

Effect Of Diet Counselling And Lifestyle Modification On Anthropometric, Glycaemic Outcomes And Diabetic Complications Among Adults With Type 2 Diabetes Mellitus: A Pilot Study

Jyothi N., Vanitha Reddy P.*

Department of Nutrition and Dietetics, JSS Academy of Higher Education and Research, Mysuru-570004

ABSTRACT

Type 2 Diabetes Mellitus (T2DM) is a chronic metabolic disorder characterized by persistent hyperglycaemia and an increased risk of microvascular and macrovascular complications. Alongside pharmacological therapy, individualized diet counselling and lifestyle modification are integral to effective diabetes management and improved glycaemic outcomes. This prospective pilot interventional study aimed to determine the prevalence of chronic diabetic complications among adults with T2DM and evaluate the impact of individualized diet counselling and lifestyle modification on anthropometric and glycaemic parameters. Thirty adults aged 40–70 years with T2DM were recruited remotely through freelancing and followed for three months. Participants received individualized nutrition counselling and guidance on lifestyle modifications, including healthy diet practices and physical activity. Anthropometric measures comprising body weight, body mass index (BMI), and waist circumference, together with biochemical parameters including glycated haemoglobin (HbA1c), fasting blood sugar (FBS), and postprandial blood sugar (PPBS), were assessed at baseline and after the intervention. Data were analysed using paired *t*-tests, with $p < 0.05$ considered statistically significant. Peripheral neuropathy was the most prevalent chronic complication (73.3%), followed by diabetic retinopathy (40.0%) and nephropathy (23.3%). Following the intervention, significant reductions were observed in body weight, BMI, waist circumference, HbA1c ($8.56 \pm 1.55\%$ to $7.22 \pm 1.64\%$), FBS (160.67 ± 60.72 mg/dL to 120.27 ± 47.37 mg/dL), and PPBS (197.43 ± 43.79 mg/dL to 158.63 ± 45.26 mg/dL) (all $p < 0.001$). These findings indicate that individualized diet counselling combined with lifestyle modification can substantially improve anthropometric indices and glycaemic control in adults with T2DM.

Keywords: Type 2 Diabetes Mellitus, Diet counselling, Lifestyle Modification, Glycaemic Control, HbA1c.

INTRODUCTION

Type 2 Diabetes Mellitus (T2DM) is a chronic metabolic disorder characterised by persistent hyperglycaemia resulting from impaired insulin secretion, insulin resistance, or a combination of both. It accounts for approximately 90–95% of all diabetes cases worldwide and is one of the leading causes of morbidity and premature mortality due to its associated microvascular and macrovascular complications. [1,2]

The global prevalence of T2DM has increased substantially over the past few decades owing to population ageing, urbanisation, sedentary lifestyles, unhealthy diet patterns, and the growing burden of overweight and obesity. This increasing prevalence

has placed considerable pressure on healthcare systems, particularly in low- and middle-income countries such as India, where diabetes has emerged as a major public health challenge. Poor glycaemic control contributes to progressive vascular damage, leading to diabetic neuropathy, retinopathy, nephropathy, cardiovascular disease, and reduced quality of life. Early detection of diabetic retinopathy remains a major challenge in resource-limited settings, and opportunistic screening strategies, such as integrating retinopathy screening into cataract outreach services, have been shown to improve case detection among underserved populations in India. [3] Early identification and effective management of hyperglycaemia are therefore essential to delay disease progression and prevent complications. [1,2]

Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Lifestyle modification remains the cornerstone of Type 2 Diabetes Mellitus management. Individualized diet counselling, regular physical activity, weight management, and behavioural counselling have consistently been shown to improve glycaemic control, reduce insulin resistance, and lower the risk of diabetes-related complications. Diet counselling delivered by trained healthcare professionals promotes healthier food choices, improved diet quality, and sustainable behavioural changes that contribute to better metabolic outcomes. Current recommendations emphasise healthy diet patterns rich in whole grains, fruits, vegetables, legumes, and high-quality protein while reducing the intake of refined carbohydrates and energy-dense foods rather than focusing on individual nutrients alone.

