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Original Article

Association of Diabetes Self-Care Management with Glycemic Control among Adults with Type 2 Diabetes in Bangladesh

Hossain M[1], Rahman MM[2], Dastider S[3], Sharmin A[4], *Alam UK[5]

Abstract

Effective self-care is essential for achieving glycemic control, yet adherence remains suboptimal in many low- and middle-income settings, making an understanding of self-management patterns crucial for guiding patient-centered interventions. This study evaluates self-care practices and their relationship with glycemic outcomes among adults with type 2 diabetes mellitus (T2DM) attending tertiary hospitals in Bangladesh. A cross-sectional study of 278 adults with T2DM was conducted at two tertiary hospitals in Dhaka. Data were collected using a structured questionnaire covering socio-demographic characteristics, diabetes history, comorbidities, glycemic records, and the Diabetes Self-Management Questionnaire (DSMQ). Glycemic control was assessed using fasting blood sugar (FBS), 2-hour after breakfast glucose (2-HABF), and glycated hemoglobin (HbA1c). Descriptive statistics, chi-square tests, and Pearson's correlation coefficients were used, with significance set at $p<0.05$. The mean age of respondents was 47.9 ± 10.9 years; 71.9% were female, and 65.8% lived in urban areas. Most participants (78.4%) had diabetes for ≤10 years, 63.3% reported a family history, and 90.7% were on pharmacological treatment—mainly oral hypoglycaemic agents (63.5%). Hypertension (42.8%) and hypothyroidism (32%) were the most common comorbidities. Poor glycemic control was widespread: 81.4% had FBS ≥7 mmol/L, 71.6% had 2-HABF ≥10 mmol/L, and 55.3% had HbA1c ≥7%. Only 42.4% demonstrated adequate overall self-care, with the lowest adequacy in glucose monitoring (30.6%) and physical activity (34.7%), and the highest in medication adherence (72.3%) and follow-up visits (62.6%). Higher DSMQ subscale scores showed significant negative correlations with HbA1c ($p<0.01$), indicating that better self-care was associated with improved glycemic outcomes. Adequate medication adherence, dietary compliance, physical activity, glucose monitoring, and follow-up visits were significantly associated with good glycemic control ($p<0.01$). Residence and treatment modality were also significant predictors of having available glycemic records ($p<0.05$). Self-care management practices among Bangladeshi adults with T2DM were suboptimal and strongly associated with poor glycemic control. Enhancing structured diabetes self-management education, improving patient–provider communication, and promoting lifestyle modification are essential for optimizing metabolic outcomes in this population.

***Keywords**: Type 2DM, diabetes self-care, HbA1c, FBS, DSMQ, lifestyle modification.*

1. Dr. Mahmudul Hossain, Associate Professor of Endocrinology, Kurmitola General Hospital, Dhaka
2. Dr. Md. Mantaka Rahman, Research Trainee, Gut-brain Axis
3. Dr. Sathi Dastider, Associate Professor of Community Medicine, National Institute of Preventive and Social Medicine (NIPSOM)
4. Dr. Ajmari Sharmin, Deputy Program Manager, National Nutrition Service, DGHS
5. *Dr. Ummul Khair Alam, Assistant Professor of Reproductive and Child Health, NIPSOM, Mohakhali, Dhaka. E-mail: ummul.hossain@gmail.com

* For correspondence

INTRODUCTION

Type 2 diabetes mellitus (T2DM) is a major contributor to global morbidity and premature mortality[2,5]. The International Diabetes Federation estimates that around 425 million adults worldwide are living with diabetes[5], while the World Health Organization reports that nearly 80% of diabetes-related deaths occur in low- and middle-income countries[6]. T2DM constitutes 85–95% of all diabetes cases, making it the predominant form of the disease[7,8,9].

Chronic hyperglycemia results in microvascular complications such as nephropathy, retinopathy, and neuropathy[3], and macrovascular outcomes including ischemic heart disease, stroke, and peripheral vascular disease[4, 11]. Evidence from the UKPDS trials shows that tighter glycemic control reduces microvascular complications by up to 25% and slows disease progression[4,12]. Despite advances in therapy, achieving optimal glycemic control remains a global challenge[13,14].

