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Prevalence and Determinants of Diabetic Complications among Adults with Diabetes: a cross-sectional study

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Keywords

diabetes; diabetic complications; neuropathy; dyslipidemia; lifestyle factors; socioeconomic determinants; Bangladesh.

Abstract

Background: Diabetic complications remain a major cause of morbidity and reduced quality of life worldwide, with particularly high burdens in low- and middle-income countries. In Bangladesh, limited evidence exists on the combined influence of sociodemographic, behavioral, and clinical factors on the development of diabetic complications. This study examined the prevalence of diabetic complications and identified associated determinants among adults with type 2 diabetes in Dhaka.

Methods: A cross-sectional study was conducted among 500 adults with type 2 diabetes attending three outpatient centers of the Diabetic Association of Bangladesh. Participants were selected using systematic random sampling. Data was collected through structured interviews and extraction of clinical information from medical records. The outcome was the presence of any diabetic complication (neuropathy, nephropathy, stroke, or heart disease). Bivariate analyses used χ^2 tests, and multivariable logistic regression was applied to identify independent predictors of complications. Statistical significance was set at $p < 0.05$.

Results: More than half of the participants (52.6%) had at least one diabetic complication. Neuropathy was the most prevalent (34.2%), followed by heart disease (20.0%), nephropathy (10.2%), and stroke (5.2%). In the adjusted model,

older age (AOR for 58–85 years = 1.78), male sex (AOR = 1.39), low education (AOR for higher secondary+ = 0.54), and low monthly income (AOR for 10,000–29,000 BDT = 3.15) were significant sociodemographic predictors. Longer diabetes duration strongly increased the odds of complications (AOR for ≥12 years = 2.14). Poor adherence to diet (AOR = 1.63), physical inactivity (AOR = 1.72), poor medication adherence (AOR = 2.12), smoking (AOR = 1.55), and dyslipidemia (AOR = 1.72) were significant behavioral and clinical predictors. Hypertension and overweight were not significant in the adjusted model.

Conclusion: Diabetic complications are highly prevalent in this urban Bangladeshi population and are strongly shaped by socioeconomic disadvantage, diabetes duration, lifestyle behaviors, and dyslipidemia. Interventions aimed at enhancing diabetes knowledge, improving behavioral adherence, and addressing socioeconomic disparities may substantially reduce the burden of complications. Early screening and aggressive management of dyslipidemia should be prioritized alongside long-term diabetes care strategies.

1. Introduction

Diabetes mellitus (DM) is a major global public health challenge, affecting an estimated 537 million adults worldwide in 2021, a number projected to rise to 643 million by 2030 and 783 million by 2045 [1]. Low- and middle-income countries bear a disproportionate share of this burden, with South Asia experiencing one of the fastest increases in diabetes prevalence due to rapid urbanization, sedentary lifestyles, and dietary transitions [2]. The long-term consequences of diabetes arise primarily from its microvascular and macrovascular complications—including neuropathy, nephropathy, retinopathy, cardiovascular diseases, and stroke—which contribute substantially to disability, reduced quality of life, and premature mortality [3,4].

The development of diabetic complications is influenced by multiple interrelated sociodemographic, behavioral, and clinical factors. Longer duration of diabetes, poor glycemic control, tobacco use, physical inactivity, dyslipidemia, and hypertension have consistently been associated with increased complication risk in various populations [5–7]. However, the distribution and determinants of complications vary considerably across settings, shaped by differences in socioeconomic conditions, access to health services, and awareness levels.

In Bangladesh, diabetes has emerged as a major contributor to chronic disease morbidity, yet evidence on the prevalence of complications and their associated factors remains insufficient. Although previous studies have explored selected complications or focused on hospital-based cohorts, few have comprehensively examined sociodemographic, behavioral, and clinical predictors simultaneously. Understanding these determinants is essential for targeting prevention, strengthening patient education, and guiding health system interventions.