Regular physical activity complements diet management by enhancing insulin sensitivity, increasing skeletal muscle glucose uptake, facilitating weight reduction, and improving overall metabolic health. Evidence from systematic reviews and randomised controlled trials indicates that structured exercise programmes combined with diet interventions significantly improve HbA1c and other metabolic outcomes in adults with T2DM compared with usual care.^[4,5]

Despite the well-established benefits of lifestyle modification, many individuals with T2DM continue to experience poor glycaemic control due to inadequate diet adherence, physical inactivity, and limited awareness regarding diabetes self-management. Furthermore, data evaluating the effectiveness of structured diet counselling and lifestyle interventions in routine clinical settings, particularly among Indian populations, remain limited. Therefore, the present pilot study was undertaken to determine the prevalence of chronic complications among adults with T2DM and to evaluate the effect of individualised diet counselling and lifestyle modification on anthropometric and glycaemic parameters over a three-month period.

METHODOLOGY

Study Design

This prospective pilot interventional study was conducted to evaluate the prevalence of chronic

complications among individuals with Type 2 Diabetes Mellitus (T2DM) and to assess the effects of diet modifications and lifestyle interventions on anthropometric and glycaemic parameters over a three-month period from June to August.

Study Setting

The study was carried out among T2DM subjects residing in Andhra Pradesh, South India. Data collection and follow-up were conducted between June and August.

Study Population

A total of 30 adults diagnosed with Type 2 Diabetes Mellitus were enrolled in the study. Both male and female participants aged between 40 and 70 years were included.

Inclusion Criteria

- Diagnosed cases of Type 2 Diabetes Mellitus.
- Duration of diabetes between 5 and 10 years.
- Age between 40 and 70 years.
- Willingness to participate and provide informed consent.
- Availability for follow-up assessments after three months.

Exclusion Criteria

- Type 1 Diabetes Mellitus.
- Gestational diabetes.
- Severe hepatic, renal, cardiovascular, or malignant disease.
- Individuals unable to comply with diet and lifestyle recommendations.
- Participants with incomplete baseline or follow-up data.

Data Collection

Baseline information was collected using a structured questionnaire. Information regarding demographic characteristics, diabetes duration, family history,

lifestyle habits, diet practices, symptoms, and diabetic complications was obtained.

Anthropometric Assessment

Anthropometric measurements included body weight (kg), height (cm), body mass index (BMI, kg/m²), and waist circumference (cm). Measurements were obtained at baseline and after three months of intervention.

Biochemical Assessment

The biochemical parameters assessed included glycated haemoglobin (HbA1c), fasting blood sugar (FBS), and postprandial blood sugar (PPBS). Baseline and post-intervention values were recorded from laboratory reports.

Diet and Lifestyle Intervention

Participants received individualized diet counselling tailored to the nutritional requirements of adults with Type 2 Diabetes Mellitus. Diet counselling focused on promoting healthy eating habits and improving diet quality through practical and sustainable diet modifications. The diet recommendations emphasised:

- Reduction in the consumption of refined carbohydrates and sugar-rich foods.
- Increased intake of diet fibre through vegetables, fruits, legumes, and whole grains.
- Adequate consumption of high-quality protein sources.
- Portion control and balanced meal planning.
- Adoption of low glycaemic index food choices whenever possible.

Lifestyle counselling focused on increasing physical activity and improving diabetes self-management practices. Participants were encouraged to:

- Engage in at least 20–30 minutes of moderate-intensity walking daily.
- Perform regular physical activity as per individual tolerance and medical advice.
- Follow meal sequencing practices, consuming fibre-rich foods and protein sources before carbohydrate-rich foods during meals.
- Maintain regular monitoring of blood glucose levels and body weight.
- Adhere to prescribed medications and routine medical follow-up.

Diet counselling and lifestyle recommendations were reinforced during follow-up interactions throughout the three-month study period.

Outcome Measures

Primary outcomes included changes in HbA1c, fasting blood sugar, and postprandial blood sugar levels.

Secondary outcomes included changes in body weight, BMI, and waist circumference, as well as the prevalence of diabetic complications.

Statistical Analysis

Data were analysed using JASP version 0.19.0.0. Continuous variables were expressed as mean $\pm$ standard deviation (SD), and categorical variables as frequencies and percentages. Pre- and post-intervention changes in anthropometric and biochemical parameters were assessed using paired t-tests. A p-value <0.05 was considered statistically significant.