Bangladesh is undergoing a rapid epidemiological transition due to urbanization, changing lifestyles, and population aging[10,15]. National surveys indicate that 8–10% of adults have diabetes, with higher rates in urban areas. Yet many patients fail to maintain recommended fasting glucose, 2-hour postprandial levels, and HbA1c values[19, 20]. Self-care

is central to diabetes management, requiring daily decisions on medication, diet, physical activity, glucose monitoring, and follow-up[6,7,13]. Studies consistently show that effective self-management improves glycemic outcomes and reduces complication risks[14,15].

However, research from Ethiopia, Nepal, Pakistan, and Malaysia demonstrates that poor self-care, particularly inadequate diet, non-adherence to medication, and limited glucose monitoring, is common and strongly associated with poor glycemic outcomes[16-20]. Although diabetes prevalence is rising in Bangladesh, evidence on the impact of self-care practices on glycemic control remains limited[10-19]. International findings show that regular glucose monitoring, medication adherence, dietary regulation, and physical activity significantly reduce HbA1c and complication risk[6,7,13,14], yet similar local data are scarce. Given variations in sociocultural practices, food habits, and healthcare access across settings, Bangladesh-specific research is essential. This study, therefore, evaluates the relationship between self-care practices and glycemic control among Bangladeshi adults with T2DM.

MATERIALS AND METHODS

A hospital-based cross-sectional study was conducted among 278 adults with type 2 diabetes mellitus (T2DM) attending the outpatient departments of Bangabandhu Sheikh Mujib Medical University and Kurmitola General Hospital between January and June 2022. Adults aged ≥18 years with a confirmed diagnosis of T2DM for at least one year and available glycemic records (FBS, 2-HABF, or HbA1c) within the past three months were eligible, while pregnant/lactating women, those with acute illness, or cognitive/psychiatric impairment were excluded. Participants were selected through purposive sampling. Data were collected using an interviewer-administered questionnaire covering socio-demographic variables, diabetes profile, comorbidities, personal habits, and glycemic measurements, alongside the validated Diabetes Self-Management Questionnaire (DSMQ), translated into Bangla using forward-backward translation and pretested on 28 individuals. DSMQ subscales-glucose management, dietary control, physical activity, and healthcare use-were scored according to standard guidelines. Glycemic control was defined as FBS <7 mmol/L, 2-HABF <10 mmol/L, and HbA1c <7%. Data were analyzed in SPSS version 26 using descriptive statistics, chi-square tests, t-tests/ANOVA, and Pearson's correlation coefficients; significance was set at $p<0.05$. Ethical approval was obtained from relevant institutional review boards, and written informed consent was secured from all participants.

RESULTS

Table I summarizes the socio-demographic characteristics of the 278 respondents. The mean age was 47.9 ± 10.9 years, with the largest proportion (35.6%) aged 41–50 years; ages ranged from 22 to 75 years. Females comprised 71.9%, giving a male–female ratio of 1:2.56. Muslim was 92%, followed by Hindus (7.6%) and Buddhists (0.4%). Married was 85.6%, while 11.9% were widowed, 2.2% divorced, and only 0.4% unmarried.

Educational status: 31.3% completed secondary level, 23% primary, 16.2% could sign only, and 4.3% were illiterate; and urban residents were 65.8%. Regarding occupation, housewives (61.5%), service holders (14.39%), and 62.2% were from nuclear families (with a mean size of 4.86 ± 2.29 members); 73% families had 1–5 members, while 25.2% had 6–10 members.

About half (52.5%) had a monthly family income of ≤ 20,000 Tk, though the mean income was 35,536 Tk. Physical activity patterns: 58.63% were sedentary, light (27.34%), medium (11.51%), or heavy (2.52%) activity.