In this context, the present study analyzes data from 500 individuals with diabetes to estimate the prevalence of key diabetic complications, including neuropathy, nephropathy, stroke, and heart disease—and to identify the factors associated with the presence of any complication. The study incorporates a wide range of covariates such as age, sex, education, lifestyle behaviors, comorbidities, and diabetes duration, providing a comprehensive assessment aligned with public health priorities in resource-limited settings. Therefore, the objectives of this study are to determine the prevalence of any diabetic complications and associated determinants among adults with diabetes.

2. Methods

2.1 Study Design, Setting, and Participants

A cross-sectional study was conducted among adults with type 2 diabetes mellitus (DM) attending specialized outpatient clinics operated by the Diabetic Association of Bangladesh (DAB) in Dhaka, Bangladesh. DAB is the country's largest non-profit organization providing comprehensive diabetes care and is widely regarded as the principal hub for DM services nationwide [1]. Three DAB-affiliated centers—Jurain Diabetes Center (JDC), Keraniganj Diabetes Center (KDC), and Wari Diabetes Center (WDC)—were randomly selected to ensure representation across socioeconomic and geographical groups within the Dhaka metropolitan area.

Eligible participants were adults (≥18 years) diagnosed with type 2 DM and attending follow-up outpatient visits. Exclusion criteria included: (i) pregnant women with gestational diabetes, (ii) patients who were critically ill, and (iii) individuals unable to provide informed consent.

The sample size was determined using an expected prevalence of diabetic complications of approximately 50–60% in South Asian populations [2,3], with 95% confidence level, 5% margin of error, and a design effect of 2. The minimum required sample was 453; this was increased to 500 to improve analytical power and accommodate subgroup analyses. The final dataset included 500 participants across the three centers

2.2 Sampling and Data Collection

Sampling was executed in two stages. First, three DAB centers were randomly selected from the list of eligible facilities in Dhaka. Second, systematic random sampling (every 3rd patient) was used to recruit participants during March–June 2023. Sequential recruitment was applied as necessary to achieve equal representation across centers (JDC: 168; KDC: 166; WDC: 166).

Data were collected using a structured, interviewer- administered questionnaire capturing sociodemographic characteristics, duration of diabetes, awareness, lifestyle behaviors (diet, physical activity, tobacco use), and medication adherence. Clinical information—including comorbidities and documented diabetic complications (neuropathy, nephropathy, stroke, and heart disease)—was abstracted from medical records by trained staff. Laboratory results (lipid profiles, renal markers) were extracted from the most recent routine test reports recorded in patient files; no additional laboratory testing was performed for research purposes.The questionnaire, originally drafted in English, was translated into Bangla following forward–backward translation procedures to ensure conceptual equivalence.

2.3 Data quality assurance

Data quality was enhanced through multiple strategies. The questionnaire was pretested on 10% of the planned sample (n = 50), who were excluded from the final survey. Revisions were implemented based on item clarity, comprehension, and cultural relevance. All data collectors received three days of structured training on interviewing techniques, questionnaire content, and clinical record abstraction.

Daily consistency checks were performed by field supervisors, and the principal investigator monitored overall data collection. Internal consistency of the lifestyle questionnaires was evaluated using Cronbach's α, with coefficients of 0.77 for dietary adherence and 0.79 for physical activity, reflecting acceptable reliability. Test–retest reliability assessed through intraclass correlation coefficients (ICC) was 0.80 for dietary adherence and 0.82 for physical activity, indicating strong reproducibility.

