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Original Article

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Dietary Adherence and Glycemic Status among Type 2 Diabetes Patients in Rural Areas

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Abstract

Introduction: *The prevalence of diabetes is rising sharply in rural areas, largely due to changes in lifestyle and dietary habits. Enhancing quality of life and preventing acute metabolic disorders as well as long-term effects by reducing premature morbidity and mortality is the core target of therapy for individuals with type 2 diabetes mellitus (T2DM).* ***Aims and Objectives:*** *To assess the level of adherence to dietary recommendations (DRs) among T2DM patients in rural areas and the glycemic status among them.* ***Materials and Methods:*** *This cross-sectional study was conducted among 228 purposively selected, diagnosed T2DM patients who attended the outpatient department of the Pirojpur Diabetic Association in Barisal from January to December 2023. Face-to-face interviews were used to collect data using a pretested, semi-structured questionnaire.* ***Results:*** *The study participants were adult patients with T2DM, with a mean age of 54.7±11.7 years. The mean duration of diabetes was 7.5±6.4 years. The study revealed that only 30.7% of participants had good adherence to DRs, while the majority (69.3%) had poor adherence. Furthermore, 35.5% of participants had good glycemic control, whereas 64.5% had poor glycemic status.* ***Conclusion:*** *Poor adherence contributes to poor glycemic control. Therefore, it is crucial to implement effective measures to improve adherence to DRs and enhance glycemic management. These steps will ultimately help prevent diabetic complications and reduce diabetes-related costs for rural residents.*

Keywords: *Dietary recommendations, glycemic status, type 2 diabetes mellitus, Bangladesh.*

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Introduction:

Diabetes Mellitus (DM) is a prevalent non-communicable disease that continues to pose an existential threat to global health[1]. Type 2 diabetes (T2DM), the most prevalent kind of diabetes, develops when the body's capacity to use insulin is reduced, which is generally caused by a combination of genetic and lifestyle factors. Typically developing in adulthood, the incidence of T2DM has surged in recent years,

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largely driven by sedentary lifestyles, poor dietary habits, and increasing obesity rates[2,3]. According to the International Diabetes Federation (IDF Diabetes Atlas, 10th edition, 2021), approximately 537 million adults (ages 20-79) are living with diabetes- about 1 in 10 people. This number is projected to rise to 643 million by 2030 and 783 million by 2045. Diabetes-related deaths increased from 4.6 million in 2011 to 6.7 million in 2021. In Bangladesh, the prevalence of diabetes among adults is rising at an alarming rate. According to the IDF, around 13.2 million adults were living with diabetes in 2021, up from just 1.75 million in 2000. The adult diabetes prevalence in Bangladesh was about 14.2% in 2021. Diabetes-related deaths among adults (20-79 years) amount to approximately 76,000 annually, with 4.2% of these deaths occurring in people under 60 years[4]. The primary goals of diabetes treatment are to prevent or delay complications and improve quality of life. Key components of diabetes management include a healthy eating pattern, regular physical activity, and, in many cases, pharmacotherapy[5]. For individuals with T2DM, following appropriate dietary DRs is a critical aspect of management and is often considered the first line of treatment. An ideal diet involves consuming fewer carbohydrates and fats, more fiber, less sodium, and foods with health-promoting properties such as fish, soy products, fruits, and vegetables[6]. Medical Nutrition Therapy (MNT), has been shown to reduce HbA1c levels by 1.0–1.9% in individuals with type 1 diabetes and by 0.3–2.0% in those with T2DM. MNT or DRs have implications for promoting healthful eating patterns, emphasizing nutrient-dense foods in appropriate portions to improve overall health, achieve and maintain body weight goals, meet individualized glycemic, blood pressure, and lipid targets, and eventually delay or prevent diabetes complications[5,7]. This study aimed to explore the association between dietary adherence and glycaemic status among rural diabetes patients in Bangladesh. The findings will assist clinicians in providing more tailored dietary advice and highlight the significance of developing structured food guidelines for diabetes patients in the country.

Materials and Methods:

A descriptive cross-sectional study was conducted to evaluate the level of adherence to dietary recommendations and the glycemic status of type 2 diabetes patients in rural areas. The study was directed among 228 outpatients who attended the Pirojpur Diabetic Association in Pirojpur, Barisal, Bangladesh. The study population comprised adult males and females aged 18 and older who were diagnosed with type 2 diabetes mellitus (T2DM) and resided outside the municipal areas. Patients with gestational diabetes mellitus (GDM) were excluded from the study. The study participants were conveniently interviewed using a pretested semi-structured questionnaire through face-to-face interactions from January to December 2023. The questionnaire included questions regarding socio-demographic characteristics, factors associated with dietary adherence, and glycemic status. To assess adherence to DRs, the "Perceived Dietary Adherence Questionnaire" (PDAQ) was employed. After the completion of data collection, the data were checked and verified for any omission, error, or irrelevance. Data were coded, entered, and analyzed in IBM SPSS v25. Descriptive statistics such as mean, standard deviation, and percent were computed for the continuous variables of the participants. Chi-square and logistic regression test was used, and a p-value of <0.05 at a 95% confidence interval was taken as significant. The results were presented in tables.