Table I: General information/Socio-demographic characteristics of respondents (n = 278)

Characteristic	Category	Frequency (n)	Percentage (%)
Age	Mean 47.9 ± 10.9	278	100
Sex	Female	200	71.9
	Male	78	28.1
Religion	Islam	256	92.0
Marital status	Married	238	85.6
Education	Secondary completed	87	31.3
Residence	Urban	183	65.8
Occupation	Housewife	171	61.5
Family type	Nuclear	173	62.2
Family size	Mean 4.86 ± 2.29	278	100
Monthly family income	≤20,000 Tk.	146	52.5%
Physical activity level	A level of sedentary work	163	58.63%

Table II displays a combined overview of the diabetes profile of the study participants. The majority of respondents (78.4%) had been living with type 2 diabetes mellitus for 10 years or less, while 16.9% had a duration of 11–20 years, and only 4.7% reported more than 21 years since diagnosis. Most respondents (90.7%) were on pharmacological treatment, reflecting standard clinical care practices in tertiary hospitals. Regarding specific therapeutic modalities, oral hypoglycaemic agents were the most commonly used treatment (63.5%), followed by insulin therapy (14.5%). The remaining 28.4% used a combination of therapies, including dual or adjunctive agents, and a positive family history of diabetes was observed in 63.3% of participants.

Table II: Diabetes Profile of the Respondents (n = 278)

Diabetes Profile Indicator	Categories	Frequency (n)	Percentage (%)
Duration of Diabetes	≤10 years	218	78.4
	11–20 years	47	16.9
	≥21 years	13	4.7
Family History of Diabetes	Yes	176	63.3
	No	102	36.7
Type of Diabetes Management	Pharmacological	252	90.7
	Non-pharmacological	26	9.3
Type of Anti-diabetic Agents Used	Oral hypoglycemic agents (OHA)	162	63.5
	Insulin	37	14.5
	Combination/Other therapies	79	28.4

Table III shows the clinical and comorbidity profiles of the respondents. Among the study population, 57.2% had no history of hypertension**,** while 42.8% reported being hypertensive. Among the hypertensives, 95% were taking antihypertensive medication. Personal habit: 7.6% were smokers, 12.2% consumed tobacco-related products (TRP), and 1.8% engaged in both smoking and TRP use. Regarding comorbidities, 59% of respondents had diseases in addition to diabetes. Among these 114 individuals, hypothyroidism was 87.7%, followed by asthma (7.9%) and obesity (0.9%), depression (0.9%), and other clinical problems (2.6%).

Table III: Clinical and Comorbidity Profile of the Respondents (n = 278)

Clinical / Comorbidity Indicator	Categories	(n)	(%)
Hypertension Status	Yes	119	42.8
	No	159	57.2
Use of Antihypertensive Agents *(among hypertensive respondents, n = 119)*	Yes	113	95.0
	No	6	5.0
Personal Habits	Smoker	21	7.6
	TRP user	34	12.2
	Both a smoker & a TRP user	5	1.8
Presence of Other Diseases	Yes	164	59.0
	No	114	41.0
Types of Other Diseases *(among those with comorbid conditions, n = 114)*	Hypothyroidism	100	87.7
	Asthma	9	7.9
	Obesity	1	0.9
	Depression	1	0.9
	Others	3	2.6

Table IV presents data on glycemic control and diabetic complications. For FBS, 18.6% of the 221 participants had levels below 7 mmol/L, while 81.4% had levels at or above this threshold, with a mean value of 10.19 mmol/L, a median of 9.0 mmol/L, and a range from 3.3 to 41 mmol/L. Regarding 2-hour post-breakfast blood glucose (2HABF), among 204 participants, 28.4% had levels below 10 mmol/L and 71.6% had levels at or above 10 mmol/L; the mean was 14.23 mmol/L, median 12.95 mmol/L, and values ranged from 5 to 44.4 mmol/L. For glycated hemoglobin (HbA1c), 44.7% of 206 participants had levels below 7%, while 55.3% had levels at or above 7%, with a mean of 7.29%, a median of 8.20%, and a range from 2 to 12.3%. Diabetic complications were reported for 278 participants, with 18.7% experiencing complications and 81.3% without complications.

