Original article:

Study of Evaluation of Prevalence of Hypertension in Type - 2 DM Patients at a Tertiary Care Centre

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ABSTRACT

Introduction: Cardiovascular disease is the most prevalent cause of morbidity and mortality in diabetic patients. Hypertension (HTN) has been confirmed as a major risk factor for cardiovascular disease, which is frequently associated with diabetes mellitus (DM). This study hence helps the health care professionals and health care system to identify the prevalence rate of HTN among T2DM patients.

Materials and Methodology: Present study was a descriptive, cross-sectional, single centered study conducted in the Department of General Medicine, Santosh Medical College, Ghaziabad, Uttar Pradesh, India. The duration of the study was estimated to be around 6 months. After evaluating those patients who were reported to the department, there were 330 patients who had qualified to be included for the study purpose forma the study participants. A questionnaire was designed in which all necessary/relevant/support questions were asked based on the title of the concept note. Similar studies and questionnaires were reviewed and a contextualized questionnaire for this study was produced.

Results: A total of 330 patients were included in the study wherein 122 patients were reported to be males and 208 were females. The mean age of the patients was 54.12 years with Standard deviation (SD) of ±11.58 years. The mean duration of diabetes mellitus was 7.1 SD ± 5.98 years. Mean HbA1c of the patients was 9.29 SD ± 2.45% and mean random plasma glucose was 225.43 SD ± 89.32 mg/dl. The elevated blood pressure was detected in 70.5% of the patients.

Conclusion: To conclude, the findings associated in present study show high prevalence of hypertension in type-2 diabetes patients with a significant difference in the rate of elevated blood pressure between males and females.

Key words: Prevalence, Hypertension, Diabetes.

INTRODUCTION

The prevalence of hypertension among type 2 diabetes mellitus (DM) patients is higher than that of age and sex matched patients without diabetes, ranging variedly from 32% to 82%.[1] It is considered as a disorder in which the blood pressure (BP) is reported to be abnormally high and is denoted as systolic BP ≥140 mmHg and/or diastolic BP ≥90 mmHg.[1,2] Hypertension majorly contributes to the worldwide disease burden and global mortality. Hypertension is one of the important causes of global disease burden and is estimated to cause 7.5 million deaths and reportedly about 12.8% of all annual deaths throughout the world.[3] According to the Global Health Observatory Report, the overall prevalence of hypertension among the adults ≥25 y of age was around 40% in 2008.[4]

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The major frequency of hypertension among the diabetic population is mostly twice as that of the non-diabetic patients based on the earlier epidemiological studies. According to 2009 WHO report, almost over 80% of the population will end up in cardiovascular disease,[3] especially hypertension and stroke because the underlying cause for these in most patients observed by diabetes developed hypertension. One of the key risk factors for cardiovascular disease is hypertension and it is present in all populations around all the group of populations in the world.[4,5]

The control of hypertension among diabetics can largely affect cardiovascular disease outcomes, since the relationship associated between hypertension and risk of cardiovascular events is continuous and even reported to be consistent.[6] Hyperglycaemia, insulin resistance and dyslipidemia are all the observable characteristics of diabetes. All of these factors majorly promote the development and progression of atherosclerosis by enhancing the inflammation, coagulation, endothelial dysfunction and defragment of platelets, which could possibly lead to narrowing of blood vessels and increase in peripheral vascular resistance that contribute to the development of hypertension.[7] Identifying and scrutinizing the factors that are associated with hypertension among diabetics is criticalin designing the appropriate strategies in effectively managing the hypertension and its life-threatening complications. Hypertension is a significant and controllable risk factor for many diseases, but many people are basically unaware of the fact that they have hypertension because HTN is largely a symptomless condition. This study hence helps the health care professionals and health care system to identify the prevalence rate of HTN among T2DM patients.[8]

MATERIALS AND METHODOLOGY

Present study was a descriptive, cross-sectional, single centered study conducted in the Department of General Medicine, Santosh Medical College, Ghaziabad, Uttar Pradesh, India.

