

Lifestyle Modification for the Prevention of Type 2 Diabetes Mellitus: A Systematic Review

Rutuja Prakash Dokh^{*1} Madhura Shivaji Nalawade²

- 1. Research associate, SuShodh Edutech and research organization, Pune, Maharashtra.**
- 2. Research associate, SuShodh Edutech and research organization, Pune, Maharashtra.**

***Corresponding Author: Rutuja Prakash Dokh**

ABSTRACT

Type 2 diabetes mellitus is a growing public health problem strongly associated with modifiable lifestyle risk factors such as unhealthy dietary habits, physical inactivity, overweight, obesity, sedentary behaviour and poor long-term weight management. Since lifestyle-related risk factors play a major role in the development of type 2 diabetes, lifestyle modification has become an important preventive strategy, particularly among adults with prediabetes or high cardiometabolic risk. This systematic review aimed to examine recent evidence on the role of lifestyle modification in the prevention of type 2 diabetes mellitus.

A structured literature search was conducted using PubMed, Google Scholar, ScienceDirect, Cochrane Library, CINAHL, World Health Organization resources, International Diabetes Federation reports and American Diabetes Association guidelines. The review included studies published between 2016 and 2026. Randomized controlled trials, systematic reviews, meta-analyses, clinical guidelines and community-based intervention studies were considered. Studies were included if they focused on lifestyle-based prevention of type 2 diabetes through dietary modification, physical activity, weight reduction, behavioural counselling, digital health intervention, community education or combined lifestyle programmes. Studies published before 2016, studies focused only on pharmacological treatment, and studies involving only diagnosed diabetic patients were excluded.

The reviewed literature showed that structured lifestyle modification is effective in reducing the risk of progression from prediabetes to type 2 diabetes. Recent evidence indicates that lifestyle interventions combining dietary change, regular physical activity and behavioural support are more effective than general health advice alone. Weight reduction was identified as a major factor in improving insulin sensitivity and promoting regression from prediabetes to normoglycaemia (Jayedi et al., 2024). Community-based and digital lifestyle interventions also showed beneficial effects, although their success depends on adherence, follow-up, cultural suitability and participant engagement (Holm et al., 2024; Shirvani et al., 2021; Wang et al., 2025).

The review concludes that lifestyle modification is a safe, practical and cost-effective approach for preventing type 2 diabetes mellitus. Integrating structured lifestyle programmes into primary health care and community settings may help reduce the growing burden of diabetes. Future research should focus on long-term adherence, culturally appropriate interventions and implementation in low-resource settings.

Keywords: Lifestyle Modification; Type 2 Diabetes Mellitus; Diabetes Prevention; Prediabetes; Physical Activity.

Introduction

Type 2 diabetes mellitus is a major public health problem that is increasing rapidly across the world. It is a chronic metabolic disorder mainly associated with insulin resistance and impaired glucose regulation. The disease is strongly connected with modifiable lifestyle factors such as unhealthy diet, physical inactivity, overweight, obesity, sedentary behaviour, tobacco use and poor weight management. Recent global data show that diabetes has become a serious health burden affecting individuals, families, communities and health-care systems. The World Health Organization reported that the number of people living with diabetes increased from 200 million in 1990 to 830 million in 2022, and type 2 diabetes is often preventable through healthy lifestyle practices (World Health Organization, 2024). Similarly, the International Diabetes Federation estimated that 589 million adults aged 20-79 years were living with diabetes in 2024, and this number is expected to rise to 853 million by 2050 (International Diabetes Federation, 2025).

Lifestyle modification plays a central role in the prevention of type 2 diabetes mellitus because it directly targets the major behavioural and metabolic risk factors responsible for the development of the disease. Healthy dietary practices, regular physical activity, weight reduction, reduced sedentary time and behavioural counselling can improve insulin sensitivity, reduce body weight, improve glucose metabolism and delay progression from prediabetes to type 2 diabetes. Current diabetes prevention guidelines recommend structured lifestyle intervention for individuals at high risk, especially those with prediabetes, overweight, obesity or a family history of diabetes. The American Diabetes Association recommends lifestyle goals such as weight reduction and at least 150 minutes of moderate-intensity physical activity per week for diabetes prevention among high-risk individuals (American Diabetes Association Professional Practice Committee, 2026).