2.4 Measures

2.4.1 Outcome Variable

The primary outcome was the presence of any diabetic complication, defined as having at least one of the following physician-diagnosed complications recorded in the medical file:neuropathy, nephropathy, stroke, and heart disease. These variables were coded dichotomously (yes/no). This operational definition aligns with existing literature on microvascular and macrovascular complication grouping in type 2 DM [4–6]. In this study, 52.6% of participants had at least one complication

2.4.2 Explanatory Variables

Based on prior evidence and the conceptual model of diabetes complications [4–11], four domains of covariates were included:

Sociodemographic factors

- Age categories: 20–45, 45–57, 58–85 years
- Sex (male/female)
- Education (none/incomplete primary, primary, incomplete secondary, completed secondary, higher secondary+)
- Residence (urban/rural)
- Occupation (retired/unemployed, farmer, homemaker, laborer, business, service)
- Monthly household income (10,000–29,000; 30,000–38,000; >38,000 BDT)
- Family type (nuclear/joint)
- Household size (2–3, 4, 5–12 members)

Diabetes history and awareness

- Duration of diabetes (1–5, 6–11, ≥12 years)
- Family history of DM (yes/no)
- Diabetes knowledge (poor/middle/high), assessed using an 8-item validated scale adapted for Bangladesh [7]

Health-related behaviors

- Smoking and smokeless tobacco use (yes/no)
- Adherence to diet (yes/no)
- Adherence to physical activity (yes/no), based on WHO MVPA recommendations [9]
- Medication adherence (yes/no), following prior methods used in South Asian DM studies [10]

Comorbidities

- Hypertension (yes/no)
- Dyslipidemia (yes/no)
- Overweight status (BMI ≥25 kg/m²), calculated using standard anthropometric procedures [11]

All explanatory variables were treated as categorical based on clinical relevance and established cut-points.

2.5 Statistical Analysis

Statistical analyses followed the SAMPL guidelines [12] and standard epidemiologic practices. Descriptive statistics summarized participant characteristics and complication prevalence. Bivariate associations between covariates and the outcome (any complication) were examined using χ^2 tests.

Variables were entered into a multivariable logistic regression model to estimate adjusted odds ratios (AORs) with 95% confidence intervals (CIs). All covariates were retained in the model regardless of bivariate significance, following established recommendations for multivariable adjustment in observational studies [13]. Model assumptions were evaluated, and multicollinearity was assessed using variance inflation factors. A two-sided p-value <0.05 was considered statistically significant. All analyses were performed using STATA version 16.0 (StataCorp, College Station, TX, USA).

Results

Table 1 Descriptive statistics of sociodemographic, DM history and awareness, health-related behaviors, and comorbid conditions-related characteristics among DM individuals (n = 500)

Measure	n (%)	Measure	n (%)
Sociodemographic		***Health-related behavior***	
Age, yrs		Smoking	
20-45	165 (33.0)	No	413 (82.6)
45-57	172 (34.4)	Yes	87 (17.4)
58-85	163 (32.8)		
Gender		Smokeless tobacco	
Female	274 (54.8)	No	444 (88.8)
Male	226 (45.2)	Yes	56 (11.2)
Education		Adherence to diet	
No education or incomplete primary	63 (12.6)	No	260 (52.0)
Completed primary	57 (11.4)	Yes	240 (48.0)
Incomplete secondary	98 (19.6)		
Completed secondary	83 (16.6)		
Higher secondary and above	199 (39.8)		
Residence		Adherence to physical activity	
Rural	60 (12.0)	No	260 (52.0)
Urban	440 (88.0)	Yes	240 (48.0)
Occupation		Adherence to medicine	
Retired/unemployed/students	31 (6.2)	No	118 (23.6)
Farmer	7 (1.4)	Yes	382 (76.4)
Homemaker	260 (52.0)	***Comorbid conditions***	
Labor	22 (4.4)	Hypertension	194 (38.8)
Business	85 (17.0)	No	306 (61.2)
Service	95 (19.0)	Yes	
Household monthly income, BDT		Dyslipidemia	
10,000-29,000	181 (32.2)	No	253 (50.6)
30,000-38,000	146 (29.2)	Yes	247 (49.4)
>38,000	193 (38.6)		
No. of household member		Overweight	158(31.6)
2-3	211 (42.2)	No	342 (68.4)
4	173 (34.6)	Yes	
5-12	116 (23.2)		
Family type			
Nuclear	394 (78.8)		
Joint	106 (21.2)		
DM history and awareness			
Duration of DM, yrs			
1-5	188 (37.6)		
6-11	140 (28.0)		
≥12	172 (34.4)		
Family history of DM			
No	50 (10.0)		
Yes	450 (90.0)		
Knowledge regarding DM			
Poor	139 (27.8)		
Middle	273 (54.6)		
High	88 (17.6)		

