Original Article

Life Style Modification among Diabetic Patients in Bangladesh — A Single Centre Hospital-Based Study

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ABSTRACT

Introduction: *Diabetes Mellitus Type 2 (T2DM) is a global health concern, with a rising prevalence in developing countries like Bangladesh. Lifestyle modifications play a crucial role in managing T2DM, impacting various clinical parameters and overall patient well-being.* ***Methods & Materials:*** *A total of 85 patients diagnosed with T2DM at the outpatient department of Satkhira Medical College and Hospital, Satkhira, Bangladesh, were included in this study. Participants were followed up at 2 months post-intervention, with lifestyle and dietary modifications being the primary focus.* ***Results:*** *In our study with 85 participants, predominantly male (68.24%), we observed significant clinical improvements following lifestyle interventions. The average age was 42.14±12years, and the initial BMI was 28.71±5. Key findings include a substantial decrease in fasting plasma glucose from 137.42 mg/dL to 129.42 mg/dL ($p<0.001$) and a reduction in 2-hour postprandial glucose from 215.35 mg/dL to 187.74 mg/dL ($p<0.001$). The mean HbA1c level improved from 8.13% to 7.24%. Lipid profiles showed favourable changes, with total cholesterol decreasing to 5.37 mmol/L, LDL-C to 3.21 mmol/L, and triglycerides to 1.67 mmol/L, while HDL-C slightly increased to 1.04 mmol/L. Serum creatinine levels also decreased to 1.72 mg/dL ($p=0.007$)—notably, smoking and alcohol consumption among participants reduced to 21.18% and*

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1.18%, respectively. ***Conclusion:*** *The study highlights the positive impact of lifestyle and dietary modifications in managing T2DM, particularly in reducing key metabolic parameters. The findings underscore the need for personalized diabetes management strategies and the importance of lifestyle interventions in improving clinical outcomes.*

Keywords: *Lifestyle Modifications, Dietary Changes, Diabetes Mellitus, Metabolic Parameters*

INTRODUCTION

Type 2 Diabetes Mellitus (T2DM) stands as a formidable challenge in global health, with its prevalence reaching alarming levels, particularly in Asia. Globally, the number of people with diabetes has risen from 108 million in 1980 to 422 million in 2014, with the prevalence of diabetes among adults over 18 years of age rising from 4.7% to 8.5% during the same period[1,2]. In Asia, the prevalence of T2DM has been escalating rapidly, with studies indicating a significant increase in both urban and rural areas[3]. In Bangladesh, the situation is particularly concerning. A recent study revealed that the prevalence of diabetes among adults in Bangladesh had undergone notable changes, with a significant increase observed between two cross-sectional surveys[4]. This rise in diabetes prevalence underscores the urgency of addressing this public health issue in the country. T2DM is characterized by insulin resistance and an inability of the pancreas to produce enough insulin. Its pathophysiology involves a complex interplay of genetic, environmental, and lifestyle factors[5]. Common risk factors include obesity, sedentary lifestyle, and poor dietary habits, which are increasingly prevalent in modern societies[6]. The disease's impact on health is profound, leading to complications such as cardiovascular disease, kidney failure, and vision loss. The progression of T2DM is typically marked by worsening glycemic control and the development of various complications over time[7]. Lifestyle modifications play a critical role in the management of T2DM. Dietary changes, physical activity, and medication adherence are key components of effective diabetes management. A study highlighted the long-term benefits of lifestyle interventions in reducing the incidence of diabetes among individuals with impaired glucose tolerance, demonstrating a 58% reduction in the incidence of diabetes over a 20-year period[8]. Few other studies emphasized the importance of health education counseling on lifestyle in patients with diabetes mellitus, showing significant improvements in glucose levels following lifestyle interventions[9-10]. However, managing diabetes in developing countries like Bangladesh presents unique challenges. Limited healthcare accessibility, cultural factors, and economic constraints often impede effective diabetes care. In many developing countries, the healthcare systems are not adequately equipped to handle the growing burden of chronic diseases like diabetes[11]. Cultural dietary practices and lack of awareness further complicate diabetes management in these settings. Despite these challenges, there are significant opportunities for improving diabetes care through lifestyle modifications in Bangladesh. Tailored health education programs and

community-based interventions can play a crucial role in promoting healthy lifestyle choices among diabetic patients. A study conducted in Bangladesh emphasized the need for health education programs for diabetics and the general population, highlighting the combination of diet, discipline, and drugs in managing diabetic patients[12]. The gap in research concerning the effectiveness of lifestyle modifications among diabetic patients in Bangladesh is evident. While global studies provide insights into T2DM management, localized research is crucial for understanding the specific needs and challenges faced by the Bangladeshi population. This study aims to address this gap by focusing on lifestyle modifications among diabetic patients in a single center in Bangladesh. It seeks to understand the impact of dietary changes, physical activity, and medication adherence on the health outcomes of these patients, providing valuable insights into the effectiveness of these interventions in a local setting.