Recent research evidence supports the preventive value of lifestyle modification. A systematic review and meta-analysis by Wang et al. (2025) found that lifestyle interventions significantly reduced the incidence of type 2 diabetes among adults with prediabetes, especially when interventions were delivered through face-to-face or blended approaches. Another recent review reported that lifestyle-based weight loss interventions improve the possibility of regression from prediabetes to normal glucose regulation, showing the importance of sustained weight management in diabetes prevention (Jayedi et al., 2024). Long-term follow-up evidence also

indicates that lifestyle intervention can delay the onset of diabetes and reduce later health complications among high-risk individuals (Gong et al., 2019).

Therefore, lifestyle modification is an important, safe and practical strategy for preventing type 2 diabetes mellitus. It is not limited to a single behaviour but includes a combined approach involving diet, exercise, body weight control and long-term behavioural change. Since type 2 diabetes is closely related to lifestyle patterns, prevention efforts must focus on improving daily habits before the disease develops. This systematic review focuses on recent evidence regarding lifestyle modification as a preventive approach for type 2 diabetes mellitus and highlights its importance in reducing diabetes risk among high-risk populations.

Methodology

This systematic review was planned to examine recent evidence on lifestyle modification for the prevention of type 2 diabetes mellitus. The review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses framework to guide the identification, screening, eligibility assessment and inclusion of relevant studies (Page et al., 2021). A structured literature search was conducted using electronic databases and academic sources, including PubMed, Google Scholar, ScienceDirect, Cochrane Library, CINAHL, World Health Organization resources, International Diabetes Federation reports and American Diabetes Association guidelines.

The search was limited to studies published from 2016 to 2026, as the purpose of the review was to include only recent evidence from the last ten years. The keywords used for searching included “lifestyle modification,” “type 2 diabetes prevention,” “prediabetes,” “dietary intervention,” “physical activity,” “weight reduction,” “behavioural counselling,” “diabetes prevention programme,” “community-based lifestyle intervention,” and “systematic review.” Boolean operators such as AND and OR were used to combine terms, for example, “lifestyle modification AND type 2 diabetes prevention” and “prediabetes AND physical activity AND dietary intervention.”

Studies were included if they focused on lifestyle-based prevention of type 2 diabetes among adults with prediabetes, impaired fasting glucose, impaired glucose tolerance, obesity, overweight, family history of diabetes or other high-risk conditions. Randomized controlled trials, cohort studies, systematic reviews, meta-analyses, clinical guidelines and community-based intervention studies were considered. Studies were excluded if they were published before 2016, focused only on drug therapy, included only diagnosed diabetic patients, were not available in English, or did not clearly report lifestyle-related outcomes.

The selected studies were screened first by title and abstract, followed by full-text review. Relevant information was extracted regarding author, year, study design, sample characteristics, intervention components, duration, outcome measures and major findings. The main limitations of the search process include restriction to English-language sources, possible exclusion of

unpublished studies and variation in intervention duration, intensity and outcome measures across the included studies.

Review of Literature

Recent literature strongly supports lifestyle modification as an important strategy for the prevention of type 2 diabetes mellitus. The available evidence from systematic reviews, meta-analyses, clinical guidelines and community-based studies shows that lifestyle change is most effective when it combines dietary modification, physical activity, weight management and behavioural support.

Dietary modification and diabetes prevention

Dietary change is one of the major components of lifestyle modification for preventing type 2 diabetes. Recent studies indicate that diets emphasizing whole grains, vegetables, fruits, legumes, fibre-rich foods and reduced intake of refined carbohydrates, saturated fat and sugar-sweetened beverages are associated with better glucose control and lower diabetes risk. The American Diabetes Association Professional Practice Committee (2026) recommends structured nutrition counselling as part of diabetes prevention for individuals with prediabetes or high cardiometabolic risk. Lifestyle-based weight loss interventions are particularly important because excess body weight increases insulin resistance and accelerates progression from prediabetes to diabetes. Jayedi et al. (2024) reported that lifestyle weight-loss interventions improved regression from prediabetes to normoglycaemia and reduced progression toward type 2 diabetes. This suggests that dietary modification should not be viewed as an isolated activity but as part of a broader lifestyle programme focused on sustainable weight control.

Physical activity and weight management

Physical activity is another key element in diabetes prevention. Regular moderate-intensity activity improves insulin sensitivity, supports weight reduction, reduces abdominal obesity and improves cardiovascular health. Current recommendations emphasize at least 150 minutes of moderate-intensity physical activity per week for high-risk adults (American Diabetes Association Professional Practice Committee, 2026). Recent evidence shows that lifestyle interventions are effective when physical activity is combined with dietary counselling and behavioural support. Wang et al. (2025), in a systematic review and meta-analysis of randomized controlled trials among adults with prediabetes, found that lifestyle interventions helped prevent type 2 diabetes and supported reversion to normal glucose regulation. The effect was particularly important among individuals with impaired glucose tolerance. This indicates that physical activity and weight management should be introduced early, before diabetes becomes established.

