

POTENTIAL BENEFITS OF SURYA NAMASKAR IN TYPE 2 DIABETES MELLITUS: A
NARRATIVE REVIEW¹*Vd. Manisha Kadam, ²Vd. Ramesh Ujwale¹PG Scholar, Department of Swasthavritta and Yoga, MAM's Sumatibhai Shah Ayurved Mahavidyalaya, Hadapsar, Pune-28.²Head of Department, Department of Swasthavritta and Yoga, MAM's Sumatibhai Shah Ayurved Mahavidyalaya, Hadapsar, Pune-28.***Corresponding Author: Vd. Manisha Kadam**PG Scholar, Department of Swasthavritta and Yoga, MAM's Sumatibhai Shah Ayurved Mahavidyalaya, Hadapsar, Pune-28. DOI: <https://doi.org/10.5281/zenodo.23803102>**How to cite this Article:** ¹*Vd. Manisha Kadam, ²Vd. Ramesh Ujwale. (2026). Potential Benefits of Surya Namaskar In Type 2 Diabetes Mellitus: A Narrative Review. European Journal of Pharmaceutical and Medical Research, 13(11), 247–250. This work is licensed under Creative Commons Attribution 4.0 International license.

Article Received on 04/10/2026

Article Revised on 25/10/2026

Article Published on 01/11/2026

ABSTRACT

Introduction: Type 2 diabetes mellitus is a chronic metabolic disorder characterized by insulin resistance and progressive dysfunction of pancreatic beta cells. Regular physical activity is an essential component of its management. Surya Namaskar (Sun Salutation) is a sequence of twelve yoga postures coordinated with breathing that may improve physical fitness and metabolic health. **Aim:** To review the origin of Surya Namaskar and its potential benefits and safety considerations in individuals with type 2 diabetes mellitus. **Materials and Methods:** A narrative review of published literature, including systematic reviews, meta-analyses, clinical practice guidelines, and relevant yoga texts, was undertaken to examine Surya Namaskar, yoga, and physical activity in diabetes management. **Results:** Evidence from broader yoga interventions suggests potential improvements in glycated hemoglobin, fasting blood glucose, postprandial blood glucose, cardiovascular fitness, psychological well-being, weight management, and physical function. However, studies specifically evaluating Surya Namaskar are limited, and variations in study protocols restrict definitive conclusions regarding its effectiveness. Safe practice requires appropriate pre-exercise assessment, prevention of low blood glucose, and modifications for individuals with diabetic retinopathy, neuropathy, or cardiovascular disease. **Conclusion:** Surya Namaskar may be an accessible complementary approach to lifestyle management in individuals with type 2 diabetes mellitus. However, it should not replace prescribed medication, nutritional management, or blood glucose monitoring. Further well-designed clinical trials are required to establish its effectiveness, safety, and long-term benefits.

KEYWORDS: Surya Namaskar, Type 2 diabetes mellitus, Yoga, Glycemic control, Insulin resistance, Lifestyle modification.

1. INTRODUCTION

Type 2 diabetes mellitus is a major global health concern characterized by chronic hyperglycemia, insulin resistance, and progressive β -cell dysfunction.^[1] Its development is influenced by genetic susceptibility, excess adiposity, physical inactivity, dietary patterns, and other lifestyle factors.^[2,3] Persistent hyperglycemia increases the risk of cardiovascular disease, neuropathy, retinopathy, and nephropathy.^[4,5]

Although pharmacological therapy remains essential, lifestyle modification is integral to comprehensive diabetes care.^[6]

Surya Namaskar (Sun Salutation) is a traditional yogic practice comprising twelve postures coordinated with breathing.^[7,8] It involves muscular activity, flexibility, controlled movements, and mindful breathing, which may support physical fitness, weight management, cardiovascular health, stress reduction, and psychological well-being.^[9,10] These benefits make Surya Namaskar a valuable complementary practice for individuals with type 2 diabetes mellitus.

