diabetes, obesity, heart disease, and autoimmune diseases. Although the studies under consideration show promising results, more investigation is necessary to clarify the processes behind yoga's therapeutic benefits and to develop standardized procedures for incorporating it into clinical practice. With its integrative, mind-body approach, yoga is a helpful adjuvant therapy that improves metabolic health overall.

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