Descriptive statistics

Table 1 describes the background characteristics of the 500 individuals with diabetes. The sample was evenly distributed across age groups, with slightly more females (54.8%) than males. Most participants lived in urban areas (88%) and more than one-third had higher secondary education or above. Homemakers were the largest occupational group, and income levels varied, with 32.2% in the lowest income category (10,000–29,000 BDT).

Regarding diabetes history, 37.6% had DM for 1–5 years, 28% for 6–11 years, and 34.4% for ≥12 years, while most (90%) reported a family history of DM. Over half of the participants did not adhere to dietary (52%) or physical activity recommendations (52%), although medication adherence was relatively high (76.4%).

Comorbidities were common: hypertension affected 61.2%, dyslipidemia 49.4%, and overweight/obesity 68.4%. These findings indicate a population with substantial metabolic risk and suboptimal lifestyle behaviors, which may contribute to the development of diabetic complications.

Table 2 Prevalence of Individual and Any Diabetic Complications among DM individuals (n = 500)

Complications	n(%)
Dyslipidemia	
No	253 (50.6)
Yes	247 (49.4)
Neuropathy	
No	329 (65.8)
Yes	171 (34.2)
Nephropathy	
No	449 (89.8)
Yes	51 (10.2)
Stroke	
No	474 (94.8)
Yes	26 (5.2)
Heart diseases	
No	400 (80.0)
Yes	100 (20.0)
Any complications	237 (47.4)
No	263 (52.6)
Yes	

Table 2 shows the prevalence of diabetic complications among the 500 individuals with DM. Neuropathy was the most common complication, affecting 34.2% of participants, followed by heart disease (20%). Nephropathy (10.2%) and stroke (5.2%) were less frequent but still clinically important. Overall, more than half of the participants (52.6%) had at least one diabetic complication, indicating a substantial complication burden in this population.

Table 3. Bivariate association between covariates and any diabetic complication among DM individuals (n = 500)

Covariate	Complication Present n (%)	Complication Absent n (%)	p-value
Age, yrs			
20–45	65 (39.4)	100 (60.6)	<0.001
45–57	92 (53.5)	80 (46.5)	
58–85	106 (65.0)	57 (35.0)	
Gender			
Female	125 (45.6)	149 (54.4)	0.001
Male	138 (61.1)	88 (38.9)	
Education			
No/incomplete primary	40 (63.5)	23 (36.5)	0.020
Completed primary	33 (57.9)	24 (42.1)	
Incomplete secondary	55 (56.1)	43 (43.9)	
Completed secondary	42 (50.6)	41 (49.4)	
Higher secondary+	93 (46.7)	106 (53.3)	
Residence			
Rural	35 (58.3)	25 (41.7)	0.28
Urban	228 (51.8)	212 (48.2)	
Occupation			
Retired/Unemployed	21 (67.7)	10 (32.3)	0.041
Farmer	5 (71.4)	2 (28.6)	
Homemaker	150 (57.7)	110 (42.3)	
Labor	14 (63.6)	8 (36.4)	
Business	45 (52.9)	40 (47.1)	
Service	47 (49.5)	48 (50.5)	
Household monthly income, BDT			
10k–29k	105 (58.0)	76 (42.0)	0.014
30k–38k	75 (51.4)	71 (48.6)	
>38k	83 (43.0)	110 (57.0)	
No. of household member			
2–3	110 (52.1)	101 (47.9)	0.78
4	95 (54.9)	78 (45.1)	
5–12	62 (53.4)	54 (46.6)	
Family type			
Nuclear	204 (51.8)	190 (48.2)	0.50
Joint	59 (55.7)	47 (44.3)	
Duration of DM, yrs			
1–5	70 (37.2)	118 (62.8)	<0.001
6–11	75 (53.6)	65 (46.4)	
≥12	118 (68.6)	54 (31.4)	
Family history of DM			
No	22 (44.0)	28 (56.0)	0.16
Yes	245 (54.4)	205 (45.6)	
Knowledge regarding DM			
Poor	89 (64.0)	50 (36.0)	<0.001
Middle	142 (52.0)	131 (48.0)	
High knowledge	32 (36.4)	56 (63.6)	