METHODS & MATERIALS

This prospective interventional study, focusing on patients with an incidental diagnosis of type 2 diabetes mellitus (T2DM), was conducted at the outpatient department of Satkhira Medical College and Hospital, Satkhira, Bangladesh from August, 2023 to January 2023, during which a total of 85 patients were enrolled. Participants were selected based on specific inclusion criteria: adults aged 18 years or older, incidentally diagnosed with T2DM during their visit to the outpatient department were recruited in this study. Patients with a history of any other type of diabetes, pregnant women, and those with significant comorbid conditions that could interfere with the study outcomes were excluded. Upon confirmation of T2DM, each patient was managed according to their individual needs. The management strategies varied from dose regulation, dietary and lifestyle changes alone to a combination of these changes with insulin and oral medications. The lifestyle modifications included dietary advice, physical activity recommendations, and education on the importance of medication adherence. The follow-up period for each patient was set at two months' after diagnosis. During this period, patients were monitored for any positive or negative changes in their health status. The primary outcomes measured were changes in glycemic control, indicated by fasting blood glucose and HbA1c levels, and secondary outcomes included changes in body weight, blood pressure, and lipid profiles. Data collection was carried out using a structured questionnaire. The questionnaire included demographic information, medical history, details of lifestyle modifications advised, and adherence to these modifications. Medical records provided objective data on clinical outcomes. Statistical analysis was performed using appropriate statistical software. Descriptive statistics were used to summarize demographic and clinical characteristics. The impact of lifestyle modifications on health outcomes was analyzed using inferential statistics, with significance set at a p-value of less than 0.05.

RESULTS

Table I displays the baseline characteristics distribution of the participants, with a total of 85 individuals included in the study. The mean age of the participants was 42.14± 12. In terms of

body mass index (BMI), the average was found to be 28.71±5. Fasting plasma glucose levels averaged at 137.42 mg/dL, while 2-hour postprandial glucose (PPG) levels were notably higher, averaging at 215.35 mg/dL. The mean HbA1c level, a key indicator of long-term glucose control, was 8.13± 2.14%. Lipid profile parameters were also assessed, revealing a mean total cholesterol level of 6.18 mmol/L, HDL-C (high-density lipoprotein cholesterol) at 1.02 mmol/L, LDL-C (low-density lipoprotein cholesterol) at 3.57 mmol/L, and triglycerides at 1.81 mmol/L. Additionally, the mean serum creatinine level was recorded at 2.12 mg/dL.

Table I: Baseline characteristics distribution of the participants (*n*=85)

Baseline Characteristics	Mean±SD
Age	42.14±12
BMI	28.71±5
Fasting Plasma Glucose (mg/dL)	137.42±3.51
2h PPG (mg/dL)	215.35±5.28
HbA1c (%)	8.13±2.14
Total Cholesterol (mmol/L)	6.18±0.72
HDL-C (mmol/L)	1.02±0.41
LDL-C (mmol/L)	3.57±0.21
Triglycerides (mmol/L)	1.81±0.44
Serum Creatinine (mg/dL)	2.12±0.68

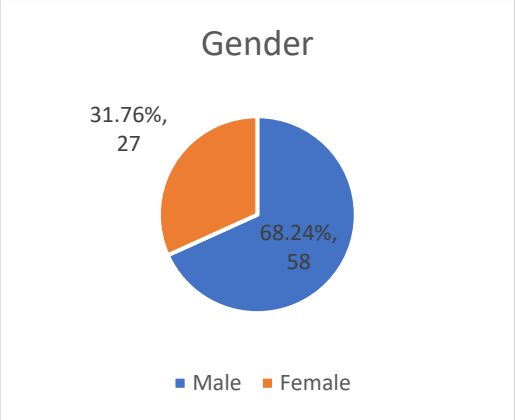

Figure 1: Gender distribution of the study population (*n*=85).

Figure 1 illustrates the gender distribution of the study population, consisting of a total of 85 participants. Among them, 58 individuals identified as male, comprising 68.24% of the total population, while 27 individuals identified as female, constituting 31.76%.

