Original Article

Glycemic Control among Type-2 Diabetes Mellitus Patients: A Large Samples Hospital Based Study

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ABSTRACT

Objective: To find out the sugar control among type 2 diabetic patients assessed on glycosylated hemoglobin (HbA1C) test.

Study Design: Retrospective study

Place and Duration of Study: This study was conducted at the Pathology Department, Kuwait Teaching Hospital, Peshawar from January 2017 to December 2018.

Materials and Methods: A total of 2654 participants were in the study. The inclusion criteria were type 2 diabetic cases, Pakistani nationals, both genders, and age above 18 years. Freshly diagnosed type 2 diabetes, secondary diabetes, type 1 diabetes, pregnancy associated diabetes, unknown type of diabetic cases or endocrine disorders were excluded. The recorded data were age, gender, and HbA1C. Poor glycemic patients were those cases having above 7% HbA1C level.

Results: The mean age of the participants of the study was 51.96 ± 13.84 years and mean glycosylated hemoglobin 8.52 ± 3.060. The females (n=1608, 60.6%) were more than males (n=1046, 39.4%). Of total sample 2654 the poor glycemic control (>7% HbA1C) was in 1705(64.2%) participants while in 949(35.8%) the glycemic control was good (<7% HbA1C). Glycemic control was different among the age groups very highly statistically significantly (P<0.001). With increasing age the glycemic control become poorer.

Conclusion: About two third type 2 diabetic patients have poor sugar control in our population. These results should be considered in future interventional research aiming to improve glycemic control in type 2 diabetes mellitus patients.

Key Words: Endocrine disorder, Glycemic control, HbA1C, Type 2 diabetes mellitus

INTRODUCTION

Diabetes mellitus (DM) is not a single disease but it is comprised of a group of some other metabolic diseases or disorders that are manifested by chronic hyperglycemia which arise from either insulin poor action, defect in someplace in insulin secretion or both.[1,2] Diabetes mellitus is divided into following general categories: type I diabetes which resulted from autoimmune elimination/damage of beta-cell which in turn causes insufficient production of insulin; type II diabetes which is caused by a gradual or progressive loss of insulin secretion from beta-cell; gestational

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diabetes mellitus which is usually detected in the second or third trimester of gestation; and other special kinds of diabetes which are due to some other causes e.g. neonatal diabetes, maturity-onset diabetes of the young, diseases of exocrine pancreas and drug induced diabetes.[3]

According to survey done in 2014 by world health organization, the world wide prevalence of diabetes mellitus was 9% among people aged 18 years or above.[4] It is estimated that by the year 2035, 592 million people will be affected by diabetes.[5] According to American Diabetes Association (2014) 29.1 million American, or 9.33% of the total US population had diabetes mellitus.[6] In North Africa& Middle East, 10% of the total population is diabetic i.e. >37 million people are diabetic, which is estimated to rise to 68 million by the year 2035. Saudi Arabia has 3.8 million diagnosed cases of diabetes.[7]

Pakistan is located in South Asia and is the 6th most popular country and 36th largest country of the world.[8] Majority of Pakistani population lives in rural areas but growing urbanization has led to high calorie diet, eating more but consuming less, sedentary life style and the stressful condition increase the prevalence of diabetes mellitus in Pakistan.[9] International Diabetic Federation (IDF) reported in 2015,that 415 million population of

the world has diabetes and will increase to 642 million by the year 2040 and in Pakistan the figure will reach to 14.4 million.[7]

Province wise prevalence of diabetes in Pakistan shows that16.2% men and 11.70% women in Sindh; 12.14% men and 9.83% women in Punjab, where's in Balochistan and in Khyber Pakhtunkhwa the mean prevalence is13.3% men and 8.9% women, 9.2% in males and 11.6% in females respectively. Comparing urban and rural areas, type II diabetes affecting more urban than rural areas i.e.14.81% in urban and 10.34% in rural areas.[8]

