

BARRIERS OF GOOD GLYCEMIC CONTROL OF KNOWN DIABETIC PATIENTS IN A TERTIARY CARE HOSPITAL

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Abstract

Introduction: Uncontrolled Diabetes mellitus is a growing cause of disability and premature death. HbA1c is an indicator of glycemic control status over the previous three months. Therefore, to minimize the morbidity and mortality of diabetic patients, it would be necessary to identify the factors associated with poor glycemic control, which may not be similar to developed countries.

Objective: To identify factors acting as a barrier to reasonable glycemic control of known diabetic patients in Bangladesh

Materials and methods: This is a hospital-based descriptive cross-sectional study among diabetic patients with poor glycemic control in the indoor and outdoor Medicine and Endocrinology departments of Dhaka medical college hospital, Dhaka, from July 2019 to December 2019 (6 months). For at least three months, patients who had uncontrolled Diabetes were selected by purposive and convenient sampling method.

Results: One hundred and six patients with poor glycemic status were included in the analysis. Aged persons were at risk for poor glycemic control, especially age range of 50-69 years (65.0%) P-value was 0.004. Duration of Diabetes and educational status were significantly associated with poor glycemic control. P values were 0.001 and 0.003, respectively.

Conclusion: Patient education plays a pivotal role in controlling glycemic control, favoring treatment success, reducing adverse drug events, and preventing further complications of Diabetes.

Keywords: Diabetes mellitus, HbA1c, Poor Glycemic control

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Introduction

Globally, the number of adults with Diabetes in 2010 was estimated to be 285 million, with a prevalence of 6.4%.¹ Diabetes is a growing cause of disability and premature death, mainly due to cardiovascular diseases and other chronic complications.² Despite well-defined treatment for Diabetes, in most people, glycemic status is poorly controlled with existing therapies.^{3,4} Diabetes Mellitus (DM) is a significant public health problem worldwide⁵ and is reported to be among the five leading causes of death in

most countries. DM is reaching epidemic status; it is estimated that the number of cases will approach 300 million by 2025.⁶ A patient's glycosylated hemoglobin (HbA1c) level indicates glycemic control status over the previous three months. A cut-off point of <7% means optimum glycaemic control. The American Diabetes Association (ADA) recommends a goal of HbA1C <7% for people with Diabetes. This test (measurement of HbA1C) has been considered the gold standard for assessing glycaemic control in diabetes care for the last 25 years.^{7,8}

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Despite research showing the importance of lower HbA1c levels for preventing diabetic complications, there are several possible reasons why adults with Diabetes are not reaching optimal HbA1c, i.e., < 7%. Apart from poverty, illiteracy, and inadequate health facilities, there could be unknown risk factors for poor glycaemic control that may act as barriers to proper diabetes management. Another reason could be that lack of good information and motivation about the morbidity of Diabetes mellitus plays a vital role that we can reverse. A better understanding of the interplay of factors that predict poor glycemic control is necessary for the devastating effects of poor glycemic control in diabetics.

Many diabetic patients remain undiagnosed in the community. Nevertheless, proper glycemic control among individuals with Diabetes should be done, reducing the risk of micro and macrovascular diseases. Poor and inadequate glycemic control among diabetic patients constitutes a significant public health problem and a significant risk factor for developing diabetic complications due to disease factors, factors related to doctors and health care providers, and factors related to self-care management behavior. Many studies have been conducted on this issue worldwide, but only a few have been in Bangladesh. Knowledge of the factors related to poor glycemic control will enable healthcare providers to select patients better for necessary intervention. So, this study will explore the factors related to poor glycemic control of known diabetic patients.

Methodology

Study design: This was a cross-sectional observational study carried out in the Department of Medicine, Dhaka Medical College Hospital, Dhaka, from July 2019 to December 2019. The study aimed To identify factors acting as barriers to reasonable poor glycemic control of known diabetic patients in Bangladesh.

