

Original Article

Factors Associated with Poor Glycemic Control: A Real World Data from a Private Outpatient Clinic of South Punjab, Pakistan

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Abstract

Objective: To study the real world data about factors behind poor glycemic control among T2DM patients visiting a private healthcare facility of South Punjab, Pakistan.

Methods: This cross-sectional study was conducted at the outpatient department of medicine, Aleena Hospital, Bahawalpur, Pakistan from 1st July 2021 to 30th December 2021. A total of 896 known T2DM patients of both gender aged between 18 to 75 years, on follow up and who underwent HbA1c levels measurement were included. Gender, age, BMI, residential status, educational status, duration of T2DM, smokers or history of smoking, and presence of hypertension were noted at the time of enrollment. HbA1c levels were asked from all institutional laboratory of the study center. HbA1c $\leq 7\%$ was labeled as good glycemic control while HbA1c $> 7\%$ was designated as poor glycemic control.

Results: In a total of 896 patients, 456 (50.9%) were male. Mean age and mean BMI were 50.55 ± 12.27 years and 26.37 ± 5.48 kg/m² respectively. Residential status of 474 (52.9%) patients was rural while there were 190 (21.2%) patients who were illiterate. Mean duration of diabetes was 6.47 ± 6.39 years. Mean HbA1c was 9.63 ± 2.40 while 130 (14.5%) patients had HbA1c $\leq 7\%$ (good glycemic control) and remaining 766 (85.5%) had HbA1c $> 7\%$ (poor glycemic control). Increasing BMI ($p=0.031$), residential status as urban ($p=0.021$), illiteracy ($p=0.002$) and increasing disease duration ($p=0.019$) were found to have significant association with poor glycemic control.

Conclusion: Vast majority of T2DM patients (85.5%) had poor glycemic control. Increased BMI, illiteracy, low socio-economic class and increased duration of T2DM were found to have significant association with poor glycemic control.

Keywords: Body mass index, glycemic control, socio-economic class, type-2 diabetes mellitus.

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Introduction

Diabetes mellitus (DM) is known to be global health issue and described as a metabolic disorder which is characterized by high glycemic level.¹ DM influences around 5 million death all over the globe while majority of these deaths are occurring in developing countries as around 80% of people with diabetes mellitus are living in developing regions of the world.^{2,3} Global estimates have shown that more than 422 million adult population is accompanying diabetes while these figures are estimated to escalate around 642 million by year 2040.^{4,5}

Type-2 DM (T2DM) is known to be a heterogeneous

group of abnormalities described by insulin resistance, impairment in insulin secretions and increase in glucose production while 90% of DM cases are T2DM.⁶ Last few decades have seen a sharp rise in T2DM cases all over the world, rising from 135 million in 1995 to 300 million in 2025 globally.^{5,7}

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.^{8,9} 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.^{10,11} 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.¹²⁻¹⁸ 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.¹⁹⁻²³

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. The present study was planned to study real world data about factors behind poor glycemic control among T2DM patients visiting a private DM care clinic of South Punjab, Pakistan.

Methods

This cross-sectional study was performed at the out-patient department of medicine, Aleena Hospital, Bahawalpur, Pakistan from 1st July 2021 to 30th December 2021. Inclusion criteria were all known T2DM patients of both gender aged between 18 to 75 years, on follow up and who underwent HbA1c levels measurement. Exclusion criteria were pregnant ladies, critically ill patients or those who were not willing to be part of this study. Considering 95% confidence level with 4% margin of error and expected prevalence of poor glycemic control as 64.1%,²⁴ the minimum sample size was turned out to be 553.

Gender, age, BMI, residential status, educational status, duration of T2DM, smokers or history of smoking, and presence of hypertension were noted at the time of enrollment. HbA1c levels were asked from all institutional laboratory of the study center. HbA1c \leq 7% was labeled as “good glycemic control” while HbA1c $>$ 7% was designated as “poor glycemic control”.²⁵ Approval from Institution’s “Ethical Review Board” was acquired (letter#01/2022, date: 04-01-2022). Informed and written consents were sought from study participants.

All study data was analyzed employing “Statistical Package for Social Sciences (SPSS)” version 26.0.

