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ORIGINAL ARTICLE

Relationship of Glycemic Control with Level of Blood Pressure amongst Type 2 Diabetic Patients

AMMARAH SAEED[1], ZUNERA JAHANZEB[1], UZMA BATOOL[1], SAMIA KAUSER[2], MUSHTAQ MUHAMMAD[3], NASIR MAHMOOD[4]
[1]Assistant Professor Medicine, Internal Medicine Department, PAF hospital, Islamabad
[2]Associate Professor Internal Medicine, Islamic International Hospital and Medical College, Islamabad
[3]FCPS General Medicine, Consultant Medical Physician, DHQ hospital, Charsadda
[4]Associate Professor Medicine, Aziz Fatimah Medical and Dental College, Faisalabad
Corresponding author: Zunera Jahanzeb, Email: doc.zuneramir.@gmail.com

ABSTRACT

Introduction: Inadequate control of glycemia in type-II diabetic patients is an important community health issue and a risk factor for the progression of problems among diabetic patients. Hypertension is a common disease accompanying diabetes. Among patients with diabetes mellitus; high blood pressure is an important factor involved in poor glycemic control which has not been adequately assessed in Pakistan.

Aim: The main goal was to evaluate the glycemic control status in type II diabetic patient depending on the basis of blood pressure levels.

Place and Duration: In Medicine Department of Islamic International Hospital and Medical College, Islamabad for the duration of six months from January 2021 to June 2021.

Methods: 220 adult patients >18 years of age with type-II diabetes mellitus were included. Patients with conditions such as liver cirrhosis, systemic infection, pregnant females, end-stage renal disease and those who were not observing diabetes treatment, counting exercise, dietary restrictions and medication, they were omitted from the anlaysis. By evaluating medical records; the patient's demographic information was obtained which includes medical history, patient age, clinical history, gender, hypertension and type of DM in addition to the assessment of blood sugar level control. Statistical analysis was performed by using the SPSS 20.0.

Results: The patients mean age was 58.10 ± 10.94 years with 35-80 years of age range. Of 220 patients, 145 (65.9%) had hypertension and 75 (34.1%) had normal blood pressure, and 7.72 ± 1.28 years was the patient's mean duration of hypertension. The males have the HbA1c levels of 7.11 ±1.34 and 7.81 ±1.58 in females. In the hypertensive group of patients; mean HbA1c was higher significantly in comparison to the normal blood pressure group ($p = 0.003$). The HbA1c mean levels were also higher significantly among hypertensive patients with duration for over ten years ($p = 0.04$) and in subjects using diuretics ($p = 0.03$) and beta-blockers ($p = 0.006$) as an antihypertensive drug. Among patients with normal body mass index and nutritional recommendations, the mean (± SD) HbA1c in patients with hypertension was 5.13 ± 0.03 compared with patients with normal blood pressure ($p = 0.00007$).

Conclusions: The control of Glycemia in type II diabetic patients is poor with hypertension. There is a complex relation of various factors, including gender, age, hypertension duration, and drugs that strongly effect control of glycemia among hypertensive patients and type-II diabetes mellitus.

Keywords: Hypertension, Type 2 diabetes, HbA1c

INTRODUCTION

Diabetes mellitus is a medicinal condition categorised by raised blood sugar levels because of relative or absolute insulin deficit[1-2]. In insulin and non-insulin dependent forms of DM, environmental stimuli interrelate with genomic predisposition to govern in which individuals will progress towards the clinical disorder[3]. The pervasiveness of DM among all age groups globally was 5.1% in 2020 and is predictable at 6.8% in 2035[4]. The pervasiveness of type-II DM in Pakistan is 12%. It is a communal disorder with significant mortality and morbidity[5-6]. The common adverse effects of DM are due to complications in vascular system, both at the microvascular level (neuropathy, retinopathy, nephropathy) and at the macrovascular level (peripheral neuropathy, coronary artery disease, cerebrovascular disease). Hypertension is a communal comorbid disease that affects most patients, and its incidence varies with the diabetes mellitus type of the patient including ethnicity, obesity and age[7-8]. Various researches have revealed the effectiveness of monitoring cardiovascular risk factors in people with diabetes in delaying or preventing CVD in diabetic patients[9]. The maximum advantages are achieved when numerous causing aspects are taken into account all over the world. Analyzing facts of the UK Diabetic Outlook anlaysis, Stratton et al and Molyneaus et al institute that better control of glycemia in type-II diabetic patients reduces the complications and its incidence[10]. The decline in HbA1c is probable to decrease the complications risk, with the minimum risk of complications if HbA1c remains within the normal range[11]. Maintaining good control of blood sugar in diabetic patients is significant to delay or prevent problems. In Pakistan, there are few studies assessing glycemic status in subjects with hypertension and normotension among type-II diabetics[12]. The main goal was to evaluate the glycemic control status in type II diabetic patient depending on the basis of blood pressure level.