This narrative review examines the potential effects of Surya Namaskar on glycaemic control, insulin sensitivity, cardiovascular health, psychological well-

being and physical function in type 2 diabetes mellitus, and discusses the quality of the available evidence and practical safety considerations.

REVIEW OF LITERATURE

1. Origin and Concept of Surya Namaskar

Surya Namaskar, meaning “salutation to the Sun,” has cultural and spiritual associations with traditional Indian reverence for the Sun. The modern exercise sequence is commonly linked to Balasaheb Pant Pratinidhi and the subsequent development of contemporary yoga practices.^[11]

The sequence generally comprises 12 positions performed in coordination with movement and breathing. A complete round typically alternates the leading leg during the second half and includes forward and backward bending, weight-bearing movements, and controlled transitions. In addition to its traditional significance, Surya Namaskar may be considered a structured form of exercise that supports flexibility, muscular endurance, and cardiorespiratory fitness.

2. Potential Mechanisms of Action

2.1 Improvement in insulin sensitivity

Muscular activity increases skeletal-muscle glucose uptake through both insulin-dependent and insulin-independent pathways. Regular physical activity may also improve insulin sensitivity over time. Surya Namaskar may produce similar effects through repeated engagement of major muscle groups, although its specific metabolic effects require further study.^[12,13]

2.2 Glycemic control and metabolic health

Regular exercise can improve fasting blood glucose and glycated hemoglobin (HbA1c).^[14] Yoga-based interventions have also shown promising results in people with T2DM.^[15-18]

2.3 Cardiovascular fitness

When performed continuously at an appropriate intensity, Surya Namaskar may increase heart rate and energy expenditure. Regular practice could therefore support physical fitness and cardiovascular risk-factor management.^[19,20]

2.4 Stress reduction and psychological well-being

Chronic psychological stress may impair diabetes self-management and glucose regulation.

The breathing awareness and focused attention involved in Surya Namaskar may promote relaxation and emotional well-being, potentially supporting diabetes management indirectly.^[21,22]

2.5 Weight management and physical function

Regular physical activity supports energy expenditure, weight management, joint mobility, and muscular endurance. Surya Namaskar may provide an accessible exercise option for individuals able to perform the

movements safely.^[23]

3. Clinical Evidence

Systematic reviews and meta-analyses of yoga interventions in adults with T2DM have reported improvements in HbA1c, fasting blood glucose, and postprandial glucose compared with control conditions. However, variation in study design, intervention duration, yoga protocols, and methodological quality limits the certainty and generalizability of these findings.^[24,25]

4. PRACTICAL CONSIDERATIONS AND SAFETY

Surya Namaskar should be introduced gradually according to an individual's physical capacity, glycemic status, and complications. Beginners may start with a few comfortable rounds under appropriate instruction and progressively increase duration or intensity.

4.1 Pre - exercise assessment

Before initiating or substantially intensifying practice, individuals with diabetes should discuss their exercise plans with a qualified healthcare professional, particularly those with long-standing diabetes, poor glycemic control, multiple cardiovascular risk factors, or established complications. Assessment may include medical history, medications, blood pressure, cardiovascular symptoms, musculoskeletal function, foot status, and screening for retinopathy, neuropathy, and kidney disease when clinically indicated. Exercise should be postponed and medical advice sought in the presence of acute illness, unexplained chest pain, severe shortness of breath, dizziness, or other concerning symptoms.^[26]

Practice should be adapted to baseline fitness and mobility. An instructor familiar with diabetes can demonstrate slower transitions, supported positions, and alternatives that minimize excessive joint loading, breath-holding, or strain. Individuals should warm up gradually, maintain hydration, use appropriate footwear or foot protection, and inspect their feet before and after practice, particularly when neuropathy or reduced sensation is present.

