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HYPERTENSIVE PATIENTS;
IMPAIRED GLUCOSE TOLERANCE

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ABSTRACT… Introduction: Hypertension along with impaired glucose tolerance has additive effect on the development of complications. Insulin resistance mediates accelerated development of hypertension related complications. **Study Design:** Cross-sectional study. **Setting:** Outpatient department of Dow university hospital. **Period:** 1st March 2017 to 31st March 2017. **Method:** OGTT was performed in 120 non-diabetic hypertensive patients presenting. **Results:** Among 120 patients, 77 were males whereas females were 43. Impaired glucose tolerance was found in 30.8 % patients. 40.5% were males and 59.4% were females. **Conclusion:** Impaired glucose tolerance can lead to future development of vascular complications in hypertensive patients due to lipogenic effects of insulin.

Key words: Hypertension, Impaired Glucose Tolerance, OGTT.

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INTRODUCTION

Hypertension along with impaired glucose tolerance has additive effect on the development of complications. They have additive effect on the development of microvascular and macrovascular complications. Mechanisms underlying these phenomenon are explained as follows. Hypertension is associated with increased renal sodium absorption and activation of renin angiotension aldosterone system. This leads to increased peripheral vascular resistance and increases sympathetic outflow. These mechanisms lead to impaired glucose homeostasis.[1] Long standing hyperglycemia impairs endothelial function and leads to atherosclerosis. Post prandial hyperglycemia suppresses endothelial medicated vasodilation. Hypertension along with hyperglycemia accelerate the process of atherosclerosis leading to early onset of complications. It therefore becomes necessary to diagnose impaired glucose tolerance at the earliest stage possible to prevent endothelial damage.[2]

Insulin resistance is an independant factor for the development of carotid arterial sclerosis in hypertensive patients. Tomiyama et al's study suggests that even in the early stages of glucose intolerance in hypertensive patients, vascular functional damage is seen and measures should be taken for its early diagnosis. Impaired glucose tolerance is also an independant factor for development of cardiovascular events and all cause morbidity and mortality.[3,4] Insulin stimulates proliferation of smooth muscle cells of arterioles which is a step towards development of hypertension. It activates multiple genes involved in inflammation.[5] Insulin also upregulates lipogenesis and hepatic very low density lipoprotein (VLDL) synthesis (VLDL) by stimulating sterol regulatory element binding protein 1c and inhibition of acetyl coenzyme A-1 carboxylase. Insulin resistance can lead to micro and macrovascular complications.[6]

The objective of this study is to determine the percentage of non-diabetic hypertensive patients with impaired glucose tolerance who are at risk of developing diabetes or vascular complications later in life.

METHOD

This is a cross-sectional study done among patients presented in medical OPD of Dow

University Hospital Karachi. Study comprised of 120 hypertensive patients. Inclusion criteria included hypertensive non-diabetic patients between age 35-75 years presenting in medical OPD of Dow University Hospital between the study duration 1st March 2017 to 31st March 2017. Exclusion criteria included patients with co-morbidities other than hypertension.

Blood pressure was measured in both arms using mercury sphygmomanometer in sitting posture with 5 minutes of rest to confirm the diagnosis of hypertension. Blood pressure cuff was selected bases on patient's arm circumference. The mean of both readings was considered as the final result. Fasting blood glucose was measured and then oral glucose load of 75 mg was given to patients. Blood glucose was measured using venous blood. The WHO criteria was used for diagnosis of impaired glucose tolerance. Impaired fasting glucose was diagnosed if the fasting plasma glucose was 7.0 mmol/l (<126mg/dl) with a two hours glucose tolerance value of 7.8-11.0 mmol/l (140-199 mg/dl)[4]. Patients were asked to avoid use of nicotine and high sugar products one week prior to performing oral glucose tolernce test (OGTT). SPSS version 16.0 was used for analysis of data.

RESULTS

Among 120 patients, 77 were males whereas females were 43. Male to female ratio was 1.7:1. Mean age was found to be 56 +/- 8.8. Majority of individuals were between ages 46-65 years. The minimum age was 36 years whereas the maximum age was 75 years. Demographic variables are shown in Table-I. Impaired glucose tolerance was found in 30.8 % patients. 40.5% were males and 59.4% were females. This is shown in detail in Table-II.

Variable	No. Patients	Percentage
Gender		
Male	77	64.1%
Female	43	35.8 %
Age		
35 - 45 years	15	1.5 %
46 - 55 years	39	1.5 %
56 - 65 years	43	1.8 %
66 -75 years	23	19.1 %

Table-I. Demographic variables.

