

Weight Loss Based Lifestyle Intervention – The Quintessential Tool to Prevent & Reverse Type- 2 Diabetes

Balachandar, J. C^{1*}, Shiv Swaroop Singh IRS², Saanvi Agrawal³, Irshad Ahamed, S⁴, Ayeshamariam, A⁵, Aditya Jeyachandran, B. C⁶, Jayachandran, M⁷

¹Bala's School of Fitness & Preventive Medicine, Faridabad, Delhi-NCR, India

²Commissioner of Income Tax, Government of India

³Strawberry Fields High School, Chandigarh

⁴General Surgery, General and Laparoscopic Surgeon, Senior Resident, Department of General Surgery, Pondicherry Institute of Medical Sciences, Puducherry

⁵Department of Physics, Khadir Mohideen College, Adirampattinam, 614701, (Affiliated to Bharathidasan University, Tiruchirappalli)

⁶National Law School of India University, Bangalore

⁷(Dean), Research and Development Center, Sethu Institute of Technology, Pullur, Kariyapatti Tamilnadu, India

***Corresponding author:** Balachandar J. C., Bala's School of Fitness & Preventive Medicine, Faridabad, Delhi-NCR, India.

Submitted: 15 November 2024 **Accepted:** 21 November 2024 **Published:** 28 November 2024

Citation: Balachandar, J. C., Shiv, S., Singh, I. R. S., Agrawal, S., Ahamed, I. S., Ayeshamariam, A., Jeyachandran, A., & Jayachandran, M. (2024). Weight loss-based lifestyle intervention – The quintessential tool to prevent & reverse type-2 diabetes. *Wor Jour of Dia Res and Pract*, 1(4), 01-05.

Abstract

Type-2 diabetes is a significant non-communicable disease that is becoming more prevalent worldwide. Type-2 diabetes occurs when the body either fails to produce sufficient insulin or is unable to utilize the insulin it does make. The prevalence of type 2 diabetes is rapidly rising globally, and it has emerged as a leading cause of vision impairment and blindness, kidney failure necessitating dialysis, cardiovascular events such as heart attacks and strokes, limb amputations, infections, and premature mortality. Discussions about the advantages of modifying lifestyle behavior were included in self-care practices. An early diagnosis can help identify the effectiveness of health promotion messages in 'high-risk' prevention strategies. Studies indicate that adopting a weight loss based healthy lifestyle can potentially prevent the onset of diabetes and even reverse its progression. This paper offers additional evidence to support the importance of promoting regular physical activity & weight loss as an integral part of a comprehensive approach to combat diabetes.

Keywords: Type-2 Diabetes, Weight Loss, Lifestyle Management and Mediterranean Diet

Introduction

Type-2 diabetes, also known as diabetes mellitus, is a significant non-communicable and rapidly increasing public health issue worldwide. It is a challenging condition to treat and manage, often requiring costly interventions. It is projected that the global population of diabetes patients will increase from approximately 190 million to around 325 million within the next 25 years [1]. People with type-2 diabetes are at a significantly increased risk of experiencing a variety of severe health issues, including heart disease, problems with blood vessels, kidney disease, eye problems that can cause blindness and disability, and an early death. It also places a substantial financial and healthcare burden

on individuals and society. The development of this condition is primarily influenced by genetic susceptibility and environmental factors. Unfortunately, there has been a significant rise in physical inactivity, obesity, and type-2 diabetes in recent times. The evidence suggests that obesity and lack of physical activity may be the primary factors contributing to the rising prevalence of diabetes in developed countries [2].

A significant reduction in the risk of type-2 diabetes was associated with the traditional eating pattern and its beneficial effects on diabetes mellitus and glucose metabolism. The dietary pattern promotes daily eating of fruits, vegetables, low-fat dairy

products, whole grains, and legumes; it also places a strong emphasis on consuming fat largely from foods high in unsaturated fatty acids. and encourages daily consumption of fruits, vegetables, low fat dairy products and whole grains, low consumption of fish, poultry, tree nuts, legumes, very less consumption of red meat or eating of red meat is discouraged [3].

It is often known that food composition has several positive health effects, including a lower risk of type-2 diabetes. Overall health has been demonstrated to benefit from a diet high in fruits, vegetables, legumes, nuts, seafood, whole grains, and omega-3 fatty acids. Increased intake of monounsaturated fats, decreased consumption of trans fats, and elevated levels of dietary fiber, antioxidants, and polyphenols are the defining characteristics of this dietary pattern. This diet also tends to be low in calorie density, which can assist avoid weight gain and ultimately lower the chance of acquiring type-2 diabetes, a situation where weight maintenance plays a role in mediating it. After adjusting for several variables, higher diet adherence combined with moderate physical activity was linked to a lower risk of developing diabetes [4].