RESULTS

Parameters	n=30	Mean	SD	t	p
Weight (Pre)	30	78.600	12.555	15.300	< 0.001
Weight (Post)	30	70.447	12.684		

BMI (Pre)	30	28.119	4.909	12.642	< 0.001
BMI (Post)	30	25.138	4.497		
Waist (Pre)	30	102.467	7.833	19.644	< 0.001
Waist (Post)	30	89.687	7.179		

Table 1- Anthropometric Values

Table 1 presents the changes in anthropometric parameters before and after the three-month diet and lifestyle intervention. The mean body weight decreased significantly from 78.60 ± 12.56 kg at baseline to 70.45 ± 12.68 kg after the intervention ($p < 0.001$). Similarly, the mean body mass index (BMI)

reduced from 28.12 ± 4.91 kg/m² to 25.14 ± 4.50 kg/m² ($p < 0.001$). Waist circumference also showed a significant reduction from 102.47 ± 7.83 cm to 89.69 ± 7.18 cm ($p < 0.001$), indicating improvements in overall adiposity following the intervention.

Variables	n=30	Mean	SD	P Value	Coefficient of variation	Cohen's d
HbA1c (Pre)	30	8.560	1.546	< 0.001	0.181	0.942
HbA1c (Post)	30	7.217	1.641		0.227	
FBS (Pre)	30	160.667	60.718	< 0.001	0.378	0.657
FBS (Post)	30	120.267	47.369		0.394	
PPBS (Pre)	30	197.433	43.787	< 0.001	0.222	0.917
PPBS (Post)	30	158.633	45.263		0.285	

Table 2- Pre And Post Glucose Changes

Table 2 summarises the pre- and post-intervention glycaemic parameters. The mean HbA1c decreased significantly from $8.56 \pm 1.55\%$ at baseline to $7.22 \pm 1.64\%$ after three months ($p < 0.001$). Likewise, fasting blood sugar (FBS) declined from 160.67 ± 60.72 mg/dL to 120.27 ± 47.37 mg/dL ($p < 0.001$),

while postprandial blood sugar (PPBS) decreased from 197.43 ± 43.79 mg/dL to 158.63 ± 45.26 mg/dL ($p < 0.001$). These findings indicate significant improvements in glycaemic control following the diet and lifestyle intervention.

Variables	Frequency (n=30)	Percentage (%)
Neuropathy	22	73.3
Nephropathy	7	23.3
Retinopathy	12	40

Table 3- Prevalence of type 2 Diabetes with chronic complications in subjects

The prevalence of chronic diabetic complications among the study participants is presented in Table 3. Peripheral neuropathy was the most frequently

reported complication, affecting 73.3% of participants (22/30), followed by diabetic retinopathy in 40.0% (12/30) and diabetic nephropathy in 23.3% (7/30).