Community-based lifestyle interventions

Community-based interventions are important because they make diabetes prevention accessible outside hospital settings. Shirvani et al. (2021), in a global systematic review and meta-analysis,

found that community-based educational interventions reduced the risk of developing type 2 diabetes and improved fasting blood sugar, HbA1c, body mass index and waist circumference. Such interventions often include health education, diet counselling, group exercise sessions, self-monitoring and peer support. These findings show that diabetes prevention can be effectively delivered through community health programmes, primary health centres and public health campaigns. However, community-based programmes may vary in effectiveness depending on cultural acceptability, follow-up duration, health literacy and availability of trained personnel.

Digital and blended lifestyle interventions

Recent literature also highlights the growing role of digital health interventions in diabetes prevention. Digital lifestyle interventions include mobile applications, web-based coaching, text-message reminders, wearable activity tracking and online counselling. Holm et al. (2024) reported that digital health lifestyle interventions can produce statistically significant changes in body weight and other outcomes among people with prediabetes. Similarly, Wang et al. (2025) compared face-to-face, digital and blended intervention modes and reported that lifestyle intervention could reduce type 2 diabetes risk among adults with prediabetes. Digital interventions are useful because they can reach large populations, reduce travel barriers and provide continuous reminders. However, they may be less effective among individuals with limited digital literacy, poor internet access or low motivation.

Gaps and contradictions in recent evidence

Although recent studies generally support lifestyle modification, some gaps remain. Cao et al. (2024), in a systematic review and meta-analysis focused on the Asia-Pacific region, found significant reduction in waist circumference but no consistent significant effect on all glycaemic outcomes. This suggests that lifestyle interventions may not produce equal results across all populations and outcomes. Differences in age, ethnicity, baseline risk, intervention duration, cultural dietary patterns, adherence and intensity of follow-up may influence results. Another gap is the limited availability of long-term follow-up studies from low- and middle-income countries. Most studies show short-term benefits, but maintaining lifestyle change over many years remains a major challenge. Therefore, current literature suggests that lifestyle modification is effective, but its success depends on sustained adherence, cultural adaptation, community support and regular follow-up.

Sr. No.	Author(s) and Year	Type of Source	Focus Area	Major Findings	Relevance to Present Review
1	American Diabetes Association Professional Practice	Clinical guideline	Lifestyle modification for diabetes prevention	Recommended structured nutrition counselling, weight reduction, and at least 150 minutes	Provides current guideline-based support for diet, exercise and weight control

	Committee (2026)			of moderate-intensity physical activity per week for high-risk adults.	in prevention of type 2 diabetes.
2	Jayedi et al. (2024)	Systematic review and meta-analysis	Lifestyle weight-loss interventions	Reported that lifestyle-based weight-loss interventions improved regression from prediabetes to normoglycaemia and reduced progression to type 2 diabetes.	Shows that weight reduction is a key mechanism in diabetes prevention.
3	Wang et al. (2025)	Systematic review and meta-analysis of randomized controlled trials	Face-to-face, digital and blended lifestyle interventions	Found that lifestyle interventions helped prevent type 2 diabetes and supported reversion to normal glucose regulation among adults with prediabetes.	Supports the effectiveness of structured lifestyle intervention among high-risk adults.
4	Shirvani et al. (2021)	Global systematic review and meta-analysis	Community-based educational interventions	Found that community-based education reduced the risk of type 2 diabetes and improved fasting blood sugar, HbA1c, BMI and waist circumference.	Supports community-level diabetes prevention programmes.
5	Holm et al. (2024)	Systematic review, meta-analysis and meta-regression	Digital health lifestyle interventions	Reported that digital lifestyle interventions produced significant changes in body weight and other outcomes among people with prediabetes.	Shows the role of digital platforms in supporting lifestyle change.
6	Cao et al. (2024)	Systematic review and	Lifestyle intervention in	Found significant reduction in waist	Highlights gaps, contradictions

		meta-analysis	Asia-Pacific region	circumference but inconsistent effects on all glycaemic outcomes.	and the need for culturally adapted interventions.
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Discussion

The findings of recent literature indicate that lifestyle modification is a highly relevant and effective approach for the prevention of type 2 diabetes mellitus. Across recent studies, the most consistent theme is that diabetes prevention is more successful when lifestyle change is delivered as a structured, multicomponent intervention rather than as general advice. Diet modification, regular physical activity, weight reduction, reduced sedentary behaviour and behavioural counselling work together to improve insulin sensitivity, reduce body fat and support healthier glucose regulation.