The positive impact of the dietary pattern on diabetes mellitus and glucose metabolism in general and traditional food pattern was linked to a substantial decrease in the likelihood of developing type-2 diabetes. The composition of diet is widely recognized as a dietary pattern that offers numerous health benefits, particularly in preventing the onset of type-2 diabetes. These benefits include reduced oxidative stress and improved insulin sensitivity. High consumption of vegetables, fruits, legumes, nuts, fish, cereals and omega-3 leads to a high ratio of monounsaturated fatty acids to saturated fatty acids, a low intake of trans fatty acids, and high ingestion of dietary fiber, antioxidants, polyphenols.

The diets are known for their low energy density, which helps prevent weight gain and has a protective effect on the development of type-2 diabetes, a condition that is influenced by weight maintenance. When individuals followed the diet more strictly and engaged in light physical activity, their chances of developing diabetes decreased, even after considering other factors. Lower blood glucose levels are a result of the body's cells absorbing glucose more efficiently when there is regular physical activity and scheduled exercise. Frequent exercise also aids in blood pressure and cholesterol regulation and improves weight management. Informing your doctor and dietician about the kinds of physical activities you regularly participate in is crucial.

They assist you in finding a balance between your diabetic diet, medicinal drug, and physical workout. Your medical doctor would possibly endorse you to increase your bodily interest ranges in case you do not already get tons of exercise. Ordinary aerobic exercise software can notably reduce the requirement for insulin, lower the risk of weight problems, and lessen the chance of coronary heart ailment to coping with diabetes. workout also enables to decrease of blood triglyceride stages, enhances the ratio of LDL to HDL cholesterol, and decreases overall cholesterol.

Regular physical activity not only helps manage weight and reduce the risk of type-2 diabetes, but also has additional benefits such as lowering stress levels and blood pressure. One of

the most accessible and low-risk forms of exercise is walking, which requires no special equipment or training and can be enjoyed by people of all ages. However, it's essential to consult with a healthcare professional before starting any new exercise program, especially if you have concerns about insulin balance or other health factors. Additionally, exercising with a buddy or partner can provide motivation and support, making it a great way to stay active and healthy.

Despite widespread knowledge of chronic disease risk factors and preventive measures, many individuals struggle to adopt healthy lifestyle habits. One significant barrier to making informed health decisions is the difficulty in grasping and retaining health information. Research suggests that our capacity to understand and recall health-related details is impaired in clinical settings, with studies showing that up to 80% of patients forget their doctor's advice shortly after leaving the consultation room. Furthermore, a staggering number of adults in the US – nearly half – face challenges in comprehending and effectively utilizing health information, regardless of their literacy levels. [5, 6].

Discussion

The Key Lifestyle Intervention Strategies to Prevent T2D Weight Reduction

Weight reduction has significant beneficial effects on glucose metabolism and is considered a cornerstone in preventing Type 2 Diabetes (T2D), with larger weight reductions associated with a lower risk of T2D.

Optimal Diet

Research has consistently shown that adhering to plant-based dietary patterns, such as the Mediterranean or DASH (Dietary Approaches to Stop Hypertension) diets, or following a vegetarian lifestyle, are associated with a lower risk of developing type 2 diabetes (T2D). Furthermore, two separate studies have found that a healthy dietary pattern, similar to the Mediterranean style, is linked to a reduced risk of gestational diabetes. These findings suggest that embracing plant-based diets may be a valuable strategy for preventing or managing diabetes.

Physical Activity/Scientific Exercises

A secondary analysis of the Finnish Diabetes Prevention Study (FDPS) investigated the role of physical activity in reducing the risk of type 2 diabetes (T2D), while considering the effects of diet and weight loss. The analysis revealed that regular physical activity may lower the risk of T2D by around 50%, according to various evaluation criteria. This finding suggests that incorporating physical activity into one's lifestyle may have a significant impact on preventing or managing T2D.