Sampling Method

We used Purposive and convenience sampling. All outdoor and indoor patients above 18 years of age with known diabetes mellitus having poor glycemic control screened by HbA1C were

included in our study. Patients with newly detected diabetes mellitus within the last three months or other treatable causes of Diabetes were excluded from the study. We also excluded patients with severe co-morbid conditions, like end-stage renal disease, decompensated CLD, Severe heart failure, Any malignancy, and psychiatric illness, and Patients who cannot take responsibility.

Data collection

After the patient's arrival with Diabetes Mellitus, the duty doctor of the corresponding medicine department attended to the patient. Then the study physician, whom the duty doctor informed, arrived and immediately followed the patient. The study subjects were enrolled in this study after fulfilling the inclusion criteria. The study's objective was discussed in detail with the patients or their attendants. Demographic information was prospectively recorded and substantiated utilizing inspection of the medical record. The information included was the subject's age, gender, and medical history; all the investigations, as mentioned earlier, are collected in the Data collection sheet and preserved to use later.

Methods of data processing and statistical analysis

Statistical analysis was carried out by using the statistical package for social sciences version 22.0 for Windows (SPSS Inc, Chicago, Illinois, USA). A descriptive analysis was performed for all data. Statistical analyses will be done by using an appropriate statistical tool like 'the chi-square' test and student's t-test, where applicable.

Ethical measures

Prior to the commencement of this study, the research protocol was approved by the Dhaka Medical College Ethical Review Committee. The aims and objectives of the study, along with its procedure, risk, and benefits, were explained to the patients in an easily understandable local language, and then informed written consent was taken from each patient of all the patients of the study intending to enlist.

Operational Definition

1. Criteria for the diagnosis of Diabetes:

HbA1C \geq 6.5%

or,

Fasting plasma glucose (FPG) \geq 126 mg/dl (7 mmol/L) or,

Two hours of plasma glucose \geq 200 mg /dl (11.1 mmol/ L) during an OGTT. The test should be performed as described by the WHO, using a glucose load containing the equivalent of 75g of anhydrous glucose dissolved in water.

Or,

In a patient with classic symptoms of hypoglycemia or hyperglycemic crisis, a random plasma glucose \geq 200 mg/dl(11.1 mmol/L).²⁰

2. Poor glycemic control:

The ADA recommends a good HbA1C < 6.5% for a non-pregnant adult with diabetics. So, poor glycaemic control is deemed as having an HbA1c of more than 7%.

3. Hypertension:

Systolic Blood Pressure > 140 mm of Hg and Diastolic Blood Pressure >90 mm of Hg confirms a diagnosis of hypertension for the diabetic patients.²²

4. Overweight / At-risk BMI:

Cases with BMI \geq 25 kg/m² are considered overweight. At-risk BMI may be lower in some ethnic groups; BMI cut-off value is 24 Kg/m² in South Asians.²³ Therefore, at-risk BMI is considered at \geq 24 Kg/ m².

5. Abnormal lipid profile:

The recommended low-risk fasting lipid values are –
LDL cholesterol <100 mg/dl, HDL cholesterol > 50 mg/dl , Triglycerides <150 mg/dl
Any distortion of that value will be termed an abnormal lipid profile.

6. Co-morbidities:

Patients receiving medications for medical conditions other than DM are classified as having co-morbid conditions.

Results

Mean age incidence of diabetes was found to be 52.81 (\pm 12.7 SD) with a highest incidence of poor diabetes was found to be at age range of 50-69 years (63.2%), (Table I).

This study shows oral antidiabetic agents are used in majority of population (56.6%), insulin used in lesser frequency (19.8%), a combination of both used in 23.8% patients (table II). Hypertension has been found to be associated with diabetes mellitus in 58.5% cases and dyslipidemia in 81.1%. Retinopathy (71.1%) is the most common complication of diabetes mellitus, followed by Nephropathy (50.9%), Ischemic Heart disease (42.0%), Cerebrovascular disease (41.0%), Neuropathy (32.1%), PVD (9.4%), Diabetic Ketoacidosis (9.4%) and Hyperosmolar Hyperglycemic State (0.9%).