4.2 Glucose monitoring and hypoglycemia prevention

Individuals using insulin or insulin-secretagogue medications should recognize the risk of exercise-associated hypoglycemia and follow individualized glucose-monitoring and medication guidance. Glucose may decline during exercise and for several hours afterward, depending on intensity, duration, medication regimen, and recent food intake. Those at risk should check glucose before practice and, when advised, during longer sessions and after exercise. They should recognize symptoms of hypoglycemia, including sweating, trembling, palpitations, hunger, weakness, confusion, and unusual fatigue, while noting that autonomic symptoms may be blunted in some individuals.

A rapid source of carbohydrate should be readily available during and after exercise. If pre-exercise glucose is low or declining, practice should be delayed until an individualized carbohydrate plan has been followed.

Exercise should also be postponed and medical guidance obtained when glucose is markedly elevated, particularly if ketones or symptoms of hyperglycemia or ketosis are present.

Medication doses and carbohydrate intake should not be routinely altered without professional advice; individuals using insulin or sulfonylureas may require individualized adjustments based on their usual response to exercise. Continuous glucose monitoring or capillary testing may benefit selected individuals, but readings should be interpreted in context and confirmed when symptoms do not correspond to displayed values.^[3]

4.3 Modifications for diabetes complications

Individuals with proliferative or severe non proliferative diabetic retinopathy should avoid vigorous activity, straining, prolonged breath-holding, and positions that substantially increase intraocular pressure until cleared by an eye-care professional. Those with peripheral neuropathy, loss of protective sensation, deformity, or a history of ulcers should avoid barefoot practice on hard or uneven surfaces, inspect their feet daily, and use non-weight-bearing or seated modifications when necessary. Active foot ulcers, infection, or severe Charcot arthropathy require avoidance of weight-bearing sequences and specialist management.

People with autonomic neuropathy may have impaired heart-rate responses, postural hypotension, abnormal sweating, and increased risk of overheating or dehydration. They should change positions slowly, avoid extreme temperatures, monitor symptoms, and use perceived exertion rather than heart rate alone to guide intensity. Individuals with cardiovascular disease, uncontrolled hypertension, advanced kidney disease, or substantial musculoskeletal limitations may require medical clearance, closer supervision, and a slower, lower-intensity sequence. Forward bends, deep knee flexion, wrist loading, and floor transitions can be replaced with supported standing, chair-based, or wall-assisted movements according to individual limitations.

5. Limitations and Future Directions

Current evidence is limited by small samples, heterogeneous intervention protocols, short follow-up periods, and the frequent inclusion of multiple yoga practices within single interventions. Consequently, the independent contribution of Surya Namaskar to glycemic control remains uncertain. Future randomized controlled trials should use standardized protocols and assess exercise intensity, duration, adherence, HbA1c, fasting and postprandial glucose, cardiovascular outcomes, adverse events, and longer-term safety across diverse

populations.

6. DISCUSSION

The potential role of Surya Namaskar in T2DM management should be considered within the broader framework of exercise prescription and individualized diabetes care.^[3,13] Its combination of dynamic movement, body-weight resistance, flexibility training, and breathing control may make it a versatile option for individuals who prefer structured mind-body practices. It may also offer advantages related to cultural acceptability, minimal equipment requirements, and home-based practice.^[8]

However, intensity varies substantially according to pace, number of rounds, posture modification, and practitioner experience. A slow sequence may primarily support mobility and relaxation, whereas rapid, continuous performance may elicit a moderate cardiovascular response.^[9,10] This variability complicates comparisons across studies and limits determination of an appropriate dose for glycemic benefit. Future research should therefore report the number of rounds, duration, pace, energy expenditure, perceived exertion, and degree of supervision.

Adherence is also critical. Long-term benefits depend not only on physiological efficacy but also on sustained, safe participation. Surya Namaskar may be most useful when integrated with walking, resistance training, dietary counseling, medication adherence, and routine diabetes monitoring.^[13,15] It should not be promoted as a stand-alone therapy or cure.