METHODS

This observational and cross-sectional study was held in Medicine Department of Islamic International Hospital and Medical College, Islamabad for the duration of six months from January 2021 to June 2021. Total 220 adult patients >18 years of age with type-II diabetes mellitus were included. Patients with conditions such as liver cirrhosis, systemic infection, pregnant females, end-stage renal disease and those who were not observing diabetes treatment, counting exercise, dietary restrictions and medication, they were omitted from the anlaysis. The Ethics Review Committee of the hospital has given approval of the study. By evaluating medical records; patient's demographic information was obtained which includes medical history, patient age, clinical history, gender, hypertension and type of DM in addition to the assessment of blood sugar level control.

Statistical analysis was accomplished by by means of the SPSS 20.0. All the data were observed under descriptive analysis. The mean values were considered for variables which were continuous. Quantitative and qualitative observations are expressed as percentage, frequency. The chi-square test with CI of 95% was applied for the analysis of categorical variables, which are presented in the cross table. For analysis of the continuous variables; F (ANOVA) and Unpaired t-test was applied. The value of p will be taken as significant if < 0.05 and insignificant if value> 0.05.

RESULTS

A total of 220 patients were enrolled in the study. The HbA1c in mean (± SD) among the studied population was 7.40± 1.91 who were less than 50 years old, 7.55 ± 1.19 among 51-60 years of age patients, 7.28 ± 0.74 among 61-70 years of age patients and 7.65 ± 0.95 in the 70-year-old patients. The difference observed among the aage groups was insignificant (p> 0.520).

Table-1: shows the patients demographic features

Characteristics	Number of Patients (%)
Age	60 (27.3)
< 50 years	
51-60 years	79 (35.9)
61-70 Years	58 (26.4)
>70 years	23 (10.4)
Gender	
Male	135 (61.4)
Female	85 (38.6)
BMI (kg/m^2)	
Normal (<23)	51 (23.2)
Obese(e—25)	97 (44.1)
Overweight (23-24.9)	72 (32.7)
Level of BP	
Normotensive (< 140/90	75 (34.1)
Hypertensive (e"140/90)	145 (65.9%)
Duration of hypertension	
>10years	63 (44.4)
6-10years	49 (33.8)
0-5 years	33 (22.8)
Antihypertensive drugs	
Beta Blocker	35 (15.9)
ACEi/ARB	95 (43.2)
Diuretics	29 (13.2)
No Treatment/others	12 (5.4)
CCB	49 (22.3)
Duration of DM	
>10years	54 (24.5)
6-10years	36 (16.5)
1-5 years	78 (35.4)
<1 year	52 (23.6)
Treatment modalities of T2 DM	
Medication (OHA, insulin)	178 (80.9)
On exercise and dietary recommendation	42 (19.1)

Of 220 patients, 145 (65.9%) had hypertension and 75 (34.1%) had normal blood pressure, and 7.72 ± 1.28 years was the patient's mean duration of hypertension. (Table 1). The males have the HbA1c levels of 7.11 ±1.34 and 7.81 ±1.58 in females. In the hypertensive group of patients; mean HbA1c was higher significantly in comparison to the normal blood pressure group (p = 0.003). Mean HbA1c was also higher significantly among hypertensive patients with duration for over ten years (p = 0.04) and in subjects using diuretics (p = 0.03) and beta-blockers (p = 0.006) as an antihypertensive drug. (Tab 2)