Table - I

Demographic characteristics of the patients

Variables	Frequency (%)	Mean \pm SD
Age (years)		
19-29	4 (3.7)	52.81 \pm 12.7
30-49	24 (22.6)	
50-69	67 (63.2.0)	
\geq 70	11 (10.3)	
Gender		
Male	55 (51.9)	
Female	51 (48.1)	
Male: Female	1.07: 1	
Level education		
Illiterate	32 (30.18)	
Primary School	22 (20.75)	
High School	10 (9.43)	
Undergraduate	12 (11.32)	
Graduate	20 (18.86)	
Post-graduate	10 (9.43)	
Personal Habit		
Non-smoker	56 (52.8)	
Current Smoker	38 (35.8)	
Alcoholism	5 (4.7)	
Both	7 (6.6)	

Table - II*Demographic status of the patients of poor glycemic status*

Variables	Frequency (%)
Type of Diabetes	
Type 1 Diabetes Mellitus	5 (4.7)
Type 2 Diabetes Mellitus	101 (95.28)
Duration of diabetes	
<5 years	30 (28.3)
5-10 years	44 (41.5)
>10 years	32 (30.2)
Drugs used	
Oral Anti-diabetic agent	60 (56.6)
Insulin	21 (19.8)
Insulin+ Oral Anti-diabetic agent	25 (23.6)
Blood glucose monitoring	
Checked regularly	50 (47.2)
Not checked regularly	56 (52.8)
Diabetic complications	
Macro vascular complication	
Ischemic Heart Disease	44 (42.0)
Cerebro-vascular disease	43 (41.0)
Peripheral Vascular Disease	10 (9.4)
Micro vascular complication	
Retinopathy	76 (71.7)
Nephropathy	54 (50.9)
Neuropathy	34 (32.1)
Others	
DKA	10 (9.4)
HHS	1 (0.9)

Elderly age group (>50-69 and >70 years) has significant influence on poor glycemic control. This study showed, gender has no relation with poor glycemic status. Patients who are being treated >10 years found to have poor glycemic control. Education has influence on glycemic control, Illiterate and primary school students has significantly higher rate of poor glycemic control. Treatment regimen like Oral antidiabetic agent or, insulin or, both has no relation in poor glycemic status. Table III.

Table - III*Co-relation between poor glycemic status and different factors*

	P value
Gender	
Male	0.687
Female	0.589
Age range	
10-29 years	0.422
30-49 years	0.055
50-69 years	0.004
>70 years	<0.001
Duration of treatment	
<5 years	0.055
5-10 years	0.085
>10 years	0.001
Level of educations	
Illiterate	0.038
Primary School	0.036
High School	0.368
Undergraduate	0.055
Graduate	0.290
Post-graduate	0.067
Comorbid conditions	0.004
Lacking of regular follow-up	0.002
Regular blood sugar check up	0.003
Type of treatment	
Only oral agent	0.071
Only insulin	0.056
Oral and insulin	0.003
Current Smoker	<0.001
Alcoholic	0.475
Both	0.485
Unhealthy Diet plan	<0.001
Regular physical exercise	0.476
Irregular sugar test	0.514

Discussion

Glycemic control knowledge is very crucial to control blood sugar levels. Unfortunately, most patients do not know enough about target blood glucose levels for diabetes management. Therefore, it is difficult for the patients to take appropriate steps for better diabetes

management without knowing the target level of the glycemic target.

Some barriers are responsible for achieving this glycemic target. The majority of the respondents in our study were in the age group of 50–69 years, with a mean age of 52.81 ± 12.735 SD years. Our study shows that age plays an important barrier to achieving glycemic control. Increasing age is more significantly associated with poor glycemic control. Patients aged 50–69 years constitute a higher proportion of patients with poor glycemic control. Elderly patients are most neglected in our society. They are also unaware of their illness, do not take medicine regularly, and are not interested in maintaining a healthy lifestyle. This is similar to a previous study conducted in Dar es Salaam.⁹ There were almost equal proportions of respondents among the two sexes (51.9% vs. 48.1%), with a slightly higher incidence in males. But sex is not associated with poor glycemic control. That means both sexes in our study were at risk for diabetic complications. Heterogeneities of culture, lifestyle, environment, and socioeconomic status play an important role in diabetes management.¹⁰