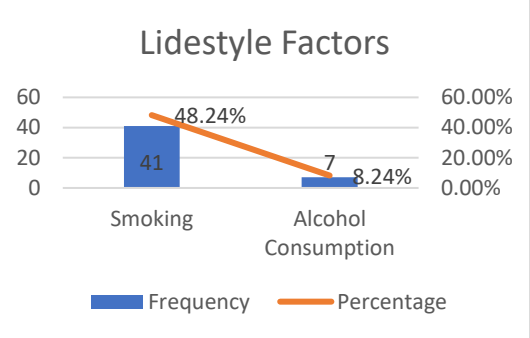

Figure 2: Lifestyle factors of the study population (*n*=85)

Figure 2 depicts the lifestyle factors observed within the study population, comprising a total of 85 participants. Among the participants, 41 individuals reported smoking, representing 48.24% of the total population. Additionally, a smaller proportion, consisting of 7 individuals, reported alcohol consumption, accounting for 8.24%.

Table II presents the adherence levels to lifestyle and dietary modifications among the study population at the 2-month follow-up, encompassing a total of 85 participants. The majority of participants, comprising 62 individuals, demonstrated strict adherence to the prescribed lifestyle and dietary modifications, representing 72.94% of the total population. Additionally, 19 individuals exhibited moderate adherence, accounting for 22.35%. A smaller subset of participants, consisting of 4 individuals, displayed mild adherence, constituting 4.71%.

Table II: Adherence to lifestyle and dietary modifications at 2-month follow-up (*n*=85).

Adherence	Frequency	Percentage
Strict Adherence	62	72.94%
Moderate Adherence	19	22.35%
Mild Adherence	4	4.71%

Table III presents the clinical and metabolic characteristics observed after the 2-month follow-up period among the study population, consisting of 85 participants. The mean BMI (body mass index) decreased to 27.14 with a standard deviation of 2.97 compared to baseline measurements. Fasting plasma glucose levels also exhibited a reduction, with a mean of 129.42 mg/dL and a standard deviation of 5.18. Similarly, the 2-hour postprandial glucose (PPG) levels decreased to a mean of 187.74 mg/dL with a standard deviation of 11.24. Notably, there was a decrease in the mean HbA1c level to 7.24%, indicating improved glycemic control over the follow-up period. Furthermore, favorable changes were observed in lipid profile parameters, including reductions in total cholesterol (mean: 5.37 mmol/L), LDL-C (mean: 3.21 mmol/L), and triglycerides (mean: 1.67 mmol/L), while HDL-C levels slightly increased (mean: 1.04 mmol/L). Moreover, the mean serum creatinine level decreased to 1.72 mg/dL, suggesting potential improvements in renal function. In terms of lifestyle factors, the proportion of participants reporting smoking decreased to 18 individuals (21.18%), and there was an observable decrease in alcohol consumption, with only 1 individual (1.18%) reporting such behavior.

Table III: Clinical and metabolic characteristics at after 2-month follow-up (N=85)

Variables	Mean±SD
BMI	27.14±2.97
Fasting Plasma Glucose (mg/dL)	129.42±5.18
2h PPG (mg/dL)	187.74±11.24
HbA1c (%)	7.24±1.85
Total Cholesterol (mmol/L)	5.37±0.51
HDL-C (mmol/L)	1.04±0.14
LDL-C (mmol/L)	3.21±.08
Triglycerides (mmol/L)	1.67±0.19
Serum Creatinine (mg/dL)	1.72±0.37
Smoking	18 (21.18%)
Alcohol Consumption	1 (1.18%)

Table IV summarizes the changes in metabolic parameters observed among the participants over the 2-month follow-up period, based on baseline and 2-month

mean values with their respective standard deviations. The mean BMI (body mass index) decreased from 28.71±4.28 at baseline to 27.14±2.97 at 2 months, reflecting a reduction of 1.57 units, although this change was not statistically significant (p=0.105). There was a significant reduction in fasting plasma glucose levels from 137.42±3.51 mg/dL at baseline to 129.42±5.18 mg/dL at 2 months, representing a decrease of 8 mg/dL (p<0.001). Similarly, the mean 2-hour postprandial glucose (PPG) levels significantly decreased from 215.35±5.28 mg/dL to 187.74±11.24 mg/dL, showing a reduction of 27.61 mg/dL (p<0.001). Although not statistically significant, there was a trend towards a decrease in the mean HbA1c level from 8.13±2.14% to 7.24±1.85%, with a difference of 0.89% (p=0.09). Notably, significant reductions were observed in total cholesterol (mean difference: 0.81 mmol/L, p<0.001), LDL-C (mean difference: 0.36 mmol/L, p<0.001), and serum creatinine (mean difference: 0.4 mg/dL, p=0.007) levels. However, changes in HDL-C and triglycerides were not statistically significant (p=0.802 and p=0.118, respectively).

