Original Article

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Socio-Demographic and Clinical Factors Associated with Poor Glycemic Control Among Patients of Type-2 Diabetes Mellitus Presenting at a Tertiary Healthcare Facility

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Author`s Contribution

[1]Conceived and designed the analysis, Drafting.
[2]Analyzing and- Interpreting data
[3] Final approval of the man critical reviewed

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ABSTRACT

Objective: To identify socio-demographic and clinical factors associated with poor glycemic control in type-2 diabetes mellitus patients at a tertiary healthcare facility.

Methodology: This cross-sectional study was conducted at Outpatient department of Medicine, Pakistan Institute of Medical Sciences, Islamabad, Pakistan, from February 2022 to July 2022, included 246 known type-2 diabetes patients of both genders, aged 18 to 75, with at least three consecutive days of fasting blood glucose (FBG) measurements. We assessed socio-demographic and clinical characteristics and classified glycemic control according to ADA guidelines: FBG between 80-130 mg/dl as good control and FBG above 130 mg/dl as poor control. We recorded the prevalence of good and poor glycemic control and compared them based on various socio-demographic and clinical factors.

Results: Among 246 patients, 152 (61.8%) were male, with a mean age of 46.47±11.55 years and a mean BMI of 23.13±5.01 kg/m². The mean diabetes duration was 9.18±7.50 years, and 132 (53.7%) patients had a disease duration > 5 years. Diabetes-related complications were present in 156 (63.4%) patients. Poor glycemic control was found in 137 (55.7%) patients. Significant associations with poor glycemic control were observed for age (p<0.001), educational status (p<0.001), BMI (p=0.002), residential status (p=0.013), family history of diabetes (p<0.001), diabetes duration (p<0.001), and current diabetes medications (p=0.001).

Conclusion: A majority (55.7%) of type-2 diabetes patients in our study had poor glycemic control. Factors such as increasing age, BMI, education level, residential status, family history of diabetes, longer disease duration, and current diabetes medications were significantly associated with poor glycemic control.

Keywords: Body mass index, diabetes mellitus, fasting blood glucose, glycemic control.

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Introduction

Diabetes mellitus (DM) is known to be a global health issue and described as a metabolic disorder characterized by high glycemic levels.[1] DM affects about 5 million deaths globally while 80% of these deaths are reported from lower-to-middle income countries.[2,3] Worldwide estimates have shown that at present, 422 million adults are having DM whereas these figures are expected to soar up to 642 million by the year 2040.[4,5]

As magnitude of mortality and cardiovascular disease related outcomes are directly linked with uncontrolled DM, achievement of desired glycemic levels is perhaps the most important goal for clinicians when they aim management of DM.[6,7] Good glycemic control is vital for ensuring prevention of complications especially in the shape of organ damage as poor glycemic control is the most important risk factor for T2DM related complications and its progression.[8,9] Poor glycemic control is a worldwide challenge when managing T2DM whereas

researches have calculated burden of poor glycemic control ranging between 50-92% in different parts of the world.[10-12] Gender, age, marital status, residential status, literacy, occupation, socio-economic class, family history of T2DM, duration of T2DM, types of medications, BMI, physical activity practices, dietary patterns, DM monitoring practices and family support have been identified to be some of the main reasons affecting glycemic control.[13-17]

Pakistan is ranked among top countries where prevalence of DM is very high but not many studies have been conducted to study factors behind poor glycemic control. Variation in socio-economic status, literacy rate, diabetes related education level, cultural norms and lifestyle, it remains very important to determine major factors that are influencing poor glycemic control so that strategies can be designed in the shape of interventions for improvement in glycemic control among T2DM as improving glycemic control can result in reduction in T2DM related morbidity and mortality.[1] The present study was planned to find out the socio-demographic and clinical factors associated with poor glycemic control among patients of diabetes mellitus presenting at a tertiary healthcare facility.

Methodology

This cross-sectional study was conducted at the outpatient department of medicine at the Pakistan Institute of Medical Sciences in Islamabad from February 2022 to July 2022. Approval from the institution's Ethical Review Board was obtained, and informed written consent was obtained from all study participants.

The inclusion criteria encompassed all known diabetes mellitus (DM) patients of both genders aged between 18 and 75 years who were on follow-up and had undergone fasting blood glucose (FBG) measurements on at least three occasions over three consecutive days. Exclusion criteria included pregnant women, critically ill patients, or those unwilling to participate in the study. With a 95% confidence level, a 6% margin of error, and an expected prevalence of poor glycemic control at 64.1%,[17] the minimum required sample size was determined to be 246. Demographic information such as gender, age, BMI, residential status, educational status, and duration of type 2 diabetes mellitus (T2DM), along with other socio-demographic and clinical characteristics, was collected. Glycemic control was categorized according to ADA guidelines, with an average FBG of three consecutive days between 80-130 mg/dL described as good glycemic control, while FBG above 130 mg/dL was defined as poor glycemic control.[18]

All study data were analyzed using Statistical Package for Social Sciences (SPSS) version 26.0. Categorical data were presented as frequencies and percentages, while numeric data were reported as means and standard deviations. The prevalence of patients with good and poor glycemic control was recorded and compared for various socio-demographic and clinical factors studied. Effect modifiers were controlled through stratification using the chi-square test, with a significance level set at $p<0.05$.