Evidence to Prove the Efficacy of Lifestyle in The Prevention and Reversal of Diabetes

A wealth of research indicates that making lifestyle modifications, such as increasing physical activity and eating a healthier diet and losing weight, can dramatically lower the risk of diabetes. Research has demonstrated through randomised controlled trials that lifestyle treatments including exercise, a nutritious diet, and weight loss can significantly lower the incidence of diabetes by 58% in individuals with impaired glucose tolerance (IGT). There is evidence that altering one's lifestyle may help

lessen the impact of genes on the risk of developing diabetes. For example, in the US Diabetes Prevention Program (DPP), people who received a lifestyle intervention saw a reduction in the correlation between vulnerable genes and the development of diabetes.

Similarly, a study conducted on adult Swedish participants revealed that leading an active lifestyle may counteract a hereditary propensity to diabetes. For populations like the American population with high mean BMIs, weight loss is the primary means of preventing diabetes. For example, in the US DPP, losing weight was the best indicator of a lower incidence of diabetes; a 5-kg weight loss accounted for 58% of the reduction in incidence. More precisely, there was a 16% decrease in the chance of developing diabetes for each kilogramme that individuals dropped. In the same way, the Finnish Diabetes Prevention Study (DPS) only showed statistically significant improvements in insulin sensitivity in those who lost 8–17% of their body weight reduction. Improving insulin sensitivity has also been connected to changes in fat distribution, namely in the amounts of visceral and liver fat. Thus, it has been suggested that the primary prevention of diabetes involves a weight loss of 7% of total body weight [7, 8].

The degree of β -cell malfunction and the hyperglycaemic character of diabetes are linked to the extent to which lifestyle modifications can either prevent or delay the onset of the disease. For example, modifying one's lifestyle can increase insulin sensitivity and eventually restore normoglycemia in people with modest β -cell malfunction who develop IGT as a result of peripheral insulin resistance. On the other hand, lifestyle modifications may assist control glucose levels but may not completely restore normoglycemia in patients with isolated IFG and moderate β -cell failure. Stated differently, alterations in lifestyle may have a negligible impact on the development of diabetes in those with isolated IFG concentrations, but they are extremely advantageous for those with IGT. Lifestyle changes can either delay or prevent the onset of type 2 diabetes (T2D) according to recent systematic reviews on the disease's prevention in high-risk populations. These systematic evaluations also conclude that modifications to lifestyle may lead to a long-term decline in T2D. However, a recent Cochrane review found that the evidence only considered the impact of dietary modifications and physical activity in combination, and that there is inadequate data to determine the impact of each strategy alone [9].

A control or lifestyle intervention group (promoting physical activity and a balanced diet) was randomly assigned to 522 persons with IGT as part of the Finnish Diabetes Prevention Study (FDPS). Repeated OGTT testing was used to diagnose T2D. The independent advisory group decided to terminate the trial early since the incidence of T2D had significantly decreased after 3.2 years of follow-up. In comparison to the control group, the intervention group saw a 58% reduction in risk. The intervention group experienced a greater reduction in weight: at one and three years, the difference in weight loss between the groups was 2.6 and 3.5 kg, respectively.

Additionally, there was a rise in physical activity in the intervention group, and there were less sedentary individuals (17%) in the intervention group than in the control group (29%) [10].

Dietary Recommendations to Prevent & Reverse Diabetes

Decrease Intake of Added Sugars and Processed Foods

The first step is to stay away from refined grains like white rice and wheat. This also entails staying away from sugary beverages like juices and sodas. Seltzer, water, and sugar-free tea or coffee is the greatest beverages.

Swap Out Refined Grains for Whole Grains

Real grains that haven't had their nutrients removed after processing are called whole grains. Whole grain-based foods (such as whole wheat) are fine, but whole grains that are still whole—such as brown rice, quinoa, corn, oatmeal, and farro—are preferable.

Increase Fiber Intake

Most fruits and vegetables are high-fiber foods. Legumes are also a good source of plant protein and fibre. Beans, chickpeas, peas, edamame, lentils, and soy are examples of legumes. Consumers of high-fiber foods typically consume less calories, weigh less, and are at a decreased risk of developing diabetes.

Increase Fruits and Vegetables Intake

Colourful fruits and vegetables should make up at least half of our daily diet; the more vibrant the better. Particularly healthful are cruciferous vegetables (broccoli, cauliflower, and Brussels sprouts) and high-fiber fruits (berries, in general).

