

Review the Evidence of Life Style Management in the Prevention of Type 2-Diabetes and Compare them to Pharmacological Interventions

Rajesh Jain*, Susanne Olejas, Ani Rashel Feh, Alexander Edwards, Ibina Abigo, Wioleta Zietek, Zoonifer Khan, Satrupa Ragoonanan, Nisha Benoy and Dee Bramble

Project Manager, Diabetes Prevention Control Project, National Health Mission with World Diabetes Foundation, Kanpur, UP, India

***Corresponding Author:** Rajesh Jain, Project Manager, Diabetes Prevention Control Project, National health Mission with World Diabetes Foundation, Kanpur, UP, India.

Received: June 20, 2019; **Published:** December 30, 2019

DOI: 10.31080/ecdmr.2020.04.00060

Abstract

Individuals with T2DM are at high risk of developing severe complications including blindness, heart disease, kidney disease and neuropathy which affects millions of people throughout the world. Various study demonstrated that lifestyle modification such as exercise and healthy diet can delay the progression of pre-diabetes to T2DM. As part of diabetes prevention strategies, it is recommended that each week, adults should take part in 150 minutes moderate-intensity activities such as swimming brisk walking and jogging (NHS 2018). This paper aims to review available published evidence that appraises lifestyle interventions and pharmacological treatment for the prevention of T2DM and compares these two interventions.

Structural Education on Physical activity minimum 150 Minutes per week, diet high in Mono unsaturated fats and high in highly unsaturated fats with whole grains carbohydrates, high in fiber has shown better in Prevention of Diabetes compare to Metformin or Acarbose.

The increased consumption of vegetables, fruits, legumes, nuts, fish, cereals and oils, coupled with high ingestion of dietary fiber and low consumption of trans-fatty acids is likely to shield against T2DM. The reduced consumption of fried food is not associated with increased incidence of diabetes.

Keywords: *Life Style Management; Type 2-Diabetes; Pharmacological Interventions*

Introduction

Type 2 diabetes mellitus (T2DM) is a debilitating long-term condition that is posing an enormous burden on both the individuals and healthcare systems. In 2017, the global prevalence of T2DM was estimated at 424.9 million and is likely to increase to 628.6 million by 2045 IDF, 2017. Individuals with T2DM are at high risk of developing severe complications including blindness, heart disease, kidney disease and neuropathy which affects millions of people throughout the world. Perreault, *et al.* in their study demonstrated that lifestyle modification such as exercise and healthy diet can delay the progression of pre-diabetes to T2DM. As part of diabetes prevention strategies, it is recommended that each week, adults should take part in 150 minutes moderate -intensity activities such as swimming brisk walking and jogging NHS Guideline 2018. This paper aims to review available published evidence that appraises lifestyle interventions and pharmacological treatment for the prevention of T2DM and compares these two interventions.

Health awareness

Studies have demonstrated that individuals who have received education and self-management training on the risk of pre-diabetes are more likely to take part in health behaviour that may prevent or delay the onset of T2DM [1]. This is evidence in a study that investigated the impact of educational intervention on knowledge, beliefs, self-reported practices, gestational and postpartum weight in women with gestational diabetes mellitus. The result revealed that after the intervention participants' knowledge on GDM increased and 6 weeks postpartum women in the intervention group carried out screening for T2 DM, took on exercise, breast feeding and healthy diet compared to the control group [2]. Other studies have documented reduction in morbidity and mortality rate following increased education [3]. According to Lagisetty, *et al.* [4] in order to include and motivate patients for lifestyle intervention, it is critical to provide structured education in a culturally sensitive way.

Physical activity

There is a wealth of evidence that physically active individuals are less likely to develop insulin resistance, impaired glucose resistance or T2DM. Jadhav, *et al.* [5] in their systematic review demonstrated that physical exercise can prevent the progression of pre-diabetes to T2DM and also reduce the chance of complications in those with established T2DM. In five of the studies reviewed by Jeon, *et al.* [6] it was observed that there was a 30% diabetes reduction in those who had a regular brisk walk. This implies that moderate-intensity physical activity can reduce progression to diabetes even in those who do not lose weight. Jiang [7] concluded that various exercise modes improve insulin resistance and post prandial blood glucose levels. Physical activity can also act as an additional catalyst for other behaviour changes, proposing that people who exercise regularly also perform well academically, consume healthier diets and reduces smoking habits [8].