Results

In a total of 246 patients, 152 (61.8%) were male representing a male to female ratio of 1.62:1. The mean age was 46.47±11.55 years while mean BMI was 23.13±5.01 kg/m2. Residential status of 167 (67.9%) patients was urban. Family history of diabetes was present in 140 (56.9%) patients. The mean duration of diabetes was 9.18±7.50 years while 132 (53.7%) patients had disease duration > 5 years. Table-1 is showing detailed description of socio-demographic and clinical characteristics of patients with type-2 diabetes mellitus.

Table-1: Socio-Demographic and Clinical Characteristics of Patients with Type-2 Diabetes Mellitus (n=246)

Socio-Demographic and Clinical Characteristics		Number (%)
Gender	Male	152 (61.8%)
	Female	94 (38.2%)
Age groups (years)	18-30	13 (5.3%)
	31-45	121 (49.2%)
	46-60	76 (30.9%)
	61-75	36 (14.6%)
Education	Illiterate	125 (50.8%)
	Primary	62 (25.2%)
	Secondary to Matriculation	43 (17.5%)
	Intermediate or above	16 (6.5%)
Marital Status	Married	221 (89.8%)
	Single	25 (10.2%)
Monthly Income	Low	230 (93.5%)
	Middle or High	16 (6.5%)
Residence	Rural	79 (32.1%)
	Urban	167 (67.9%)
Family History of Diabetes		140 (56.9%)
Duration of Diabetes (years)	<1	25 (10.2%)
	1-5	89 (36.2%)
	>5	132 (53.7%)
Current Medications for DM	Oral	98 (39.8%)
	Insulin	44 (17.9%)
	Both (Oral+Insulin)	104 (42.3%)

Frequency of diabetes mellitus related complications were observed in 156 (63.4%) patients while neuropathy and

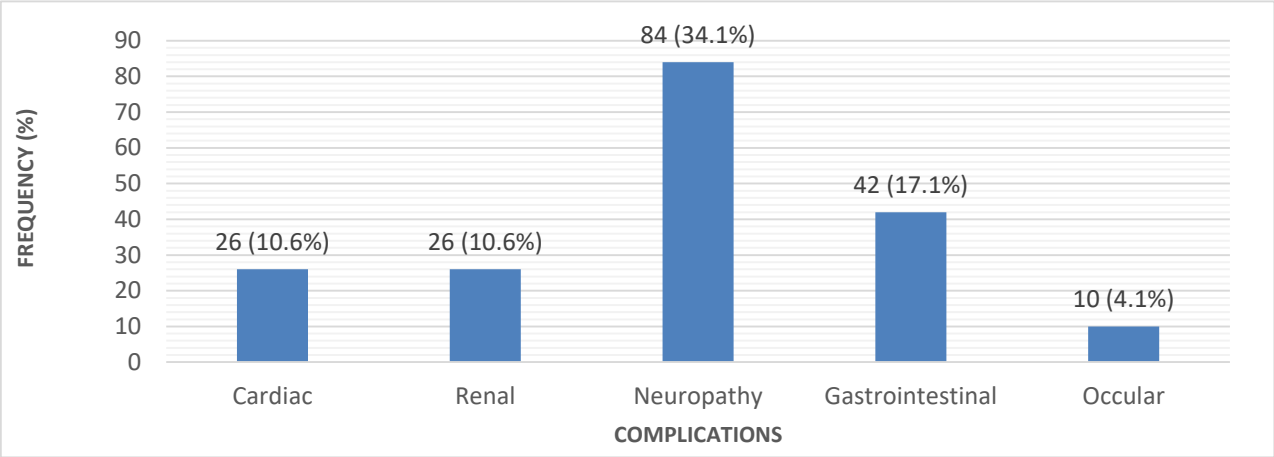

Figure 1. Frequency of Diabetes Mellitus Related Complications (n=246)

gastrointestinal related complications were the most frequent ones noted in 84 (34.1%) and 42 (17.1%) patients respectively. Figure-1 is showing frequency of diabetes mellitus related complications.