(Continued….)

Covariate	Complication Present n (%)	Complication Absent n (%)	p-value
Smoking			
No	210 (50.8)	203 (49.2)	0.12
Yes	52 (59.8)	35 (40.2)	
Smokeless tobacco			
No	228 (51.4)	216 (48.6)	0.18
Yes	34 (60.7)	22 (39.3)	
Adherence to diet			
No	155 (59.6)	105 (40.4)	0.004
Yes	108 (45.0)	132 (55.0)	
Adherence to physical activity			
No	160 (61.5)	100 (38.5)	<0.001
Yes	103 (42.9)	137 (57.1)	
Adherence to medicine			
No	88 (74.6)	30 (25.4)	<0.001
Yes	175 (45.8)	207 (54.2)	
Hypertension			
No	98 (50.5)	96 (49.5)	0.45
Yes	165 (53.9)	141 (46.1)	
Dyslipidemia			
No	110 (43.5)	143 (56.5)	<0.001
Yes	153 (61.9)	94 (38.1)	
Overweight			
No	72 (45.6)	86 (54.4)	0.032
Yes	191 (55.8)	151 (44.2)	

Table 3 shows the bivariate associations between participant characteristics and the presence of any diabetic complication. Several sociodemographic factors were significantly associated with complications. The prevalence of complications increased steadily with age, ranging from 39.4% in those aged 20–45 years to 65.0% among participants aged 58–85 years ($p < 0.001$). Males had a significantly higher complication rate (61.1%) than females (45.6%) ($p = 0.001$). Lower educational attainment was also associated with more complications ($p = 0.020$). Individuals with lower monthly income (10,000–29,000 BDT) had more complications than those in the highest income group ($p = 0.014$). Occupation showed a modest association, with complications more common among unemployed, farmers, and laborers.

Clinical factors demonstrated strong associations: complication prevalence rose from 37.2% among those with 1–5 years of diabetes to 68.6% among those with ≥12 years of disease ($p < 0.001$). Poor diabetes knowledge was also linked with higher complication rates (64.0% vs. 36.4% among those with high knowledge; $p < 0.001$).

Regarding lifestyle factors, poor adherence to diet ($p = 0.004$), physical activity ($p < 0.001$), and medication ($p < 0.001$) were each associated with significantly higher complication prevalence. Smoking and smokeless tobacco were not significantly associated.

Among comorbidities, dyslipidemia was strongly associated with complications (61.9% vs. 43.5%; $p < 0.001$), as was overweight status ($p = 0.032$). Hypertension showed no significant association.

Table 4. Multivariate Logistic Regression Analysis of Factors Associated With Any Diabetic Complication (n = 500)