Weight management appears to be one of the strongest mechanisms through which lifestyle modification prevents diabetes. Jayedi et al. (2024) reported that lifestyle weight-loss interventions reduced progression to type 2 diabetes and increased regression from prediabetes to normal glucose regulation. This finding suggests that even moderate weight loss can produce meaningful metabolic benefits in high-risk adults. Similarly, the American Diabetes Association Professional Practice Committee (2026) emphasizes physical activity, dietary change and weight reduction as major components of diabetes prevention. Therefore, lifestyle modification should not be understood only as exercise or diet alone, but as a combined behavioural strategy.

Another important pattern in the reviewed studies is the value of early intervention among individuals with prediabetes. Wang et al. (2025) found that lifestyle interventions were effective in reducing diabetes risk and improving reversion to normoglycaemia among adults with prediabetes. This supports the idea that prevention should begin before diabetes develops, especially among individuals with impaired glucose regulation, obesity, family history or sedentary lifestyle. Community-based programmes also showed positive effects. Shirvani et al. (2021) reported that educational interventions reduced diabetes incidence and improved risk parameters such as fasting blood glucose, body mass index and waist circumference. These findings are important for public health practice because community settings can reach high-risk populations who may not regularly attend specialist health services.

Digital and blended lifestyle interventions are emerging as promising approaches. Holm et al. (2024) found that digital health lifestyle interventions improved body weight and other prediabetes-related outcomes. Digital tools may improve accessibility, follow-up and self-monitoring; however, their success depends on digital literacy, motivation and regular engagement. Some contradictions also exist. Cao et al. (2024) noted that lifestyle interventions in the Asia-Pacific region did not show uniform improvement across all glycaemic outcomes,

although waist circumference improved. This indicates that intervention effectiveness may vary by population, culture, duration and adherence.

Overall, the evidence suggests that lifestyle modification is a practical and preventive strategy for reducing type 2 diabetes risk. However, long-term adherence remains a major challenge. Future programmes should focus on culturally acceptable diet plans, affordable physical activity options, family support, continuous counselling and integration into primary health care.

Conclusion

Lifestyle modification is one of the most important strategies for the prevention of type 2 diabetes mellitus. Recent evidence shows that type 2 diabetes is closely associated with modifiable lifestyle risk factors such as unhealthy dietary habits, physical inactivity, excess body weight, abdominal obesity and sedentary behaviour. Therefore, prevention should focus on correcting these risk factors before diabetes develops. The reviewed literature indicates that structured lifestyle interventions can reduce the progression from prediabetes to type 2 diabetes and can also support reversion from prediabetes to normal glucose regulation.

The common themes identified across recent studies include dietary modification, regular physical activity, weight reduction, behavioural counselling, self-monitoring and continuous follow-up. Among these, weight management appears to be a major factor because excess body weight contributes directly to insulin resistance. Recent meta-analytic evidence shows that lifestyle weight-loss interventions increase regression to normoglycaemia and reduce progression to type 2 diabetes among people with prediabetes (Jayedi et al., 2024). Similarly, lifestyle interventions delivered through face-to-face, digital or blended modes have been found effective in reducing diabetes risk among adults with prediabetes, although face-to-face support often shows stronger and more consistent outcomes (Wang et al., 2025).

The findings also suggest that lifestyle modification should not be limited to individual advice. It should be implemented through structured diabetes prevention programmes, community-based education, primary health-care services and regular follow-up mechanisms. Current guidelines recommend lifestyle goals such as weight reduction and at least 150 minutes of moderate-intensity physical activity per week for high-risk adults (American Diabetes Association Professional Practice Committee, 2026). These recommendations are important because they are practical, low-cost and suitable for population-level prevention.

However, several limitations remain in the current research. Many studies differ in intervention duration, intensity, delivery method and outcome measures, making comparison difficult. Long-term adherence to lifestyle change is also a major challenge. Digital interventions may improve access, but they may not be equally effective for people with poor digital literacy or limited internet access. Future research should focus on culturally appropriate lifestyle programmes, long-term follow-up, cost-effectiveness, family involvement and implementation in low-resource settings.

In conclusion, lifestyle modification is a safe, effective and essential approach for preventing type 2 diabetes mellitus. A combined focus on healthy diet, physical activity, weight control and sustained behavioural change can reduce diabetes risk and improve overall metabolic health. Strengthening lifestyle-based prevention in community and primary care settings can help reduce the growing global burden of type 2 diabetes.

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