Table IV: Glycemic Control and Diabetic Complications among Adults with Type 2 Diabetes in Bangladesh

Parameter	Category	Frequency (n)	Percentage (%)	Mean ± SD	Median (IQR)	Range (Min–Max)
Fasting Blood Sugar (FBS) (n=221)	<7 mmol/L	41	18.6	10.19 ± 4.47	9.0	3.3 – 41
	≥7 mmol/L	180	81.4	–	–	–
2Hour After Breakfast (2HABF) (n=204)	<10 mmol/L	58	28.4	14.23 ± 6.16	12.95	5 – 44.40
	≥10 mmol/L	146	71.6	–	–	–
HbA1c (n=206)	<7%	92	44.7	7.29 ± 2.92	8.20	2 – 12.30
	≥7%	114	55.3	–	–	–
Diabetic Complications (n=278)	Present	52	18.7	–	–	–
	Absent	226	81.3	–	–	–

Table V elaborates the distribution of the respondents according to types of diabetic complications. Among the 52 respondents who developed diabetic complications, diabetic nephropathy was in 26.9%, followed by heart disease in 19.2%, retinopathy and peripheral vascular disease each in 11.5%, and neuropathy and cerebrovascular disease each in 5.8%. A further 26.9% reported other complications. In contrast, participants did not present with these conditions, with absence rates ranging from 73.1% for nephropathy and "other" complications to 94.2% for neuropathy and cerebrovascular disease. Overall, 18.7% reported complications.

Table V: Distribution of the respondents according to types of diabetic complications (n=52)

DCom. (n=52)	DNep. n (%)	DNeu. n (%)	DRet. n (%)	HD n (%)	CVD n (%)	PVD n (%)	Others n (%)
Present	14(26.9%)	3(5.8%)	6(11.5%)	10(19.2%)	3(5.8%)	6 (11.5%)	14 (26.9%)
Absent	38(73.1%)	49(94.2%)	46(88.5%)	42(80.8%)	49(94.2%)	46(88.5%)	38 (73.1%)

DCom.: Diabetic Complication; DNep.: Diabetic nephropathy; DNeu.: Diabetic neuropathy; DRet.: Diabetic retinopathy; HD: Heart disease

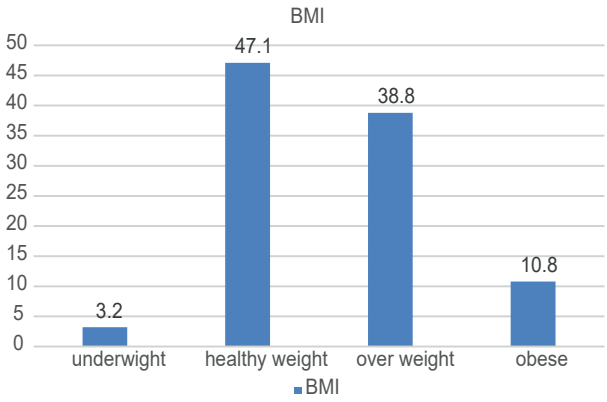

Figure 1: Distribution of the respondents according to BMI

Figure 1 illustrates the distribution of respondents according to body mass index (BMI); 131 individuals (47.1%) had a healthy weight. Overweight status was reported in 108 respondents (38.8%), while obesity was present in 30 respondents (10.8%). A small proportion, 9 respondents (3.2%), were underweight.

Table VI demonstrates the self-care practices among adults with Type 2 Diabetes. Among respondents, adherence to prescribed medication was the most consistently adequate (72.3%), while dietary compliance (40.3%) and physical activity (34.7%) were frequently inadequate. Regular glucose monitoring was reported by only 30.6% of participants, and 62.6% attended scheduled medical follow-up visits.

Table VI: Self-Care Practices among Adults with Type 2 Diabetes

Self Care Domain	Adequate n (%)	Inadequate n (%)
Frequency of self-monitoring of blood glucose	85 (30.6)	193 (69.4)
Adherence to the prescribed medication regimen	201 (72.3)	77 (27.7)
Compliance with recommended dietary practices	112 (40.3)	166 (59.7)
Engagement in regular physical activity	97 (34.7)	181 (65.3)
Attendance at scheduled medical follow-up visits	174 (62.6)	104 (37.4)

Notes: Adequate = meeting recommended practice; Inadequate = below recommended practice.

Table VII focuses on the distribution of self-care outcomes. Overall, 42.4% of respondents demonstrated adequate self-care behaviors, while the majority, 57.6%, reported inadequate practices.