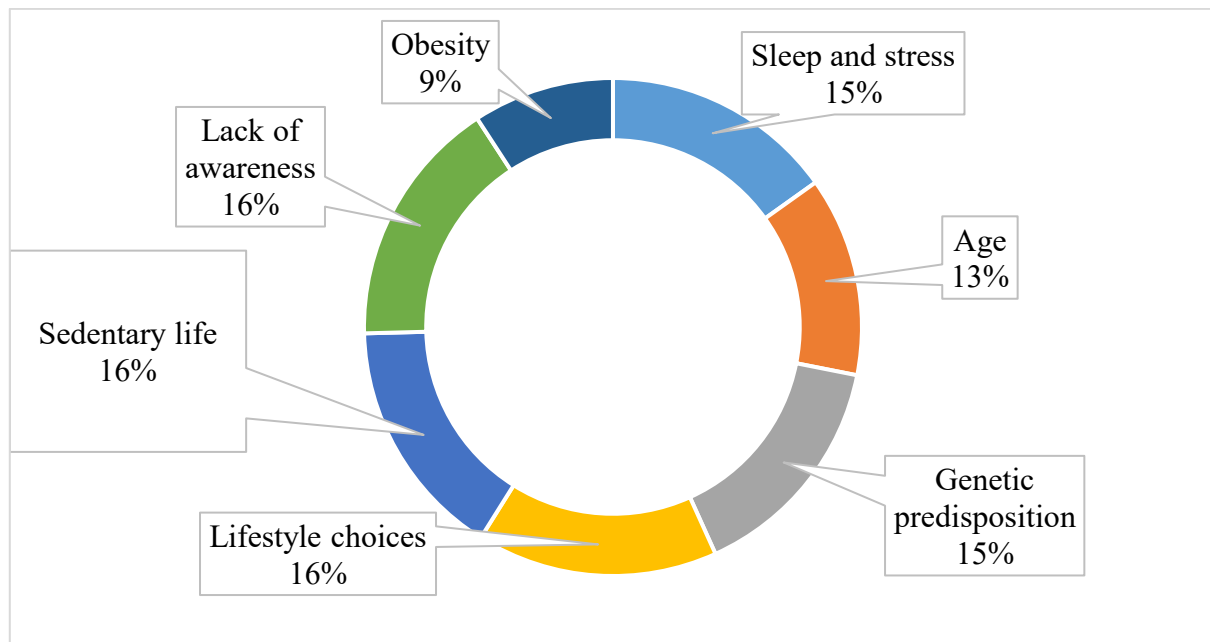


Figure 1- Aetiological Factors of Type 2 Diabetic Subjects.

Figure 1 illustrates the distribution of major aetiological factors reported by the study participants. Lifestyle-related factors, including unhealthy lifestyle practices, sedentary behaviour, and lack of awareness regarding diabetes management, were the most commonly reported contributors, each accounting for approximately 16% of responses. Genetic predisposition and sleep or stress-related factors each contributed 15%, whereas age accounted for 13% and obesity represented the least frequently reported factor (9%).

DISCUSSION

This pilot study evaluated the effect of diet counselling and lifestyle modification on anthropometric and glycaemic parameters among adults with Type 2 Diabetes Mellitus (T2DM). The findings demonstrated significant improvements in body weight, body mass index (BMI), waist circumference, glycated haemoglobin (HbA1c), fasting blood sugar (FBS), and postprandial blood sugar (PPBS) following a three-month intervention. In addition, peripheral neuropathy was the most prevalent diabetic complication among the participants, followed by diabetic retinopathy and nephropathy.

The significant reductions in body weight, BMI, and waist circumference observed in the present study suggest that individualised diet counselling combined with increased physical activity can effectively improve anthropometric outcomes in individuals with T2DM. Weight reduction is a cornerstone of diabetes management because even modest weight loss improves insulin sensitivity, decreases insulin resistance, and reduces cardiometabolic risk. Similar findings have been reported by Pavithran et al., who demonstrated that a low-glycaemic index South Indian diet pattern significantly reduced body weight, waist circumference, and cardiovascular risk factors among adults with T2DM. Likewise, the American Diabetes Association (ADA) emphasises that lifestyle modification incorporating healthy eating patterns and regular physical activity remains the first-line strategy for weight management and metabolic control in people with T2DM.^[6]

The present study also demonstrated a significant reduction in HbA1c, fasting blood glucose, and postprandial blood glucose after three months of intervention. These findings indicate improved glycaemic control following diet modification and lifestyle counselling. Individualized diet counselling has been shown to improve glycaemic outcomes by

encouraging healthier diet choices, improving diet quality, promoting energy balance, and enhancing insulin sensitivity. The ADA recommends individualised diet counselling as an essential component of diabetes management and reports that structured nutrition interventions can reduce HbA1c by approximately 0.5–2.0%, depending on baseline glycaemic status and adherence. Similar improvements have been reported in systematic reviews evaluating low-glycaemic index diets, Mediterranean diet patterns, and carbohydrate-modified diets among adults with T2DM.^[7]

Regular physical activity is another key component of diabetes management. Participants in the present study were encouraged to engage in daily walking and adopt healthier lifestyle practices, which may have contributed to improved glucose utilisation and insulin sensitivity. Aerobic exercise enhances skeletal muscle glucose uptake through insulin-dependent and insulin-independent pathways while reducing visceral adiposity. The joint position statement from the American College of Sports Medicine and the American Diabetes Association recommends at least 150 minutes of moderate-intensity physical activity per week to improve glycaemic control and reduce diabetes-related complications.^[4] These recommendations are consistent with the improvements observed in the present study.