Ethical approval

Participants were thoroughly informed about the study and encouraged to take part. Informed written consent was obtained from each participant. Ethical approval was granted by the Institutional Review Board (IRB) of the National Institute of Preventive and Social Medicine (NIPSOM) in Dhaka 1212, Bangladesh (NIPSOM/IRB/2023/06).

Results:

Table I presents the socio-demographic characteristics of the respondents. Among the 228 participants, the majorities were female (57.9%), while males accounted for 42.1%. The mean age of the participants was 54.7 (±11.7) years, with an age range of 28 to 85 years. Most participants (43.9%) fell within the age group of 41-60 years. Regarding education, 43.4% of the respondents had completed primary education. In this study, more than half of the respondents (56.1%) were housewives, and 16.2% were engaged in business. The mean monthly family income was 17,000.6 (±9,000.1) BDT, with over half of the respondents (54.8%) earning between 10,001 and 20,000 BDT per month. Nutritional status was assessed by calculating BMI, categorized according to the Asian BMI classification. Only 36.4% had a normal BMI, while a notable 33.3% were classified as obese. Table II shows the disease and individual diet-related characteristics of the participants. The mean duration of diabetes among respondents was 7.5 (±6.4) years. Among the 228 individuals, 52.6% had diabetes for >5 years, while 47.4% had diabetes for ≤5 years. Most participants (68.2%) were on oral medication for their diabetes, 4.4% did not take any medication, only 1.8% individuals were on insulin, and approximately one-fourth (25.4%) used both oral agents and insulin. The majority (61.8%) of respondents reported no family history of diabetes among their parents or siblings, while the remaining participants had a family history of the condition. Among the participants, 49.1% had one or more comorbidities. More than half (54.8%) engaged in regular physical exercise. However, over two-thirds (69.7%) of the participants reported that they could not afford the cost of the recommended diet. Additionally, 48.2% expressed a preference for sugar-sweetened beverages. Approximately three-fourths

(72.8%) of respondents reported having self-control over their diet. In this study, only 30.7% revealed good dietary adherence, while the majority (69.3%) exhibited poor adherence to DRs. Table III presents the association between dietary adherence and perceived factors. The regression analysis revealed a statistically significant association between absence of self-control over diet and poor dietary adherence (p=0.007). Furthermore, participants who reported spending too much time preparing the recommended diet and those facing challenges adhering to DRs during social or work events were also significantly associated with poor dietary adherence (p<0.05). Table IV depicts the association between dietary adherence and glycemic status. There was a significant association (p<0.001) between dietary adherence and glycemic status, indicating that those with good adherence were more likely to obtain good glycemic status. Table V shows the results of a logistic regression analysis that evaluated the effects of gender, physical activity, dietary adherence, difficulties adherence to the recommended diet during social or work events, self-control over food, and a preference for sweetened beverages on glycemic status. Poor dietary adherence was significantly associated with poor glycemic status (p<0.001). Gender and self-control over eating were substantially related to glycemic status (p<0.05).

Table I: Socio-demographic characteristics (n=228)

Characteristics	Frequency (n)	Percentage (%)
Gender		
Male	96	42.1
Female	132	57.9
Age groups (in years)		
18-40	32	14.0
41-60	124	54.4
>60	72	31.6
Mean±SD		54.7±11.7
Level of education		
Primary	99	43.4
Secondary	87	38.2
Higher Secondary	23	10.1
Graduation	15	6.6
Post-graduation	4	1.8
Occupation		
Housewife	128	56.1
Business	37	16.2
Service holder	28	12.3
Retired	18	7.9
Others	17	7.5
Average monthly family income (BDT)		
≤10,000	52	22.8
10,001-20,000	125	54.8
20,001-30,000	39	17.1
>30,000	12	5.3
Mean±SD	17,000.6±9,000.1	
Nutritional status (in BMI)		
Underweight	14	6.1
Normal range	83	36.4
Overweight	55	24.1
Obese I	68	29.8
Obese II	8	3.5

Table II: Disease and diet related information (n=228)

Traits	Frequency (n)	Percentage (%)
Duration of DM		
≤5 years	108	47.4
>5 years	120	52.6
Mean±SD		7.5±6.4
Type of treatment respondent follows		
No drug	10	4.4
Oral hypoglycemic agent	156	68.4
Insulin	4	1.8
(OHA + Insulin)	58	25.4
Family history of DM		
Yes	87	38.2
No	141	61.8
Comorbidity		
Present	112	49.1
Absent	116	50.9
Regular physical exercise		
Yes	125	54.8
No	103	45.2
Cost for recommended diet		
Affordable	69	30.3
Not affordable	159	69.7
Sugar-sweetened beverage preference		
Preference	110	48.2
No preference	118	51.8
Self-control on diet		
Have	166	72.8
Don't have	62	27.2
Adherence to dietary recommendations		
Good adherence	70	30.7
Poor adherence	158	69.3