Table IV: Changes in metabolic parameters among participants (*n*=85)

Variables	Baseline Mean±SD	2-Months Mean±SD	Difference	Significance
BMI	28.71±4.28	27.14±2.97	1.57	0.105
Fasting Plasma Glucose (mg/dL)	137.42±3.51	129.42±5.18	8	0.001
2h PPG (mg/dL)	215.35±5.28	187.74±11.24	27.61	0.001
HbA1c (%)	8.13±2.14	7.24±1.85	0.89	0.09
Total Cholesterol (mmol/L)	6.18±0.72	5.37±0.51	0.81	0.001
HDL-C (mmol/L)	1.02±0.41	1.04±0.14	-0.02	0.802
LDL-C (mmol/L)	3.57±0.21	3.21±.08	0.36	0.001
Triglycerides (mmol/L)	1.81±0.44	1.67±0.19	0.14	0.118
Serum Creatinine (mg/dL)	2.12±0.68	1.72±0.37	0.4	0.007

DISCUSSION

The current study's exploration of lifestyle modifications among diabetic patients in Bangladesh reveals several critical findings, particularly when compared with existing literature. The baseline characteristics of our study population, including a mean age of 42.14 years and an average BMI of 28.71, align with global trends in diabetes demographics[13,14]. For instance, Delahanty et al. in their randomized controlled trial reported a mean age of 54.9 years and a BMI of 32.0, highlighting the typical profile of individuals affected by T2DM[15]. Our study observed a higher prevalence of males (68.24%) among the participants, which is consistent with the findings of Kautzky-Willer et al., who observed a similar trend in gender distribution, with a worldwide distribution of 17.7 million more men than women with diabetes[16]. Other studies have also supported this gender difference in prevalence[17].

At baseline, 48.24% of our participants reported smoking, and 8.24% reported alcohol consumption. These lifestyle factors are significant as they are known to exacerbate diabetes complications. Gupta et al., in their study on psychological aspects related to diabetes, emphasized the impact of lifestyle modifications on the quality of life and well-being of people with diabetes, although specific percentages regarding smoking and alcohol consumption were not provided[18]. The adherence to lifestyle modifications in our study was remarkably high, with 72.94% of participants showing strict adherence. This finding is crucial as it demonstrates the effectiveness of lifestyle interventions in diabetes management, a sentiment echoed by Giri et al., who emphasized the importance of diet and exercise in diabetes control. However, they did not provide specific adherence percentages in their study[19].

Our study's observation of significant clinical improvements post-intervention in diabetic patients is of significant importance in implementing proper lifestyle and dietary modification as a method of diabetes management. The mean Body Mass Index (BMI) in our study decreased to 27.14, contradicts the trend in Delahanty et al.'s study, where significant weight loss was achieved through lifestyle interventions[15]. This suggests that while BMI reduction is a common goal, its achievement can vary based on the intensity and nature of the interventions. In terms of glucose levels, our study showed significant reductions in fasting plasma glucose and 2-hour postprandial glucose levels, which is consistent with the findings of *Nabi et al.*[9]. They reported similar improvements in metabolic parameters following lifestyle modifications. This highlights the effectiveness of lifestyle changes in glycemic control, a critical aspect of diabetes management. The favorable changes in lipid profiles, including reductions in total cholesterol and LDL-C, and the decrease in serum creatinine levels in our study, are noteworthy. This emphasizes the importance of lifestyle modifications in improving lipid profiles and renal function. However, the lack of significant changes in HbA1c, HDL-C, and triglycerides in our study presents an intriguing aspect. These varying findings suggest that the impact of lifestyle changes on these parameters might require a longer duration to become evident. The significant decrease in smoking and alcohol consumption post-intervention in our study is a positive outcome, reflecting the effectiveness of health education and counseling. This is supported by the work of *Debono et al.*, who discussed the impact of lifestyle modifications on the quality of life and well-being of people with diabetes[20].

Limitations of the study:

The study was conducted in a short time duration with minimal follow-up and a small sample size, so the effect of lifestyle and dietary modification cannot be accurately represented in the current study.

Conclusion:

The current study provides valuable insights into the impact of lifestyle modifications on diabetic patients in Bangladesh, contributing to the broader understanding of diabetes management. The findings highlight the significance of lifestyle factors such as smoking and alcohol consumption, and their influence on diabetes complications. Notably, the

high adherence rate to lifestyle modifications among participants (72.94%) underscores the potential of such interventions in effectively managing diabetes. Despite the lack of statistically significant changes in BMI, fasting plasma glucose, and lipid profiles showed considerable improvement, indicating the positive effects of lifestyle changes on metabolic parameters. However, the absence of significant changes in HbA1c, HDL-C, and triglycerides suggests the need for a longer duration to observe substantial improvements in these areas. The reduction in smoking and alcohol consumption post-intervention further emphasizes the role of health education and counseling in promoting healthier lifestyles among diabetic patients.

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