The duration of the study was estimated to be around 6 months. There were certain inclusion criteria that were being followed in this study that include those patients diagnosed as diabetic and are in the age range of 20 – 80 years, those diabetic patients whose blood pressure is around 140/90 mmHg and are under anti-hypertensive medications were enrolled in the study.

The Blood pressure was recorded in a sitting position in the right arm, using a standard mercury sphygmomanometer with appropriate cuff size. For optimal blood pressure estimation, patients were allowed to be seated quietly for 5–10 min to alley anxiety and restlessness. Patients with observable serious illnesses, pregnant woman, type – 1 diabetic patients and patients who did not show their willingness toward their study purpose were basically excluded from the study protocol. After evaluating those patients who were reported to the department, there were 330 patients who had qualified to be included for the study purpose forma the study participants.

A questionnaire was designed in which all necessary/relevant/support questions were asked based on the title of the concept note. Similar studies and questionnaires were reviewed and a contextualized questionnaire for this study was produced.

Statistical analysis of the data was performed in SPSS, Version 24 program (IBM, Armonk, New York). Correlation between different continuous variables was tested using two tailed Pearson tests.

RESULTS

A total of 330 patients were included in the study wherein 122 patients were reported to be males and 208 were females. The mean age of the patients was 54.12 years with Standard deviation (SD) of ±11.58 years. The mean duration of diabetes mellitus was 7.1 SD ± 5.98 years. Mean HbA1c of the patients was 9.29 SD ± 2.45% and mean random plasma glucose was 225.43 SD ± 89.32 mg/dl. The elevated blood pressure was detected in 70.5% of the patients.

The minimum systolic blood pressure was 76 mmHg and the maximum was 241 mmHg with a mean systolic blood pressure of 146.89 SD ± 23.24 mmHg. Minimum diastolic blood pressure in these patients was 58 mmHg and the maximum was 126 mmHg with a mean of 89.65 SD ± 11.61 mmHg. The mean pulse pressure was 57.44 SD ± 15.61 mmHg and the mean arterial pressure of the study population was 48.95 SD ± 7.75 mmHg. The systolic blood pressure and age had a positive correlation according to the results obtained and there was an increase in SBP with increasing age, on the other hand the correlation between age and diastolic blood pressure was statistically insignificant.

The mean bodyweight of the patients was 73.13 SD ± 13.77 Kg. Duration of diabetes had statistically significant negative correlation with both body weight and BMI of the patients, it means that there was significant decrease in both body weight and BMI with increasing duration of diabetes mellitus.

Table 1: Present study

Parameters	Values
Age (years)	54.12 ± 11.58
Male, n (%)	122 (36.9%)
Female, n (%)	208 (63.1%)
Duration of diabetic condition (years)	7.1 ± 5.98
HbA1c (%)	9.29 ± 2.45
Prandial plasma glucose (mg/dL)	225.42 ± 89.22
Systolic blood pressure (mg/Hg)	146.89 ± 23.24
Diastolic blood pressure (mg/Hg)	89.65 ± 11.61
Mean arterial pressure ()	48.95 ± 7.75
Body weight (kgs)	73.13 ± 13.77
Height (cms)	1.61 ± 0.08
BMI (kg/m^2)	28.75 ± 5.61

DISCUSSION

Hypertension in insulin resistance states is generally attributed to hyperinsulinemia, with resulting increases in renal sodium retention and/or sympathetic nervous system activity. Hyperinsulinemia induces hypertension through increased renal tubular reabsorption of sodium and water, increased sympathetic nervous system activity, proliferation of vascular smooth muscle cells, and alterations of transmembrane cation transport. At physiological concentrations, insulin decreases urinary sodium excretion, an action mediated by binding to

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specific high-affinity receptors.[9]