Table III: Factors associated with dietary adherence (n=228)

Factors	Reference category	Adjusted Odds Ratio (AOR)	95% CI	p-value
Takes too long time (Yes)	No	2.070	1.036-4.137	*0.039
Face problem adhering to diet during social or work events (Yes)	No	2.391	1.164-4.912	*0.018
Have self-control (No)	Yes	4.199	1.468-12.015	*0.007
Prefer sweetened beverage (Yes)	No	1.732	0.877-3.421	0.114
Problem to remember recommended diet (Yes)	No	1.401	0.617-3.180	0.420

*Statistically significant value

Table IV: Association of dietary adherence with glycemic status (n=228)

Dietary adherence	Glycemic status		Test of significance	p-value
	Poor n(%)	Good n(%)	Total n(%)		
Poor	125(79.1)	33(20.9)	158(100)	$\chi^2 = 48.157$	*0.001
Good	22(31.4)	48(68.6)	70(100)		

*Statistically significant value

Table V: Summary of logistic regression model to see associated factors of glycemic status (n=228)

Factors	Reference category	AOR	95% CI	p-value
Gender (Female)	Male	2.055	1.041-4.058	*0.038
Physical exercise (No)	Yes	1.845	0.941-3.615	0.074
Dietary adherence (Poor)	Good	5.845	2.847-12.001	*0.001
Face difficulty adhering to diet during social or work events (Yes)	No	0.859	0.398-1.857	0.700
Have self-control (No)	Yes	6.149	1.932-19.568	*0.002
Prefer sugar-sweetened beverage (Yes)	No	1.551	0.759-3.172	0.229

*Statistically significant value

Discussion:

The study found that only 30.7% of participants adhered well to DRs, indicating that the majority (69.3%) had poor adherence. These findings are consistent with various studies conducted in different countries. For example, a study in India using the PDAQ tool reported a good adherence rate of 28%.[8] In Ethiopia, another study found that 33.5% of participants had good dietary adherence[9]. However, some studies reported lower adherence rates; a study in Oman indicated good adherence at 25.7%, while a study in Nepal showed only 15.7% of participants adhered well to DRs10,[11]. These disparities may arise from differences in settings, socio-demographic characteristics, and dietary habits among the study populations. No similar studies have been conducted in Bangladesh using the PDAQ to assess dietary adherence. However, one study that utilized a three-point scale to evaluate non-adherence found a non-adherence rate of 88%[12]. Another Bangladeshi study identified a significant association ($p<0.001$) between the time taken to prepare the recommended diet and dietary adherence[13]. It also found a significant association ($p<0.001$) between difficulties in adhering to DRs and overall dietary adherence, with those facing challenges prone to have poor adherence. In fact, a separate study reported that 91% of respondents encountered difficulties adhering to their recommended diets[8]. In the current study, more than two-thirds (69.7%) of participants reported that they could not afford the recommended diet, which significantly contributed to non-adherence. A study in India found that approximately 76% of participants faced similar financial constraints regarding the cost of the recommended diet[8]. For instance, a study in Bangladesh identified cost as a primary barrier to accessing medication[13]. It was revealed that participants who could afford the recommended diet were nearly three times more likely to adhere to it compared to those who could not[10,14]. In this study, only 35.5% of participants achieved good glycemic status, while 64.5% had poor glycemic control. These findings are consistent with other research in the field. Poor glycemic control has been reported in various studies, including 59.5% in West Ethiopia, 65% in India, 65.4% in Nepal, 60.5% in Ethiopia, 80.5% in Palestine, and 55% in Niger[16-21]. A study in Bangladesh indicated that 81.2% of patients had poor glycemic control based on HbA1c levels[22], while another study in Bangladesh reported poor glycemic control in 69% of patients[23]. The discrepancy between the current study and these other studies may be attributed to the statistic that the aforementioned studies utilized the HbA1c test, which is the recommended gold standard for assessing glycemic control, whereas this study assessed glycemic status using fasting blood sugar (FBS) levels. Dietary adherence and glycemic status were shown to be significantly associated ($p<0.001$), revealing that individuals who adhered to their diets well had a higher probability of reaching optimal glycemic levels. Conversely, individuals who did not follow the recommended diet closely had a 5.8-fold increased risk of having low glycemic status. This result is consistent with earlier studies that have demonstrated a strong association between poor glycemic management and low self-care behavior compliance[24]. Furthermore, a related study revealed a positive association between reduced HbA1c values and following the diabetic dietary guidelines as evaluated by the PDAQ[25].

Conclusion:

Based on the results of the study, it can be concluded that the majority of participants from rural areas had poor adherence to DRs. The main factors significantly associated with dietary adherence included the time taken to prepare the recommended diet, challenges encountered during social or professional events, self-control over food, preference for sweetened beverages, and challenges in remembering the recommended diet. It is essential to develop simplified and practical dietary guidelines that are easy for individuals in rural areas to follow. Furthermore, policies should be established to promote access to diabetes education and counseling in this region.

Conflict of Interest: None.

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