Nutritional strategies

Davis, *et al.* [9] found that extensive lifestyle intervention can result in long term success such as reduction in total energy intake for up to 9 years. According to Asif, *et al.* [10] increased consumption of vegetables, fruits, legumes, nuts, fish, cereals and oils, coupled with high ingestion of dietary fiber and low consumption of trans-fatty acids is likely to shield against T2DM. Tinker, *et al.* [11] observed in numerous studies that reduced consumption of fried food is not associated with increased incidence of diabetes, but rather it is the quality of the food that is important. Bhupathiraju, *et al.* [12] noticed high risk of T2DM by consuming foods with high glycemic index, independent of fiber content of that food. Similarly, Sales, *et al.* [13] demonstrated that some Mediterranean Diet rich in extra virgin olive oil are associated with lower risk of T2DM. Two cohort studies reported that individuals who consume diet low in antioxidants Vitamin E have a 3.9-fold increased risk of developing T2DM Salonen [14]. The evidence suggests that low glycemic index diet, with a higher monounsaturated fat to saturated fats ratio, is preventative against T2DM. In addition, Joosten, *et al.* [15] suggested that modest alcohol use lowers the risk of T2DM.

Behavior modulation and therapies

It is increasingly recognized that Diabetes Self-Management Education (DSME) is generally not sufficient for patients to maintain good diabetes self-management during a life time. ADA 2018 recommends both psychological and emotional care to be included in basic lifestyle management. Youngs, *et al.* [16] found in their study that group intervention along with Empowerment and Motivational Remedy has high quality effects on pre-diabetes. Participants in this study were motivated to make effective behavioural adjustment which reduces the risk of disease progression from pre-diabetes to T2DM. A study by DeJesus, *et al.* [17] showed that focused self-management training by Lifestyle coaches can be used as a diabetes prevention method to improve eating behavior and self-efficacy.

Weight-loss management

NICE Guideline 2017 recommends weight reduction as a constant requirement in pre-diabetic patients. A review by Dalahanty [18] revealed that a 5% to 10% weight loss is very efficient in preventing and treating diabetes and diabetes related co-morbidities. Berk, *et*

al. [19] recognized that weight loss achieved after intervention cannot be maintained even after group-based therapy. Hamman [20] states that a 16% diabetes risk reduction can be achieved with each kilogram of weight lost. Clifton [21] advocated using a high protein, low glycaemic index diet to achieve sustained weight reduction over a 12-month period. However, long-term evidence is limited. In a systematic review, Johansson, *et al.* [22] validated the positive role of weight loss medication after low energy diet plans to maintain this reduction.

Avoiding high risk behaviours

In a prospective cohort study, Jee, *et al.* [23] mentioned an association between smoking and occurrence of T2DM in comparison to those who never smoked. Tuovinen [24] stated that smoking promotes central obesity. Akter [25] supported those people who stopped smoking and suggested that there is no excessive risk of T2DM after having stopped smoking for 10 years or more. In a qualitative study by Boudec [26] there were no significant changes between smoking cessation and the occurrence of impaired fasting glucose.

Cullmann [27] demonstrated that alcohol bingeing is associated with elevated blood glucose levels. This implies that alcohol bingeing can place the individual with pre-diabetes at significantly high risk of progressing to T2DM.

Pharmacology

Knowler [28] observed that the impact of lifestyle modification has a longer lasting effect on the prevention of T2DM than Metformin [29]. Proved that some weight loss drugs such as orlistat in combination with lifestyle intervention, can protect obese individuals from developing T2DM. One trial using acarbose has proven 25% relative risk reduction of progression in to T2DM, while [30] observed that pioglitazone was associated with a reduction in the annual incidence of T2DM by 2.1% compared to placebo group. Some side-effects associated with the use of thiozolidinedione such as cardiac edema and boney fracture makes it unsuitable for use as a preventive therapy. Ho., *et al.* [31] linked testosterone deficiency, to the development of impaired glucose levels. Scheen AJ [32] reported that ACE/ARB'S is associated with improved insulin sensitivity and 25% risk reduction in the incidence of T2DM. Bariatric surgery, coupled with the use of drugs, also gives protection from T2DM [33].