A considerably longer and healthier life is linked to all fruits and vegetables! Eat Less Meat, and Avoid Processed Red Meat—Many Studies Have Shown Us that Certain Meats are Incredibly Risky for us—People who eat processed red meat are considerably more likely to get diabetes: one serving a day (which is two slices of bacon, two slices of deli meat, or one hot dog) is connected with almost a 50% increased risk of acquiring type 2 diabetes. A 20% higher risk of type 2 diabetes is linked to eating even a tiny amount of red meat—beef, lamb, and pork—daily, such as a piece of steak the size of your palm. The iron in red meats and the toxins in processed meats could be the cause of this. In actuality, your risk of developing diabetes decreases with the amount of meat you consume. The risk of type 2 diabetes can be considerably reduced by eating poultry, eggs, dairy, fish, and no red meat at all. It can be reduced by 50% for people who consume only fish, 60% for those who eat only eggs and dairy, and 80% for vegans [11].

Eat Healthier Fats

It's not always harmful to be fat. It does matter what kind of fat you consume. Meat-derived saturated fats, in particular, have been linked to a higher risk of heart disease and diabetes. Extra virgin olive oil and canola oil are examples of plant oils that are lower in risk. Walnuts, flax seeds, and certain types of fish contain omega-3 fats, which are actually quite healthy for you. Eat more foods low on the glycaemic index: Foods with a high glycaemic index are those that raise blood sugar levels quickly. With the help of this useful tool, you may choose foods that affect blood sugar levels significantly less. Sugar alone, white potatoes, the majority of wheat flour products, and the majority of cold cereals—such as pumpernickel, rye, multigrain or sourdough bread—as well as homemade oatmeal, bran cereals, grape nuts, most fruits, sweet potatoes, pasta, rice, barley, couscous, beans, peas, lentils, and most vegetables—are high-glycemic index foods [12].

Reduce Salt (“sodium”) in Diet

If you have diabetes, you may also have high blood pressure. Reducing your salt intake can assist in maintaining low blood pressure. Try seasoning your food with (salt-free) herbs, spices, and garlic, and cut back on the quantity of salt you apply when cooking and in recipes. Taste your food before adding salt at the table. Foods' inherent saltiness is enhanced by lemon juice. Steer clear of processed foods high in salt (sodium chloride), such as packaged or canned goods, and condiments like mustard. Look for the word "Na" (sodium) on food labels. Snacks like chips, pretzels, and the like contain a lot of salt; consult your doctor before consuming any salt replacements [13].

Exercise Recommendations to Prevent & Reverse Diabetes

Frequent scientific exercise helps control blood sugar levels, burns calories, aids in weight loss, and raises insulin sensitivity, which facilitates the uptake of blood sugar by cells [14]. Any skeletal muscle-driven movement that requires the use of energy is considered physical activity or scientific exercises. Examples of these movements include play, games, sports, household chores, transportation (such as walking or cycling), and leisure time physical activity. 20% to 30% lower incidence of diabetes is linked to a variety of physical activities and intensities, particularly in high-risk adults. For example, regardless of BMI, ≥ 2.5 hours per week of moderate-intensity brisk walking are linked to a 27% reduction in the incidence of diabetes [15].

Moreover, regardless of obesity, moderate-to-intense exercise has been connected to improved β -cell function and glucose management. It has been observed that structured exercise training improves β -cell activity and insulin sensitivity in high-risk patients and lowers HbA1c by 67% in diabetic patients. These results are on par with or better than those obtained with popular anti-diabetic medications. According to international guidelines, adults 18 years of age and older should, on two or more days a week, perform 150 minutes of moderate-intensity or 75 minutes of vigorous-intensity aerobic physical activity (or a combination of these) that build up to bouts of at least 10 minutes. These bouts should involve muscle-strengthening activities that involve major muscle groups [16, 17].

Conclusion

In conclusion, the key to prevent, reverse and treat type-2 diabetes is making effective lifestyle changes, such as losing weight, following a healthy diet like the Mediterranean diet, and engaging in regular scientific exercise or physical activity. Thus, especially for high-risk individuals, attention needs to be placed on encouraging a better lifestyle and identifying ways to improve adherence and compliance to lifestyle alterations. There is strong evidence that T2D can be prevented by adopting a disciplined lifestyle, such as losing weight through dietary modifications that follow the most recent guidelines for fibre consumption, whole grain products, fruit and vegetable consumption, and quality fat. The degree of long-term weight loss and adherence to lifestyle modifications is positively correlated with the lowering of T2D risk, and this preventative effect has been shown to last for many years following active intervention. The effectiveness of these interventions in clinical and community settings, across delivery forms and implementers, is amply supported by the available evidence.