Table VII: Overall Distribution of Self-Care Outcomes among Adults with Type 2 Diabetes

Outcome Category	Frequency (n)	Percentage (%)
Adequate self-care	118	42.4
Inadequate self-care	160	57.6
Total	278	100

Association between glycemic control and diabetes self-care practices

Table VIII displays the association of glycemic control (HbA1c) with self-care management practices. Respondents with good glycemic control (HbA1c <7%) were significantly more likely to report adequate self-care practices across all domains compared with those with poor control (HbA1c ≥7%). The strongest associations were observed for medication adherence (χ^2=12.34, p<0.001) and follow-up visits (χ^2=11.02, p=0.001). Adequate glucose monitoring, dietary compliance, and physical activity also showed significant associations with better glycemic outcomes.

Table VIII: Association of Glycemic Control (HbA1c) with Self-Care Management Practices among Adults with Type 2 Diabetes

Self Care Domain	HbA1c <7% (n=92)	HbA1c ≥7% (n=114)	χ^2 (df)	pvalue
Glucose monitoring (adequate)	45 (48.9%)	32 (28.1%)	9.21 (1)	0.002
Medication adherence (adequate)	70 (76.1%)	58 (50.9%)	12.34 (1)	<0.001
Dietary compliance (adequate)	52 (56.5%)	40 (35.1%)	8.47 (1)	0.004
Physical activity (adequate)	44 (47.8%)	33 (28.9%)	7.56 (1)	0.006
Followup visits (adequate)	65 (70.7%)	52 (45.6%)	11.02 (1)	0.001

Notes: HbA1c <7% = good glycemic control; HbA1c ≥7% = poor glycemic control. χ^2 = Chisquare test statistic; df = degrees of freedom. p<0.05 is considered statistically significant.

Association between socio-demographic characteristics and glycemic record present or absent

Table IX states the association between the residence of the respondent and glycemic record presence or absence. For statistical analysis, Chi-square was performed to understand the association between the residence of the respondent with glycemic record present or absent (χ^2=8.123, df=2, p=0.013). Table IX shows that the residence of the respondent was statistically significant (p < 0.05). Respondents who resided in an urban or city had a glycemic record.

Table IX: Association between residence of the respondent and glycemic record present or absent (n=278)

Residence of the respondent	Glycemic record present or absent		
	Absent f (%)	Present f (%)	
Rural	17 (18.1)	77 (81.9)	df=2
Urban/City	13 (7.1)	170 (92.9)	=8.123
Slum	0 (0.0)	1 (100.0)	P value
			=.013*

Fisher's Exact Test done *statistically significant

Table X shows the association between the type of anti-diabetic agent used by the respondent and glycemic record presence or absence. For statistical analysis, Chi-square was performed to see the association between the type of anti-diabetic agent with glycemic record present or absent (χ^2=6.350, df=2, p=0.038). Table 20 shows that the type of anti-diabetic agent was statistically significant ($p < 0.05$). Respondents who took insulin had a glycemic record.

Table X: Association between type of anti-diabetic agent used by the respondent and glycemic record present or absent (n=255)

Type of anti-diabetic agent	Glycemic record present or absent		
	Absent f (%)	Present f (%)	
Oral	20 (12.3)	142 (87.7)	df=2
Insulin	13 (7.1)	170 (92.9)	χ^2= 6.350
Oral + Insulin	1(1.8)	5 (98.2)	P value
			=.038*

*Statistically significant

Association of Socio-Demographic and Treatment Characteristics with Glycemic Record Status

Table IX reflects the association between respondent socio-demographic characteristics and the presence of glycemic records. Among rural respondents, 81.9% had records compared with 92.9% of urban residents, while the single respondent from a slum also had a record. Respondents on oral agents had records in 87.7% of cases, those on insulin in 92.9%, and those on combined oral plus insulin therapy in 98.2%.

Table IX: Association between respondent characteristics and presence of glycemic record (n=278)

Characteristic	Category	Glycemic record absent n (%)	Glycemic record present n (%)	χ^2 (df)	pvalue
Residence	Rural	17 (18.1)	77 (81.9)	8.123 (2)	0.013*
	Urban/City	13 (7.1)	170 (92.9)	–	–
	Slum	0 (0.0)	1 (100.0)	–	–
Type of antidiabetic agent	Oral	20 (12.3)	142 (87.7)	6.350 (2)	0.038*
	Insulin	13 (7.1)	170 (92.9)	–	–
	Oral + Insulin	1 (1.8)	5 (98.2)	–	–

*Notes: χ^2 = Chisquare test statistic; df = degrees of freedom. *$p<0.05$ considered statistically significant.*

Urban residence was significantly associated with higher likelihood of having a glycemic record compared with rural residence (χ^2=8.123, p=0.013). Similarly, respondents using insulin, either alone or in combination with oral agents, were more likely to have glycemic records than those on oral agents alone (χ^2=6.350, p=0.038).