The first diagnosis's duration contributes to complications because patients lose their patience and hope about the discipline for reasonable glycemic control. Our study found that more than ten years of diabetes disease was significantly associated with poor glycemic control. And this was consistent with previous studies that reported the duration of diabetes was associated with poor glycemic control.^{11,12} Patients with the shortest disease duration may be relatively adherent to medication and recommended diets. From the pathophysiology of the disease, a longer period of diabetes is associated with poor outcomes due to various factors contributing to progressive impairment of insulin secretion, increased insulin resistance, and, eventually, a decrease in insulin secretion. In earlier disease stages, reaching a glycemic goal achieved by good beta cell activity is a progressive decline in the advanced stage.¹³ Our study shows, Poor compliance is responsible for poor glycemic status. Poor adherence is mainly related to drug

numbers, dosing schedules, cost, and side effects. Many studies show unhealthy diet plans harm glycemic status. Mediterranean style diet pattern (e.i. low carbohydrate, high fiber, and unsaturated fat-rich diet) is recommended for better glycemic control. Georg Louis M et al. showed that a healthy. A Mediterranean diet is enough to delay insulin resistance, delay type 2 diabetes mellitus onset, and sometimes delay end-organ damage by ensuring proper glycemic control.¹⁴

South Asian region countries have lower education levels than any other countries. As a result, the less-educated population has little knowledge of a healthy diet and cannot afford the high cost of anti-diabetic drugs or insulin. Our study shows that illiterate and primary school patients have significantly poorer glycemic control than relatively educated patients. Blomster J et. al showed. The impact of the level of education on vascular events and mortality in patients with type 2 diabetes mellitus was similar to another study.¹⁶ This study shows that self-monitoring and physical activity has no relation to poor glycemic status. Another study in sub-Saharan countries shows that to achieve glycemic control targets, self-monitoring of blood glucose, physical activity, and risk reduction behavior are insufficient.¹⁶

Even in many developed European countries, patients may find this degree of disease management difficult, negatively impacting adherence and glycemic control.¹⁷

This study shows that self-monitoring is essential for reasonable glycemic control and is statistically significant. Our study found that physical activity is not related to the poor glycaemic status, which is inconsistent with other studies.¹⁸ The survey in sub-Saharan countries shows that to achieve glycemic control targets, self-monitoring of blood glucose, physical activity, and risk reduction behavior are insufficient.

In general, various problems are encountered in managing diabetes in Bangladesh. It includes issues related to diagnosis, medical care, drug supply, monitoring, diabetes education, cost of medication, and dietary advice. Moreover, poor patient attendance, short consultation time,

inadequate infrastructure, poor evaluation of complications of diabetes, poor record-keeping, disproportionate distribution of healthcare facilities, and lack of adequately trained healthcare professionals are the most critical challenges for better diabetic patient management. In our setup, medicine is not free of cost patients are not supplied with medications; instead, they buy all the medicine. Proper knowledge of the overall burden of diabetes in high-risk populations and countries is a prerequisite for effective diabetes management and avoiding diabetes-related complications. Healthcare delivery. This requires urgent targeted interventions to improve glycemic control in this population and prevent further chronic complications.

It is a single-centered cross-sectional study with a relatively small study population; overall, all patients did not have HbA1c due to financial constraints. A further multi-center clinical study with a larger sample size with an appropriate design is recommended.

Conclusion

This study revealed that slightly less than half of the patients had poor glucose levels. Age, exercise, education level, treatment duration, and smoking were significantly associated with poor glycemic control among type 2 diabetes patients. Thus, patients should know the rationales for self-care activities and take appropriate interventions accordingly. Health sectors should provide continuous health education emphasizing behavioral lifestyle modification with the importance of encouraging physical activity and cessation of smoking. Patient education plays a pivotal role in controlling glycemic control, favoring treatment success, reducing adverse drug events, and preventing further complications of diabetes.

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