References

1. Kanaley, J. A., Colberg, S. R., Corcoran, M. H., Malin, S. K., Rodriguez, N. R., Crespo, C. J., ... & Zierath, J. R. (2022). Exercise/physical activity in individuals with type 2 diabetes: a consensus statement from the American College of Sports Medicine. *Medicine and science in sports and exercise*, 54(2), 353.
2. Shultz, J. A., Sprague, M. A., Branen, L. J., Lambeth, S. (2001). A comparison of views of individuals with type 2 diabetes mellitus and diabetes educators about barriers to diet and exercise. *Journal of health communication*, 6(2), 99-115.
3. Myers, V. H., McVay, M. A., Brashear, M. M., Johannsen, N. M., Swift, D. L., Kramer, K., ... & Church, T. S. (2013). Exercise training and quality of life in individuals with type 2 diabetes: a randomized controlled trial. *Diabetes care*, 36(7), 1884-1890.
4. Dunkler, D., Dehghan, M., Teo, K. K., Heinze, G., Gao, P., Kohl, M., ... & Oberbauer, R. (2013). Diet and kidney disease in high-risk individuals with type 2 diabetes mellitus. *JAMA internal medicine*, 173(18).
5. Litwak, L., Goh, S. Y., Hussein, Z., Malek, R., Prusty, V., Khamseh, M. E. (2013). Prevalence of diabetes complications in people with type 2 diabetes mellitus and its association with baseline characteristics in the multinational A 1 chieve study. *Diabetology & metabolic syndrome*, 5, 1-10.
6. Thomas, R. L., Dunstan, F., Luzio, S. D., Chowdury, S. R., Hale, S. L., North, R. V., ... & Owens, D. R. (2012). Incidence of diabetic retinopathy in people with type 2 diabetes mellitus attending the Diabetic Retinopathy Screening Service for Wales: retrospective analysis. *Bmj*, 344.
7. Bombak, A. (2014). Obesity, health at every size, and public health policy. *American journal of public health*, 104(2), e60-e67.
8. Ramlo-Halsted, B. A., Edelman, S. V. (1999). The natural history of type 2 diabetes: implications for clinical practice. *Primary Care: Clinics in Office Practice*, 26(4), 771-790.
9. American Diabetes Association (2013). Diagnosis and classification of diabetes mellitus. *Diabetes care*, 36 Suppl 1(Suppl 1), S67-S74. <https://doi.org/10.2337/dc13-S067>.
10. Bergman, M. (2013). Pathophysiology of prediabetes and treatment implications for the prevention of type 2 diabetes mellitus. *Endocrine*, 43, 504-513.
11. Cersosimo, E., Solis-Herrera, C., E Trautmann, M., Malloy, J., L Triplitt, C. (2014). Assessment of pancreatic β -cell function: review of methods and clinical applications. *Current diabetes reviews*, 10(1), 2-42.
12. Galaviz, K. I., Narayan, K. V., Lobelo, F., Weber, M. B. (2018). Lifestyle and the prevention of type 2 diabetes: a status report. *American journal of lifestyle medicine*, 12(1), 4-20.
13. Keerthi, G. S., Pal, P., Pal, G. K., Sahoo, J. P., Sridhar, M. G., Balachander, J. (2017). Effect of 12 Weeks of yoga therapy on quality of life and Indian diabetes risk score in normotensive Indian young adult prediabetics and diabetics: randomized control trial. *Journal of clinical and diagnostic research: JCDR*, 11(9), CC10.
14. Ashida, T. S., Thenmozhi, S., Girija, S., Balachander, J. (2022). Analytical study of angiographic profile of acute coronary syndrome and its risk factors among young individuals (≤ 45 years). *Heart India*, 10(3), 121-127.

-
15. Balachandar, J. C., Jayachandran, M. (2023). Irshad Ahamed. Chronic Stress-The Root Cause for All the Diseases. *Endocrinol Metab Nutr*, 2(1), 1-3.
 16. Petersen, P. E., and Ogawa, H. (2012). The global burden of periodontal disease: towards integration with chronic disease prevention and control. *Periodontology 2000*, 60(1), 15-39.
 17. D'Innocenzo, S., Biagi, C., Lanari, M. (2019). Obesity and the Mediterranean diet: a review of evidence of the role and sustainability of the Mediterranean diet. *Nutrients*, 11(6), 1306.