7. CONCLUSION

Surya Namaskar may be a practical, culturally familiar, and accessible component of lifestyle management for individuals with T2DM. Potential benefits include increased physical activity, improved physical function, stress management, and possible support for glycemic control. However, evidence is stronger for yoga and regular exercise generally than for Surya Namaskar specifically. Rigorous clinical research is needed to establish its independent effects and long-term benefits. Until then, it should be incorporated as an adjunct to evidence-based diabetes care, not as a substitute for conventional treatment.

8. REFERENCES

1. Sun H, Saeedi P, Karuranga S, Pinkepank M, Ogurtsova K, Duncan BB, et al. IDF Diabetes Atlas: global, regional and country-level diabetes prevalence estimates for 2021 and projections for 2045. *Diabetes Res Clin Pract*, 2022; 183: 109119. <https://doi.org/10.1016/j.diabres.2021.109119>
2. DeFronzo RA, Ferrannini E, Groop L, Henry RR, Herman WH, Holst JJ, et al. Type 2 diabetes mellitus. *Nat Rev Dis Primers*, 2015; 1: 15019. <https://doi.org/10.1038/nrdp.2015.19>
3. American Diabetes Association Professional Practice

- Committee. 5. Facilitating positive health behaviors and well-being to improve health outcomes: Standards of Care in Diabetes—2026. *Diabetes Care*, 2026; 49(1): S89-S131. <https://doi.org/10.2337/dc26-S005>
4. ElSayed NA, Aleppo G, Bannuru RR, Bruemmer D, Collins BS, Das SR, et al. 10. Cardiovascular disease and risk management: Standards of Care in Diabetes—2024. *Diabetes Care*, 2024; 47(1): S179-S218. <https://doi.org/10.2337/dc24-S010>
5. American Diabetes Association Professional Practice Committee. 12. Retinopathy, neuropathy, and foot care: Standards of Care in Diabetes—2025. *Diabetes Care*, 2025; 48(1,1): S252-S265. <https://doi.org/10.2337/dc25-S012>
6. American Diabetes Association Professional Practice Committee. 5. Facilitating positive health behaviors and well-being to improve health outcomes: Standards of Care in Diabetes—2024. *Diabetes Care*, 2024; 47(1): S77-S110. <https://doi.org/10.2337/dc24-S005>
7. Swami Satyananda Saraswati. A systematic course in the ancient tantric techniques of yoga and kriya. Munger: Bihar School of Yoga, 2009.
8. Prasanna Venkatesh L, Vandhana S. Insights on Surya Namaskar from its origin to application towards health. *J Ayurveda Integr Med.*, 2022; 13(2): 100530. <https://doi.org/10.1016/j.jaim.2021.10.002>
9. Bhutkar MV, Bhutkar PM, Taware GB, Surdi AD. How effective is sun salutation in improving muscle strength, general body endurance and body composition? *Asian J Sports Med.*, 2011; 2(4): 259-266. <https://doi.org/10.5812/asjms.34742>
10. Sinha B, Ray US, Pathak A, Selvamurthy W. Energy cost and cardiorespiratory changes during the practice of Surya Namaskar. *Indian J Physiol Pharmacol*, 2004; 48(2): 184-190. <https://pubmed.ncbi.nlm.nih.gov/15521557/>
11. Singleton M. Yoga body: the origins of modern posture practice. New York: Oxford University Press, 2010. <https://doi.org/10.1093/acprof:oso/9780195395358.010001>
12. Richter EA, Hargreaves M. Exercise, GLUT4, and skeletal muscle glucose uptake. *Physiol Rev.*, 2013; 93(3): 993-1017. <https://doi.org/10.1152/physrev.00038.2012>