Representation of categorical data was made using frequencies and percentages while numeric data were calculated in the form of mean and standard deviation. Effect modifiers were controlled through stratification applying chi-square test considering $p < 0.05$ as significant.

Results

In a total of 896 patients, 456 (50.9%) were male. Mean age was 50.55 ± 12.27 years. Mean BMI was 26.37 ± 5.48 kg/m² while 374 (41.7%) patients had BMI below 25 kg/m². Residential status of 474 (52.9%) patients was rural while there were 190 (21.2%) patients who were illiterate (who could not read and write). Mean duration of diabetes was 6.47 ± 6.39 years whereas 314 (35.0%) patients had disease duration of T2DM below 2 years. Table-1 is showing characteristics of all patients.

Mean HbA1c was 9.63 ± 2.40 while 130 (14.5%) patients

Table 1: Characteristics of Patients with T2DM (n=896)

Characteristics	Number
Gender	Male 456 (50.9%)
	Female 440 (49.1%)
Age in years	18-30 46 (5.1%)
	31-40 172 (19.2%)
	41-50 266 (29.7%)
	51-60 244 (27.2%)
	61-70 132 (14.7%)
	>70 36 (4.0%)
BMI in kg/m ²	<25 374 (41.7%)
	25-29.9 331 (37.1%)
	\geq 30 190 (21.2%)
Residential Status	Urban 422 (47.1%)
	Rural 474 (52.9%)
Educational Status	Illiterate 190 (21.2%)
	Literate 706 (78.8%)
Duration of Diabetes Mellitus in years	\leq 2 314 (35.0%)
	3-5 204 (22.8%)
	6-10 196 (21.9%)
>10 182 (20.3%)	
Smokers or History of Smoking	50 (25.6%)
Hypertension	472 (52.7%)

had HbA1c \leq 7% (good glycemic control) and remaining 766 (85.5%) had HbA1c $>$ 7% (poor glycemic control). Figure 1 showing complete categorical distribution of HbA1c levels studied in among all patients included.

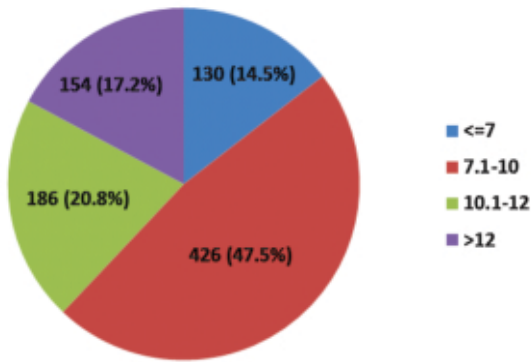


Figure I: Distribution of HbA1c (%) Levels in Patients with T2DM (n=896)

No statistical association of gender (p=0.103), age (p=0.671), smokers or history of smoking (p=0.714) or hypertension (p=0.637) was found with glycemic controls among patients. On the other hand, increasing BMI (p=0.031), residential status as urban (p=0.021) and illiteracy (p=0.002) were found to have significant

Table 2: Association of Patients Characteristics with respect to Glycemic Control (N=896)

Characteristics	Glycemic Controls		P-value	
	Good (n=130)	Poor (n=766)		
Gender	Male	54 (41.5%)	402 (52.5%)	0.103
	Female	76 (58.5%)	364 (47.5%)	
Age in years	18-30	2 (1.5%)	44 (5.7%)	0.671
	31-40	22 (16.9%)	150 (19.6%)	
	41-50	42 (32.3%)	224 (29.2%)	
	51-60	36 (27.7%)	208 (27.2%)	
	61-70	24 (18.5%)	108 (14.1%)	
	>70	4 (3.1%)	32 (4.2%)	
BMI in kg/m ²	<25	62 (47.7%)	312 (40.7%)	0.031
	25-29.9	30 (23.1%)	302 (39.4%)	
	≥30	38 (29.2%)	152 (19.8%)	
Residential Status	Urban	44 (33.8%)	378 (49.3%)	0.021
	Rural	96 (66.2%)	388 (50.7%)	
Educational Status	Illiterate	14 (10.8%)	176 (23.0%)	0.002
	Literate	116 (89.2%)	590 (77.0%)	
Smokers or History of Smoking		6 (4.6%)	44 (5.7%)	0.714
Hypertension		72 (55.4%)	400 (52.2%)	0.637

association with poor glycemic control (table 2).