Peripheral neuropathy was the most frequently observed diabetic complication, followed by diabetic retinopathy and nephropathy. The burden of diabetic retinopathy observed in the present study is consistent with findings from community-based screening conducted in semi-urban and rural India, where opportunistic screening during cataract camps facilitated early identification of previously undiagnosed cases of diabetic retinopathy, emphasising the importance of integrating retinal screening into routine diabetes care.^[3] This distribution is comparable with previous epidemiological studies conducted in India, which have reported diabetic neuropathy as one of the earliest and most common microvascular complications associated with prolonged hyperglycaemia. Chronic exposure to elevated blood glucose results in oxidative stress, inflammation, and microvascular damage that contribute to progressive nerve injury. Poor glycaemic control remains one of

the strongest predictors for the development of microvascular complications, highlighting the importance of early diagnosis and sustained metabolic control.^[8,2]

Lifestyle-related factors, including physical inactivity, unhealthy diet habits, and inadequate awareness regarding diabetes management, were commonly reported among the study participants. These findings support previous evidence indicating that rapid urbanisation, sedentary behaviour, unhealthy diet transitions, and obesity are major contributors to the increasing prevalence of T2DM in India. Education regarding healthy eating, regular physical activity, and self-management remains fundamental for achieving long-term glycaemic control and reducing diabetes-related complications.^[9]

The present study has several strengths. It evaluated both anthropometric and biochemical outcomes following a structured diet and lifestyle intervention and assessed the prevalence of chronic diabetic complications within the study population. However, several limitations should be acknowledged. The study included a relatively small sample size, lacked a control group, and had a short follow-up period of three months, which limits the generalizability of the findings. Diet adherence and physical activity were assessed through participant counselling rather than objective monitoring, and potential confounding factors such as medication adherence and changes in pharmacological therapy were not evaluated. Therefore, larger randomised controlled trials with longer follow-up periods are warranted to confirm these findings and establish the long-term effectiveness of lifestyle-based interventions in individuals with T2DM.

CONCLUSION

This pilot study demonstrated that individualised diet counselling and lifestyle modification significantly improved anthropometric parameters and glycaemic control among adults with Type 2 Diabetes Mellitus over a three-month period. The findings highlight the importance of individualized diet counselling and regular physical activity as key components of diabetes management. However, given the small sample size and short follow-up period, larger

controlled studies are needed to confirm these findings and evaluate the long-term effectiveness of such interventions.

REFERENCES

1. Goyal R, Singhal M, Jialal I. Type 2 diabetes. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2026 Jan-. Updated 2023 Jun 23. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK513253>.
2. Zheng Y, Ley SH, Hu FB. Global aetiology and epidemiology of type 2 diabetes mellitus and its complications. *Nat Rev Endocrinol*. 2018;14(2):88-98. doi:10.1038/nrendo.2017.151.
3. Akanth KR, Padmaraj G, Suhas S, Nagesha CK, Firdose AI. Integrating diabetic retinopathy screening into cataract camps: a cross-sectional study from semi-urban and rural India. *Acta Sci Ophthalmol*. 2025;8(8):2-9. doi:10.31080/ASOP.2025.08.0855.
4. 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):2065-79. doi:10.2337/dc16-1728.
5. Rosenfeld RM, Grega ML, Gulati M. Lifestyle interventions for treatment and remission of type 2 diabetes and prediabetes in adults: implications for clinicians. *Am J Lifestyle Med*. 2025;19(7):964-996. doi:10.1177/15598276251325802.
6. American Diabetes Association Professional Practice Committee. Diagnosis and classification of diabetes: Standards of Care in Diabetes—2025. *Diabetes Care*. 2025;48(Suppl 1):S27-S49. doi:10.2337/dc25-S002
7. Ajala O, English P, Pinkney J. Systematic review and meta-analysis of different diet approaches to the management of type 2 diabetes. *Am J Clin Nutr*. 2013;97(3):505-16. doi:10.3945/ajcn.112.042457..
8. Pradeepa R, Mohan V. Epidemiology of type 2 diabetes in India. *Indian J Ophthalmol*. 2021;69(11):2932-8. doi:10.4103/ijo.IJO_1627_21.
9. Ismail L, Materwala H, Al Kaabi J. Association of risk factors with type 2 diabetes: a systematic review. *Comput Struct Biotechnol J*. 2021;19:1759-85. doi:10.1016/j.csbj.2021.03.003.

HOW TO CITE: Jyothi N., Vanitha Reddy P.*, Effect Of Diet Counselling And Lifestyle Modification On Anthropometric, Glycaemic Outcomes And Diabetic Complications Among Adults With Type 2 Diabetes Mellitus: A Pilot Study, *Int. J. Sci. R. Tech.*, 2026, 3 (7), 297-303. <https://doi.org/10.5281/zenodo.21333241>