Age	No. of Patients	Males and females
35 - 45 years	4	1 male, 3 females
46 - 55 years	8	2 males, 5 females
56 - 65 years	9	5 males, 4 females
66 -75 years	11	6 males, 5 females

Table-II. Impaired glucose tolerance in patients

Age	Glucose level <8.9 mmol/L	Glucose level 8.9-12.1 mmol/L
35 - 45 years	11	4
46 - 55 years	31	8
56 - 65 years	34	9
66 -75 years	12	11

Table-III. Oral glucose tolerance test

DISCUSSION

In hypertensive patients aged 55-75 years, screening for diabetes mellitus is cost effective when compared with the screening for general population because they are 2.5 times more likely to develop diabetes mellitus in future.[7,8] We performed OGTT in individuals aged 35-75, majority of which were between ages 46-65 years. Another study have reported that hypertensive subjects with impaired glucose tolerance have 50% risk of developing type 2 diabetes mellitus over 10 year period.[9,10] Fasting glucose measurement can miss the diagnosis of diabetes in one third patients whereas impaired glucose tolerance gives confirmed diagnosis of diabetes. However most physicians avoid using OGTT because of its complicated methodology. Implicating the use of OGTT can reduce the number of patients which are left undiagnosed and diagnosed later in life. Early diagnosis helps commencement of preventive and treatment strategies which can reduce the number of future cardiovascular events.[11] It has been estimated that treatment of diabetic patients without any complications is cost-effective than treatment of diabetes related complications. Although it is difficult and time consuming to perform OGTT in every patient. Combination of raised BMI and long standing hypertension should guide the physician to perform OGTT.[12]

Korhonen et al reports his study results which was conducted among 6013 hypertensive

patients aged 45-70 years.[13] He reports that every fifth hypertensive patient had impaired glucose tolerance. "41% of hypertensive patients had impaired glucose tolerance. Similarly another study reports 4500 randomly selected Finns aged 45-74 years. This study reports impaired glucose homeostasis in 28% women and 32% men.[14] Our study shows 41% males and 49% females. The White Hall study which was conducted over period of 18-20 years, the incidence of cardiovascular mortality among patients with impaired glucose tolerance was 2 times more than normal control subjects.[15] Salmasi et al reports his study results conducted on 99 patients who were not diagnosed with diabetes previously and were visiting hypertensive clinic because of uncontrolled hypertension. OGTT was abnormal in 58% patients with impaired glucose tolerance in 18% patients and type 2 diabetes mellitus in 24% patients. Hoorn's study reports 10 times increased risk of conversion to type 2 diabetes mellitus in patients with impaired glucose tolerance.[16] Luders et al impaired glucose tolerance in 39% and type 2 diabetes mellitus in 12% patients when OGTT was performed in 260 patients.[17] Our study reports impaired glucose tolerance in 30.8% hypertensive patients majority of which were females."

The American diabetes association recommended using fasting blood glucose instead of OGTT for diagnosing impaired glucose tolerance in patients with hypertension[18] however the Diabetes Epidemiology: Collaborative Analysis of Diagnostic Criteria (DECODE) in Europe suggested that 75g OGTT is better indicator of glucose intolerance than fasting blood glucose.[19] Tomiyama et al's study suggests that 2 hour blood glucose levels in patients are a better indicator of endothelial dysfunction than fasting blood glucose.[20]

Our study reports impaired glucose tolerance in patients with hypertension. In contrast to this, studies have been done which report impaired glucose tolerance which leads to development of hypertension later in life. In the Paris Prospective cohort study, fasting glucose and post-prabdial glucose of 4,419 Caucasian non-diabetic, non-hypertensive men was analyzed. Individuals with elevated fasting and post prandial glucose were found to have hypertension of follow up.[21] Chan et al's study reports that abdominal obesity is an independent and powerful risk factor for the development of hypertension in later life. Obesity is associated with insulin resistance and insulin resistance can mediate the development of hypertension in later life due to its effect on vasculature.[1] Korohonen et al reports that glucose homeostasis and weight had significant correlation in women and not in men.[13] Weight losing campaigns should be made part of routine health care among patients. Antihypertensive medications such as thiazide diuretics and beta blockers also account for impaired glucose tolerance.

CONCLUSION

The rate of impaired glucose tolerance in hypertensive patients of our community was 30.8%. These patients are at increased risk for developing diabetes in future and hence more likely to develop vascular complications. OGTT If performed regularly by clinicians can help in early diagnosis and commencement of preventive strategies.

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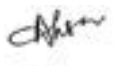
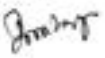
1	Ahsan Mobin	Conception and design, Critical revision of the article for important intellectual content.	
2	Imtiaz Manzoor	Statistical expertise, Critical revision of the article for important intellectual content	
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