Table II: Factors Linked with Poor Glycemic Control (n=246)

Socio-Demographic and Clinical Characteristics		Glycemic Control		P-Value
		Good (n=109)	Poor (n=137)	
Gender	Male	73 (67.0%)	79 (57.7%)	0.136
	Female	36 (33.0%)	58 (42.3%)	
Age groups (years)	18-30	13 (11.9%)	-	<0.001
	31-45	59 (54.1%)	62 (45.3%)	
	46-60	27 (24.8%)	49 (35.8%)	
	61-75	10 (9.2%)	26 (19.0%)	
BMI (kg/m^2)		23.22±4.07	23.05±5.74	0.002
Education	Illiterate	91 (83.5%)	34 (24.8%)	<0.001
	Primary	10 (9.2%)	52 (38.0%)	
	Secondary to Matriculation	8 (7.3%)	35 (25.5%)	
	Intermediate or above	-	16 (11.7%)	
Marital Status	Married	99 (90.8%)	122(89.1%)	0.647
	Single	10 (9.2%)	15 (10.9%)	
Monthly Income	Low	101(92.7%)	129 (94.2%)	0.636
	Middle or High	8 (7.3%)	8 (5.8%)	
Residence	Rural	26 (23.9%)	53 (38.7%)	0.013
	Urban	83 (76.1%)	84 (61.3%)	
Family History of Diabetes	Yes	78 (71.6%)	62 (45.3%)	<0.001
Duration of Diabetes (years)	<1	-	25 (18.2%)	<0.001
	1-5	89 (81.7%)	-	
	>5	20 (18.3%)	112 (81.8%)	
Current Medications for DM	Oral	54 (49.5%)	34 (24.8%)	<0.001
	Insulin	10 (9.2%)	44(32.1%)	
	Both (Oral+Insulin)	45(41.3%)	59(43.1%)	

The mean post-prandial blood glucose and FBG were 231.91±60.56 mg/dl and 149.54±41.99 mg/dl respectively. Good glycemic control was found in 109 (44.3%) patients while remaining 137 (55.7%) had poor glycemic control

Table II is showing comparison of socio-demographic and clinical characteristics of patients associated with poor/good glycemic control. It was found that age ($p<0.001$), educational status ($p<0.001$), BMI ($p=0.002$), residential status ($p=0.013$), family history of diabetes ($p<0.001$), duration of diabetes ($p<0.001$) and current medications for diabetes ($p=0.001$) were having significant association with poor glycemic control.

Discussion

To reduce complications related to diabetes mellitus (DM), maintaining good glycemic control has long been a key strategy in DM management. In this study, our aim was to identify socio-demographic and clinical characteristics associated with poor glycemic control. We found that the majority of patients (55.7%) had poor glycemic control, highlighting the need for improved interventions in managing the current pool of type 2 DM (T2DM) patients. Global data from various developing regions around the world support our findings, indicating that poor glycemic control ranges between 50% and 73.5% among T2DM patients. [9,17,19,20] The variation could be due to different diagnostic criteria and patient characteristics, but overall, the prevalence of poor glycemic control among patients visiting outpatient medical settings appears to be high.

In present study, we observed a clear male predominance among T2DM patients, but no significant association between gender and glycemic control was noted. Yosef T et al. from Ethiopia reported that males had a 2.3 times higher risk of poor glycemic control compared to females, while some other studies have found a significant link between female gender and poor glycemic control.[21] Literature has shown that male T2DM patients are known

to have higher rates of insulin resistance compared to females, but this was not evident in our study.[22]

We found that increasing age and BMI were significantly associated with poor glycemic control. Borgharkar and colleagues reported that for every 1-unit rise in BMI, there was a 0.1% increase in HbA1c. [23] Data from Yosef T et al. also found similar results, noting that overweight and obese T2DM patients had 2.6 and 3.4 times increased odds of poor glycemic control.[21]

Illiteracy status was significantly related to poor glycemic control in our findings. Data from another developing country revealed that patients without formal education were at a 3 times increased risk of poor glycemic control.[21] Data from developing countries align with our findings, underscoring the importance of literacy in glycemic control. Illiteracy or a low level of diabetes education can lead to lapses in self-care and treatment approaches, hindering the achievement of good glycemic control. We also noted that an increasing duration of T2DM was significantly linked to poor glycemic control.[26] It is crucial to monitor and educate T2DM patients about regular self-monitoring of blood glucose so that timely assistance or interventions can be sought to improve glycemic control.[27]

The main limitation of this study is the use of fasting blood glucose (FBG) as the criterion for glycemic control. HbA1c is considered a better predictor of glycemic control, but due to limitations in the study design and the outpatient department setting, we were unable to monitor HbA1c levels in our patients. More prospective studies are needed to further evaluate the impact of glycemic control on both microvascular and macrovascular complications among the local population of Pakistan. This will help in adopting timely interventions and strategies to reduce the overall burden of poor glycemic control in T2DM patients.

Conclusion

The vast majority of type-2 diabetes mellitus (DM) patients (55.7%) had poor glycemic control. Increasing age, BMI, literacy status, residential status, family history of diabetes, disease duration, and current medications for DM management were significantly associated with poor glycemic control.

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