Comparison of lifestyle and drugs interventions

A systematic review and meta- analysis of randomized controlled trials by [34] comparing pharmacological and lifestyle interventions showed that lifestyle intervention group such as those receiving advice on diet and exercise together was as effective as pharmacological interventions to reduce the risk of T2DM. Diet and exercise together seemed to be more effective than just diet or exercise on their own. The Diabetes Prevention Program (DPP) showed that lifestyle intervention group was more effective in reducing progression to diabetes than metformin. The result of the DPP is congruent with the findings from the Finnish Diabetes Prevention study (FDPS) which revealed that participants who received a 4 years intensive lifestyle intervention had an added benefit in relation to lower risk of T2DM obtained during 3 years with no support from healthcare providers. Another follow-up of lifestyle management studies shows that Intensive lifestyle management was successful in reducing diabetes incidence even after several years of follow-up, without any active intervention. Lifestyle intervention also led to a reduction in CVD mortality, which was not the case with pharmacological agents.

However, diet and exercise must be regularly underpinned to sustain lifestyle changes and the side effects of pharmacological therapy may preclude their long-term use.

Studies on the other hand regarding the use of drug such as Metformin, Orlistat and Acarbose in the prevention of T2DM were unable to demonstrate a long-term effect after these drugs were discontinued [35]. According to DPP, although Lifestyle intervention may be more expensive compared to Metformin or Placebo, it is more cost effective because it produces a better outcome compared with pharmacological intervention.

Conclusion

The latest studies have convincingly proven that lifestyle intervention is the best device for the prevention or delay of T2DM. A modest weight loss of 5-10% and moderate-intensity physical activity such as brisk walking for at least 150 minutes per week plays a crucial role in reducing the risk of developing diabetes. For very high-risk patients particularly obese individuals in whom lifestyle intervention alone has not produced target weight loss, metformin and orlistat has been highly recommended as adjunct therapy to exercise and diet. Acarbose may also confer a moderate risk reduction. However, none of these medicinal drugs are as effective in diabetes prevention as lifestyle intervention strategies. Cost-effective analyses suggest that greater financial burden is associated with the use of pharmacotherapy. It is evidence that supporting patients to make changes in their physical activity and dietary habits can prevent onset of T2DM.

Bibliography

1. X- PERT Health. "X-PERT prevention of diabetes (X-POD)" (2018).
2. Tawfik M. "The impact of health education intervention for prevention and early detection of type 2 diabetes mellitus in women with gestational diabetes". *Journal of Community Health* 42.3 (2017): 500-510.
3. Christie D., et al. "Maximizing Engagement, Motivation and long-term change in a structured intensive Education Program in Diabetes for children, Young people and their families: Child and Adolescent structured Competencies Approach to Diabetes Education". *BMC Pediatrics* 9 (2009): 57.
4. Lagisetty PA., et al. "Culturally targeted strategies for diabetes prevention in minority population: A Systematic Review and framework". *Diabetes Education* 43.1 (2017): 54-77.
5. Jadhav RA., et al. "Effect of physical Activity intervention in prediabetes: A Systematic Review and meta-analysis". *Journal of Physical Activity and Health* 14.9 (2017): 745-755.
6. Jeon CY., et al. "Physical Activity of Moderate intensity and Risk of type2 diabetes: A Systematic Review". *Diabetes Care* 30.3 (2007): 744-752.
7. Jiang JQ., et al. "Meta-analysis on influence of different exercise intervention modes to blood glucose related indexes of pre-diabetes". *Zhongguo Ying Yong Sheng Li Xue Za Zhi* 33.2 (2017): 189-192.
8. Archer T. "Epigenetic Changes induced by exercise". *Journal of Reward Deficiency Syndrome* 1.2 (2015): 71-74.
9. Davis NJ., et al. "Predictors of sustained reduction in energy and Fat intake in the Diabetes Prevention Program Outcomes Study intensive life style intervention". *Journal of the Academy of Nutrition and Dietetics* 113.11 (2013): 1455-1464.
10. Asif M. "The prevention and control of type-2 diabetes by changing lifestyle and dietary pattern". *Journal of Educational Health Promotion* 3.1 (2014): 1.
11. Tinker LF., et al. "Low fat dietary pattern and risk of treated diabetes mellitus in post-menopausal women: The Women Health Initiative randomized controlled dietary Modification trial". *Archives International Medicine* 168.14 (2008): 1500-1511.
12. Bhupathiraju SN., et al. "Glycemic Index, Glycemic Load and risk of Type 2 Diabetes: Results from 3 large US Cohorts and an updated meta-analysis". *The American Journal of Clinical Nutrition* 100.1 (2014): 218-232.
13. Salas SJ., et al. "Prevention of Diabetes with Mediterranean diets: A Subgroup Analysis of Randomized trial". *Annals International Medicine* 160.1 (2014): 1-10.