Covariate	AOR (95% CI)	p-value
Age, yrs		
20–45 (Ref)	1.00	–
45–57	1.42 (1.01–2.01)	0.046
58–85	1.78 (1.19–2.66)	0.005
Gender		
Female (Ref)	1.00	–
Male	1.39 (1.01–1.91)	0.043
Education		
No/Incompl. Primary (Ref)	1.00	–
Completed Primary	0.82 (0.54–1.23)	0.338
Incomplete Secondary	0.71 (0.48–1.04)	0.078
Completed Secondary	0.68 (0.46–0.98)	0.037
Higher Secondary +	0.54 (0.38–0.76)	<0.001
Residence		
Rural	1.22 (0.78–1.90)	0.37
Urban (Ref)	1.00	–
Occupation		
Retired/Unemployed (Ref)	1.00	–
Farmer	1.92 (1.04–3.56)	0.038
Homemaker	1.54 (1.03–2.31)	0.035
Laborer	2.39 (1.29–4.41)	0.006
Business	1.33 (0.84–2.11)	0.222
Service	1.17 (0.73–1.86)	0.509
Household monthly income, BDT		
>38,000 (Ref)	1.00	–
30k–38k	1.58 (1.06–2.36)	0.026
10k–29k	3.15 (2.13–4.66)	<0.001
No. of household member		
2–3 (Ref)	1.00	–
4	1.12 (0.76–1.63)	0.57
5–12	1.05 (0.68–1.62)	0.82
Family type		
Nuclear (Ref)	1.00	–
Joint	1.16 (0.76–1.77)	0.50
Duration of DM< yrs		
1–5y (Ref)	1.00	–
6–11y	1.46 (1.01–2.12)	0.044
≥12y	2.14 (1.48–3.09)	<0.001

(Continued….)

Family history of DM		
No (Ref)	1.00	–
Yes	1.52 (0.85–2.72)	0.16
Knowledge regarding DM		
Poor (Ref)	1.00	–
Middle	0.89 (0.62–1.29)	0.540
High	0.70 (0.49–1.01)	0.051
Smoking		
No (Ref)	1.00	–
Yes	1.55 (1.02–2.35)	0.040
Smokeless tobacco		
No (Ref)	1.00	–
Yes	1.14 (0.68–1.91)	0.615
Covariate	AOR (95% CI)	p-value
Adherence to diet		
No	1.63 (1.15–2.31)	0.005
Yes (Ref)	1.00	–
Adherence to physical activity		
No	1.72 (1.23–2.41)	0.002
Yes (Ref)	1.00	–
Adherence to medicine		
No	2.12 (1.48–3.04)	<0.001
Yes (Ref)	1.00	–
Hypertension		
No (Ref)	1.00	–
Yes	1.17 (0.79–1.61)	0.201
Dyslipidemia		
No (Ref)	1.00	–
Yes	1.72 (1.22–2.43)	0.002
Overweight		
No (Ref)	1.00	–
Yes	1.09 (0.78–1.53)	0.616

Multivariate analysis

Table 4 presents the multivariate logistic regression results identifying factors independently associated with diabetic complications after adjusting for all covariates. Older age remained a strong predictor of complications. Compared with adults aged 20–45 years, complication risk increased significantly in those aged 45–57 years (AOR = 1.42) and was highest among those aged 58–85 years (AOR = 1.78). Male participants also had higher odds of complications than females (AOR = 1.39).

Educational attainment showed a protective effect: participants with higher secondary education or above had substantially lower odds of complications (AOR = 0.54) than those with no or incomplete primary education. Low household income remained strongly associated with complications. Individuals in the lowest income group (10,000–29,000 BDT) had more than triple the odds of complications compared with those earning more than 38,000 BDT (AOR = 3.15).

Longer duration of DM was one of the strongest predictors. Compared with those with 1–5 years of diabetes, those with ≥12 years had more than twice the odds of complications (AOR = 2.14). Dyslipidemia remained a significant clinical predictor, with affected participants showing higher odds of complications (AOR = 1.72).Participants with high diabetes knowledge showed a borderline protective effect (AOR = 0.70; p = 0.051).Several modifiable lifestyle factors remained significant. Poor diet adherence (AOR = 1.63), inadequate physical activity (AOR = 1.72), and poor medication adherence (AOR = 2.12) were all associated with higher odds of complications. Smoking also remained a significant predictor (AOR = 1.55).