Figure II is showing relationship of duration of T2DM with glycemic control and it was found that with increase in duration of disease, glycemic control deteriorated significantly (p=0.019).

P-value = 0.019

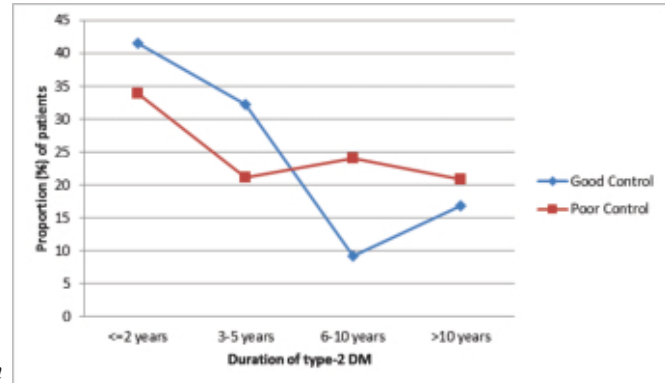


Figure II: Relationship of Duration of T2DM with Glycemic Control (n=448)

Discussion

Glycemic control is nominated to be a major factor behind complications related to T2DM. In the present study, we noted that a vast majority of T2DM patients (85.5%) on follow-up had poor glycemic control. Variation exists regarding proportion of poor glycemic control among T2DM patients ranging between 50-92%.¹²⁻¹⁸ Difference in sample size studied, operational definitions, socio-economic class, cultural norms and lifestyle characteristics are nominated to be reasons behind such variations. Our study showed that no gender was found to have no significant relationship with glycemic control. These findings are in contradiction with what was found from Ethiopia where the researchers revealed that male gender had 2.3 times more risk of accompanying poor glycemic control when compared to female gender.²⁴ Contrary to us, Yakubu A showed association of male gender with poor glycemic control.¹² Some researchers have labeled male gender showing relatively higher insulin resistance levels in comparison to female gender which could be the possible reason behind linkage of male gender with poor glycemic control but we did not observe this.²⁶

We noted that patients with increasing BMI were having significant linkage with poor glycemic control. Borgharkar and colleagues reported that for every 1-unit rise in BMI resulted in 0.1% HbA1c.²⁷ Data from Yosef T et al also found similar results where they noted that overweight and obese patients of T2DM were having 2.6 and 3.4 times increased odds of poor glycemic control.²⁴

Illiteracy was having significant relation with poor glycemic control in the present findings. Data from another developing country revealed that patients who did not have any formal education were at 3 times increased risk of poor glycemic control.²⁴ Data from developing countries is in sync with the present findings regarding importance of literacy regarding glycemic

control.²⁸ Illiteracy or low level of diabetes education can influence lapses in practice and treatment approach by affected individuals aiming good glycemic control. We also found that low socio-economic class was having a significant association with poor glycemic control which is consistent with what has been reported previously.^{29,30} As management of T2DM required long-term care whereas inability to afford and purchase appropriate medications is thought to influence poor glycemic control. Low socio-economic class can also have its impact on monitoring and evaluation of blood glucose levels so these factors can also influence poor glycemic control. We also noted that increasing T2DM disease duration was significantly linked with poor glycemic control. It is important to monitor and ask patients of T2DM for self-monitoring of blood glucose on regular intervals so that timely assistance or interventions can be sought for aiming better glycemic control.

The present study accompanied some limitations. We were unable to gather data about current treatment/therapeutic regimens which could be vital in assessing reasons behind poor glycemic control. We could not evaluate presence of T2DM related complications in current set of patients. Data about physical activity/excursive could not be gathered.

Conclusion

Vast majority of T2DM patients (85.5%) had poor glycemic control. Increased BMI, illiteracy, low socio-economic class and increased duration of T2DM were found to have significant association with poor glycemic control. Effort should be put on increasing DM related education and achievement of optimal body weight.

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