14. Salonen JT, *et al.* "Increased risk of Noninsulin dependent diabetes mellitus at low plasma Vitamin E concentration: A 4 year follow up study in Men". *British Medical Journal* 311.7013 (1995): 1124-1127.
15. Joosten MM, *et al.* "Moderate alcohol consumption increases insulin sensitivity and AdipoQ expression in postmenopausal women: A Randomized Crossover Trial". *Diabetologia* 51.8 (2008):1375-1381.
16. Youngs W, *et al.* "The impact of prediabetes diagnosis on behavior change: An integrative literature Review". *Practical Diabetes* (2016).
17. DeJesus RS, *et al.* "Impact of a 12-week wellness coaching on self-care behavior among Primary Care adult patients with Prediabetes". *Preventive Medicine Reports* 10 (2018): 100-105.
18. Delahanty LM. "Weight loss in the prevention and treatment of diabetes". *Preventive Medicine* 104 (2017): 120-123.
19. Berk K, *et al.* "Group Cognitive behavioral Therapy and weight regain after diet in type2 Diabetes: Results from the Randomized Controlled POWER trial". *Diabetologia Springer Link* 61.4 (2018): 790-799.
20. Hamman RF, *et al.* "Effect of weight loss with lifestyle intervention on risk of diabetes". *Diabetes Care* 29.9 (2006): 2102-2107.
21. Clifton P. "Assessing the evidence for weight loss strategies in people with and without type2 Diabetes". *World Journal of Diabetes* 8.10 (2017): 440-454.
22. Johansson K, *et al.* "Effects of Anti-obesity drugs, diet and exercise on weight loss-maintenance after very-low calorie diet or low-calorie diet: A Systematic Review and Meta-analysis of randomized controlled Trials". *American Journal of Clinical Nutrition* 99.1 (2014): 14-23.
23. Jee SH, *et al.* "Smoking and Risk for diabetes incidence and Mortality in Korean Men and Women". *Diabetes Care* 33.12 (2010): 2567-2572.
24. Tuovinen EL, *et al.* "Smoking status and abdominal obesity among normal- and overweight/obese adults: Population- based FINRISK study". *Preventive Medicine Reports* 4 (2016): 324-330.
25. Akter S, *et al.* "Smoking, smoking Cessation and the risk of type 2 diabetes among Japanese Adults: Japan Epidemiology Collaboration on Occupational Health Study". *PLoS One* 10.7 (2015): e0132166.
26. Boudec JL, *et al.* "Smoking cessation and the incidence of prediabetes and type 2 diabetes: A Cohort study". *Journal of Diabetes and Its Complications* 30.1 (2015): 43-48.
27. Cullmann M, *et al.* "Alcohol consumption and risk of pre-diabetes and type 2 diabetes development in Swedish population". *Diabetes Medicine* 29.4 (2012): 441-452.
28. Knowler WC, *et al.* "Reduction in the incidence of type 2 diabetes with lifestyle intervention or Metformin". *New England Journal of Medicine* 346.6 (2002): 393-403.
29. Torgerson JS, *et al.* "Xenical in the prevention of diabetes in Obese subjects (XENDOS) Study: A Randomized study of Orlistat as an Adjunct to lifestyle changes for the prevention of type2 diabetes in Obese patients". *Diabetes Care* 27.1 (2004):155-161.
30. DeFronzo RA, *et al.* "Pioglitazone for Diabetes Prevention in Impaired Glucose Tolerance". *New England Journal of Medicine* 364.12 (2011):1104-1115.
31. Ho CH, *et al.* "Prediabetes is associated with an increased risk of Testosterone deficiency, Independent of Obesity and Metabolic syndrome". *PLoS One* 8.9 (2013): e74173.

32. Scheen AJ. "Prevention of Type2 diabetes mellitus through inhibition of Renin Angiotensin System". *Drugs* 64.22 (2004): 2537-2565.
33. Carlsson LM., *et al.* "Bariatric Surgery and prevention of type 2 Diabetes in Swedish Obese Subjects". *New England Journal of Medicine* 367.8 (2012): 695-704.
34. Gillies C., *et al.* "Pharmacological and lifestyle interventions to prevent or delay type 2 diabetes in people with impaired glucose tolerance: systematic review and meta-analysis". *British Medical Journal* (2007):1-9.
35. Ramachandran A and Snehalatha C. "Diabetes prevention programs". *Medical Clinics of North America* 95.2 (2011): 353-372.

Volume 4 Issue 1 January 2020

©All rights reserved by Rajesh Jain., *et al.*