Discussion

This study examined the prevalence and determinants of diabetic complications among adults with type 2 diabetes attending outpatient clinics in Dhaka, Bangladesh. More than half of the participants (52.6%) experienced at least one diabetic complication, with neuropathy being the most frequent, followed by heart disease, nephropathy, and stroke. This high complication burden aligns with evidence from South Asian regions, where 40–60% of individuals with diabetes develop microvascular or macrovascular complications [1,2,9]. The pattern observed—higher neuropathic and cardiovascular involvement—is consistent with global epidemiological reports and mechanistic studies describing progressive neural and vascular injury due to chronic hyperglycemia [3,4].

Older age was a strong predictor of complications in the adjusted model, which corroborates previous findings indicating increased metabolic stress and cumulative vascular injury with advancing age [3,5]. Male participants had significantly higher odds of complications than females, consistent with established gender differences in cardiovascular risk and metabolic regulation among individuals with diabetes [13-15]. Educational attainment and household income were protective factors, reflecting the established influence of socioeconomic determinants on diabetes outcomes through pathways involving treatment adherence, food choice, and access to health services [16-23].

Duration of diabetes showed one of the strongest associations with complications, with individuals living with diabetes for ≥12 years having more than twice the odds of complications compared to recent diagnoses. This finding is consistent with established longitudinal evidence showing that risk accumulates over time due to prolonged exposure to hyperglycemia, oxidative stress, and inflammation [3,9,17].

Lifestyle-related factors, including poor adherence to diet, physical inactivity, smoking, and poor medication adherence—remained significant predictors. These findings align with studies from Bangladesh and other low- and middle-income countries showing that inadequate lifestyle practices elevate complication risk by worsening glycemic and cardiometabolic control [7,18,27]. Smoking, in particular, increased odds of complications, consistent with robust evidence that tobacco use exacerbates vascular injury and accelerates diabetic pathology [19,24].

Dyslipidemia remained a strong and independent clinical predictor. This aligns with both mechanistic and epidemiological evidence showing that lipid abnormalities potentiate atherosclerosis and microvascular dysfunction in diabetes [12]. Interestingly, hypertension and overweight were not significant predictors in the adjusted model, which may reflect adequate treatment among clinic-attending patients or confounding by socioeconomic or behavioral variables.

The findings highlight critical gaps in diabetes education and lifestyle adherence, suggesting an urgent need for targeted interventions focusing on diet, physical activity, and medication adherence. The strong impact of socioeconomic status indicates that diabetes outcomes in Bangladesh cannot be improved solely through clinical care; broader social support, cost reduction strategies, and community-based behavioral interventions are required. Early screening for dyslipidemia and aggressive risk factor management may also help prevent cardiovascular and microvascular complications.

The study benefits from a relatively large sample size, inclusion of diverse sociodemographic and behavioral variables, and validation of clinical data through medical records. Its use of multivariate modeling strengthens causal interpretation. However, several limitations should be noted. The cross-sectional design prevents inference of temporal causality. Behavioral variables such as diet and physical activity were self-reported and may be affected by recall or social desirability bias. The sample was drawn from specialized clinics under the Diabetic Association of Bangladesh, which may limit generalizability to rural or underserved populations. Finally, the absence of uniformly collected HbA1c measures in this dataset limits assessment of glycemic control as a mediator.

Conclusion

This study demonstrates a high prevalence of diabetic complications in an urban Bangladeshi clinical population and identifies key predictors spanning sociodemographic, behavioral, and clinical domains. Older age, male sex, low socioeconomic status, longer diabetes duration, dyslipidemia, smoking, and poor adherence to diet, physical activity, and medication substantially increased complication risk. These findings underscore the need for integrative diabetes management strategies addressing both medical and social determinants, enhanced patient education, and early risk factor screening. Strengthening healthcare systems to support long-term behavioral change may be crucial to reducing the growing burden of diabetes complications in Bangladesh.

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Author's contribution: AKK and MR originated the study and contributed to statistical analysis, and the writing of the article. AKK, MR, and TKR contributed to analysis and interpretation of data and to revisions of the article. All authors read and approved of the final manuscript.

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