Table 2: shows mean levels HbA1c conferring to gender, age, Duration of hypertension, blood pressure Levels, Antihypertensive drugs

Characteristics	Mean (±SD) HbA1c	P-value
Age		
>70 years	7.65 ± 0.95	
61-70 years	7.28 ± 0.74	
51-60 years	7.55 ± 1.19	0.520
<50 years	7.40± 1.91	
Gender		0.04
Male	7.11 ±1.34	
Female	7.81 ±1.58	
Level of blood pressure		
Normotensive (<140/90)	7.08 ±1.32	0.003
Hypertensive(e"140/90)	7.70 ±1.38	
Duration of HTN		
>10 years	7.92 ±1.46	0.04
<10 years	7.52 ±1.01	
Duration of T2DM		
>10 years	8.40 ±1.68	<0.001
1-5 years	7.71±0.65	
6-10years	7.31 ±1.52	
<1 years	6.75 ±1.21	
Antihypertensive drugs		
Diuretics	7.31 ±1.62	0.03
Beta blocker	8.10 ±1.52	0.006
CCB	7.67 ±1.39	0.89
ACEi/ARB	7.37 ±0.85	0.32

Among patients with normal body mass index and nutritional recommendations, the mean (± SD) HbA1c in patients with hypertension was 5.13 ± 0.03 compared with patients with normal blood pressure (p = 0.00007, Table 3).

Table 3: shows Mean levels of HbA1c conferring to blood pressure levels among patients with normal BMI and on exercise and dietary recommendation

Patients with normal BMI and exercise and on dietary commendation	Mean ((±SD) HbA1c	p value
Normotensive (<140/90)	5.13 ± 0.03	
Hypertensive (≥140/90)	7.09 ±1.05)	0.00007

DISCUSSION

This cross-sectional study observation was conducted to assess the type-II diabetic patients' demographic profile, to monitor blood glucose levels by duration and treatment of hypertension. The patients mean age was 58.10 ± 10.94 years with 35-80 years of age range. Of 220 patients, 145 (65.9%) had hypertension and 75 (34.1%) had normal blood pressure, and 7.72 ± 1.28 years was the patient's mean duration of hypertension. The males have the mean (± SD) HbA1c levels of 7.11 ±1.34 in males and 7.81 ±1.58 in females. Alteration between the age groups was not statistically important (p> 0.520). These results are reliable with the few researches that failed to establish an association between glycemic control and age. For example, Balkkrishnan et al and Shorr et al evaluate the association between glycemic control and age and institute no important changes among the age groups[13-14]. Though, research in Burma by Nyunt et al noticed that age 60 or over was related with poor control of blood sugar levels[15-16]. The perceived variation between the poor control of blood sugar levels and age and can be described by the change in peoples demographic features and age differences in the studies. Hypertension is the utmost common comorbidities in DM2 patients[17]. In our study, 65.9% of the subjects had high blood pressure. Khattab et al, Benoit et al., Adham et al also institute that the maximum of the diabetic people in the study had hypertension[18-20]. The research showed that the peoples having diabetes for long period of time significantly associated with high blood sugar level. The atherosclerosis was mostly seen among diabetic patients have high blood pressure with least control on blood sugar levels.[21] In addition, adverse effects of some antihypertensive drugs on glucose metabolism have been documented. All these aspects collectively subsidise to poor control of glycemia among diabetic patients with hypertension[22]. Studies have shown that hypertension is independent control factor in diabetic patients with poor glycemic control[23-24].

Limitations: We found that this analysis was limited to a small sample size. Solitary one hospital was included in the survey, so the survey result may not reflect the full depiction of the country.

CONCLUSION

The control of Glycemia in type II diabetic patients is poor with hypertension. There is a complex relation of various factors, including gender, age, hypertension duration, and drugs that strongly effect control of glycemia among hypertensive patients and type-II diabetes mellitus.

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