13. Colberg SR, Sigal RJ, Yardley JE, Riddell MC, Dunstan DW, Dempsey PC, et al. Physical activity/exercise and diabetes: a position statement of the American Diabetes Association. *Diabetes Care*, 2016; 39(11): 2065-2079. <https://doi.org/10.2337/dc16-1728>
14. Sigal RJ, Kenny GP, Boulé NG, Wells GA, Prud'homme D, Fortier M, et al. Effects of aerobic training, resistance training, or both on glycemic control in type 2 diabetes: a randomized trial. *Ann Intern Med.*, 2007; 147(6): 357-369. <https://doi.org/10.7326/0003-4819-147-6-200709180-00005>
15. Cui J, Yan JH, Yan LM, Pan L, Le JJ, Guo YZ. Effects of yoga in adults with type 2 diabetes mellitus: a meta-analysis. *J Diabetes Investig*, 2017; 8(2): 201-9. <https://doi.org/10.1111/jdi.12548>
16. Kumar V, Jagannathan A, Philip M, Thulasi A, Angadi P, Raghuram N. Role of yoga for patients with type II diabetes mellitus: a systematic review and meta-analysis. *Complement Ther Med.*, 2016; 25: 104-12. <https://doi.org/10.1016/j.ctim.2016.02.001>
17. Thind H, Lantini R, Balletto BL, Donahue ML, Salmoirago-Blotcher E, Bock BC, et al. The effects of yoga among adults with type 2 diabetes: a systematic review and meta-analysis. *Prev Med.*, 2017; 105: 116-26. <https://doi.org/10.1016/j.ypmed.2017.08.017>
18. Sengupta P. Health impacts of yoga and pranayama: a state-of-the-art review. *Int J Prev Med.*, 2012; 3(7): 444-58. PMID: 22891145; PMCID: PMC3415184.
19. Cramer H, Lauche R, Haller H, Steckhan N, Michalsen A, Dobos G. Effects of yoga on cardiovascular disease risk factors: a systematic review and meta-analysis. *Int J Cardiol*, 2014; 173(2): 170-83. <https://doi.org/10.1016/j.ijcard.2014.02.017>
20. Singh S, Malhotra V, Singh KP, Madhu SV, Tandon OP. Role of yoga in modifying certain cardiovascular functions in type 2 diabetic patients. *J Assoc Physicians India*, 2004; 52: 203-6. PMID: 15636309.
21. Hackett RA, Steptoe A. Type 2 diabetes mellitus and psychological stress - a modifiable risk factor. *Nat Rev Endocrinol*, 2017; 13(9): 547-60. <https://doi.org/10.1038/nrendo.2017.64>
22. Wang F, Szabo A. Effects of yoga on stress among healthy adults: a systematic review. *Altern Ther Health Med.*, 2020; 26(4): AT6214. PMID: 32088671.
23. Bull FC, Al-Ansari SS, Biddle S, Borodulin K, Buman MP, Cardon G, et al. World Health Organization 2020 guidelines on physical activity and sedentary behaviour. *Br J Sports Med.*, 2020; 54(24): 1451-62. <https://doi.org/10.1136/bjsports-2020-102955>
24. Hegde SV, Adhikari P, Kotian S, Pinto VJ, D'Souza S, D'Souza V. Effect of 3-month yoga on oxidative stress in type 2 diabetes with or without complications: a controlled clinical trial. *Diabetes Care*, 2011; 34(10): 2208-10. <https://doi.org/10.2337/dc10-2430>
25. Raveendran AV, Deshpandae A, Joshi SR. Therapeutic role of yoga in type 2 diabetes. *Endocrinol Metab (Seoul)*, 2018; 33(3): 307-17. <https://doi.org/10.3803/EnM.2018.33.3.307>
26. Cramer H, Ward L, Saper R, Fishbein D, Dobos G, Lauche R. The safety of yoga: a systematic review and meta-analysis of randomized controlled trials. *Am J Epidemiol*, 2015; 182(4): 281-93. <https://doi.org/10.1093/aje/kwv071>