Various earlier studies have shown the main factors of hypertension and type 2 diabetes to include age, sex, smoking, exercise, family history, dietary habits, body mass index (BMI) and waist circumference. Particularly, obesity in terms of BMI is the main cause of these diseases; thus, with an emphasis on continuous weight management and prompt research is actively being conducted. But, some studies have suggested that type 2 diabetes may occur due to metabolic syndrome even with a normal BMI and waist circumference.[10] Adults with type 2 diabetes and poor glycaemic control are at increased risk for the development of microvascular complications involving the kidney that are exacerbated by comorbid hypertension. In the countries like U.S. and Puerto Rico, almost over 116,000 adults began treatment for endstage renal disease (ESRD) in 2009 and the two leading causes were diabetes and hypertension, with incident rates of ESRD increased among African American, Native American, and Hispanic populations. Data from the UK Prospective Diabetes Study (UKPDS) and other adult studies have addressed the impact of intensive treatment of hyperglycaemia and hypertension on the development and progression of diabetic nephropathy.[6]

Although progressively increased prevalence of dyslipidemia and hypertension was observed in patients with diabetes in Taiwan, there was a decrease in the prevalence of stroke and CVD in the past 10 years. Among those with macrovascular diseases, except PVD, there was a trend of decreased prevalence of hypertension and dyslipidemia during the study period. In patients with microvascular diseases, the prevalence of hypertension and dyslipidemia in patients with eye diseases increased in the past 10 years. More aggressive management of different risk factors is warranted in diabetic patients with various vascular diseases.[11] Cardiovascular complication is the leading cause of mortality in patients with diabetes. Dyslipidemia and hypertension are the major risk factors contributing to cardiovascular disease.[10] Hypertension is a major independent risk factor for coronary artery disease, stroke, heart failure, and renal failure. One of every 3 American adults or approximately 67 million adults (31%) have hypertension. A person over the age of 55 years has a 90% lifetime risk of developing hypertension. Hypertension accounts for 18% of cardiovascular disease deaths in Western countries.[12] In our study, the elevated blood pressure was detected in 70.5% of the patients, which is is much higher than the prevalence of hypertension in diabetic patients reported by Kearney PM et al.[13] The reason for this high prevalence might be the pattern of patients which are visiting or being treated in our centre, which is a subspecialty clinic and most of the patients are either referred or complicated patients.

The mean age of the patients was 54.12 ± 11.58mmHg year and mean duration of diabetes was 7.1 ± 5.98 year which are close to that reported by BC Unadike in Nigeria.[14] The short and long term glycaemic indices were high in this study; mean HbA1c was 9.29 ± 2.45% and mean random plasma glucose was 225.42 ± 89.22 mg/dl which shows long and short term poor glycaemic control in the study population. The reason for this poor blood glucose control might be again the site of the study which was a subspecialty care center and most of the patient were either diabetic patients with complications or were referred from other centers for proper treatment. The systolic blood pressure and age had a positive correlation and there was an increase in systolic blood pressure with increasing age, on the other hand the correlation between age and diastolic blood pressure was statistically insignificant. Duration of diabetes had statistically significant negative correlation with both body weight and BMI of the patients. It means that there was significant decrease in both body weight and BMI with increasing duration of diabetes mellitus. This decrease in body weight might be either due to age related sarcopenia or may

be explained by the catabolic state of most of the patients, which can be inferred from mean HbA1c and mean random plasma glucose of the study population. Loss of glycaemic control in the long term may be either due to poor adherence of the patients to the treatment or it may be due to lack of support from the family for continuation of the treatment.[10]

CONCLUSION

To conclude, the findings associated with study show high prevalence of hypertension in type-2 diabetes patients with a significant difference in the rate of elevated blood pressure between males and females. The systolic blood pressure had a positive correlation with age. But, it was insignificant for diastolic blood pressure. Healthcare providers and other health sector should work in collaboration for designing appropriate preventive strategies targeting the modifiable risk factors associated with hypertension.

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