DISCUSSION

This study observed diabetes self-care practices and their association with glycemic control among adults with type 2 diabetes mellitus (T2DM) attending tertiary hospitals in Bangladesh. The findings reveal that poor glycemic control remains widespread, with 81.4% of respondents exhibiting elevated FBS, 71.6% elevated 2-HABF, and 55.3% having HbA1c ≥7%. These results mirror global and regional patterns in which a significant proportion of individuals with T2DM fail to meet recommended glycemic targets, particularly in low- and middle-income settings[56]. Similar studies from Ethiopia, Nepal, and Pakistan reported poor glycemic control in 60–75% of diabetic patients, reflecting challenges comparable to those observed in the present study[16-19].

The strong negative correlations found between DSMQ subscale scores and HbA1c reinforce the importance of effective self-care behaviors in maintaining optimal glycemic outcomes. In this study, higher glucose management, dietary control, physical activity, and health-care use scores were significantly associated with lower HbA1c levels ($p<0.01$).

These findings are consistent with earlier evidence demonstrating that structured self-management significantly reduces the risk of microvascular complications and improves long-term glycemic control[4, 12]. Moreover, the weaker relationship observed between DSMQ scores and short-term markers such as FBS and 2-HABF aligns with the established understanding that HbA1c better reflects cumulative glycemic exposure[13].

Self-care adherence varied across domains. Although 72.3% adhered to medication recommendations and 62.6% attended follow-up visits regularly, only 30.6% performed adequate glucose monitoring and 34.7% engaged in sufficient physical activity. These gaps are comparable to findings from Malaysia and Pakistan, where fewer than one-third of diabetic patients reported regular monitoring or consistent exercise[17, 18]. Cultural dietary patterns, limited opportunities for physical activity, economic constraints, and inadequate health education may contribute to these behaviors. The predominance of housewives (61.5%) and individuals from lower-income groups in this study likely reinforces barriers to active lifestyle modification.

Comorbidities also played an important role in shaping disease burden. Nearly 43% of respondents had hypertension, and 32% had hypothyroidism, consistent with global evidence that endocrine and cardiovascular comorbidities frequently coexist with T2DM[3, 4, 11]. These conditions increase treatment complexity and may negatively influence both self-care capacity and glycemic outcomes.

Urban residence and insulin use were significantly associated with having recent glycemic records ($p<0.05$), suggesting better healthcare access and monitoring among these groups. Similar trends have been reported in Malaysian studies where urban patients showed higher healthcare utilization[17]. However, record availability alone did not translate into better glycemic outcomes, reinforcing that behavior-driven self-management remains central to metabolic control.

Collectively, the findings indicate that diabetes self-management behaviors are suboptimal among Bangladeshi adults with T2DM and are strongly associated with unfavorable glycemic outcomes. These results align with international literature, which emphasizes that self-management rather than pharmacological treatment alone is fundamental to achieving durable glycemic control[6, 7, 13, 14].

CONCLUSION

This study demonstrates that glycemic control among adults with type 2 diabetes in Bangladesh is suboptimal, with a high proportion exhibiting elevated FBS, 2-HABF, and HbA1c levels. Diabetes self-care practices, particularly dietary regulation, physical activity, and glucose monitoring, were inadequate and showed strong associations with poor glycemic outcomes. Comorbid conditions such as hypertension and hypothyroidism further contributed to the complexity of disease management. Overall, the findings emphasize that effective self-management is critical for achieving metabolic control. Strengthening structured diabetes education and culturally appropriate lifestyle support is essential to improve long-term diabetic outcomes in this population.

LIMITATIONS

This cross-sectional design limits causal inference. Glycemic measurements were partly based on patient-reported records, which may introduce recall bias. The use of purposive sampling from tertiary hospitals limits generalizability to primary-care populations.

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