Glycated hemoglobin provides us the evidence of glucose level in blood for last three months, which is the approximated half-life of red blood cells (RBCs).[6]Glycated hemoglobin is nowadays suggested as a standard diagnostic tool to test and monitor diabetes type II.[10] Koenig et al[11]first proposed the use of HbA1c as a biomarker for monitoring the levels of blood sugar in patients of DM. On HbA1C diabetes is diagnosed at equal to 6.5% or higher.[12] The sensitivity and specificity of HbA1c is good for the diagnosis of DM of type II in comparison to other tests. This test shows sugar control of the last three months.[13]

In a research conducted in China on glycemic control showed that above 50% patient's glycemic control (HbA1C >7%) was poor. This study was retrospective database at a tertiary care diabetes centre.[14] Other studies reported that in type 2 diabetes the poor sugar control was 15 to 68%.[15, 16]

This is of prime importance to know the glycemic control of our population on large sample in order to avoid or stop the complications of type 2 diabetes like nephropathy, retinopathy, vasculopathy, ketoacidosis and diabetic foot. Most of the studies conducted in our country are on prevalence of diabetes and not on glycemic control of type 2 diabetes. This study can help the clinicians to know the burden of uncontrolled diabetes.

MATERIALS AND METHODS

This retrospective study was carried out at Pathology Department, Kuwait Teaching Hospital, Peshawar from 1stJanuary 2017 to 31stDecember 2018 on Khyber Pakhtunkhwa (KP) residents and comprised of 2654 participants. The inclusion criteria were type 2 diabetic cases, Pakistani nationals, both genders, and age above 18 years. Freshly diagnosed type 2 diabetes, type 1 diabetes, secondary diabetes, gestational diabetes, unknown type of diabetic cases or endocrine disorders for instance Cushing syndrome or hyperthyroidism were excluded because of high sugar level. The recorded data were age, gender, and HbA1C.Poor glycemic control patients were those cases having above 7% HbA1C.[14]The data was examined in SPSS-22. Chi-square test was applied and P≤0.05 was the significance level.

RESULTS

The mean age of the study was 51.96±13.84 years and mean glycosylated hemoglobin was 8.52±3.060 (Table I). The females (n=1608, 60.6%) were more than males (n=1046, 39.4%). The most common age category was 40 to 60 years which had 1626(61.3%) participants followed by above 60 years (n=605, 15.9%) and least was 18 to 39 years [n=423, 15.9%] (Table 2). Of total sample 2654 the poor glycemic control (>7% HbA1C) was in 1705(64.2%) subjects while in 949(35.8%) the glycemic control was good [<7% HbA1C] (Fig. 1).
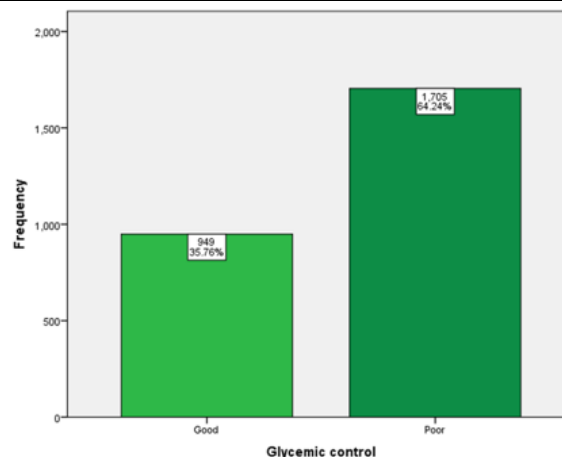
Glycemic control among genders was not different statistically significantly [P=0.677] (Table 3). Glycemic control was different among the various age groups very highly statistically significantly (P<0.001). With increasing age the glycemic control become poorer. Above 40 years, the number of diabetic patients with bad sugar control was more than good glycemic control, and age 40 to 60 years 496(30.50%) had good glycemic control while 1130(69.50%) had poor glycemic control. Similar results were found for above 60 years age (Table 4).

Table 1: Mean and standard deviation of age and glycosylated hemoglobin

Variable	Mean±SD	Range
Age (years)	51.96±13.84	18-105
HbA1C (%)	8.52±3.060	0-17.26

Table 2: Frequency of gender and age groups (n=2654)

Variable	No.	%
Gender		
Male	1046	39.4
Female	1608	60.6
Age (years)		
18-39	423	15.9
40-60	1626	61.3
>60	605	22.8

Figure No.1: Glycemic control of the study

Table 3: Comparison of glycemic control among genders

Gender	Glycemic control				P value
	Good		Poor		
	No.	%	No.	%	
Male	369	35.30	677	64.70	0.677
Female	580	36.10	1028	63.90	

Table 4: Comparison of glycemic control among age groups

Age (years)	Glycemic control				P value
	Good		Poor		
	No.	%	No.	%	
18-39	217	51.30	206	48.70	<0.001
40-60	496	30.50	1130	69.50	
>60	236	39.00	369	61.00	

DISCUSSION

The research was done to find out the control levels of glucose among the patients of type 2 DM. The study findings showed that in 64.2% had poor glycemic control (>7% HbA1C). With increasing age the glycemic control become poorer. As far as the control of blood sugar level in patients with DM type 2 is concerned, the tertiary care hospitals typically carry out realistic estimate comparative to primary and secondary healthcare levels due to large number of cases available.[17]

Our research found that 64.2% patients had poor control of blood glucose level. Liu et al[16] conducted a nationwide multicenter study in China. They reported that 65% type 2 diabetic patients had poor sugar control. Ji et al[18] investigated the sugar control among type 2 diabetics in China receiving oral hypoglycemic drugs or injectable insulin. They included 238,639 patients in their survey. They reported that 68% type 2 diabetic patients had bad sugar control. These results are in consistent with our study. Another cross sectional, multicenter study conducted in Lahore, Pakistan on glucose levels of DM type 2 on elderly subjects. They reported that only two third (32.3%) had good glycemic control[19] and results were found similar to the present study.

However another two studies conducted on blood sugar level among type 2 diabetic subjects reported that 51% and 52% had poor glycemic control respectively.[15,20]The difference in results can be attributed to awareness among patients, educational level of patients, and availability of physicians.

Our results showed that with increasing age the glycemic control become poorer. Similar results were found by Li et al[14] in China and Atif et al[19] in Pakistan. There has an established positive association between prolong duration of type 2 diabetes poor glycemic control.[18,21] As type 2 diabetes is progressive disease, as the time passes the functional and volumetric capacity of β-cells steadily decreases.[14] In order to attain strict glycemic control systemic approach is recommended for type 2 diabetic patients. These include modification in lifestyle like diet and physical activity, use of oral hypoglycemics and insulin as suggested by endocrinologist.[22]

The current study showed that the glycemic control among genders was not statistically significant. Similar findings were shown in retrospective study in China by Li et al.[14]

Our study has some strong and some weak points also but this is the first study of such a large sample to explore the glycemic control among type 2 diabetics in a teaching and tertiary care hospital of Peshawar. We used HbA1C test which gold standard for glycemic control for monitoring over past 3 months. However, our study was retrospective design and single center. So, multi centre and prospective design studies are recommended to further explore this area.

CONCLUSION

About two third diabetic patients have very bad sugar control in our population. These results should be considered in future interventional research aiming to make better the sugar control in diabetic patients.

Author's Contribution:

Concept & Design of Study:	Shabina Saifullah
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Data Analysis:	Akhtar Zarin
Revisiting Critically:	Shabina Saifullah, Muhammad Abbas
Final Approval of version:	Shabina Saifullah

Conflict of Interest: The study has no conflict of interest to declare by any author.

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