

Analysis of Hypertension and its Associated Factors Among Type 2 Diabetes Mellitus Patients: An Institutional Based Study

Mohammad Rashid Farooqui

Associate Professor, Department of General Medicine,
DD Medical College & DD Hospital, Thiruvallur, Chennai, Tamilnadu, India.

Article History

Received: 15 Jan 2016

Revised: 07 Feb 2016

Accepted: 22 Feb 2016

*Correspondence to:

Dr. Mohammad Rashid Farooqui
Associate Professor,
Department of General Medicine, DD Medical College & DD Hospital, Thiruvallur, Chennai, Tamilnadu, India.

ABSTRACT

Background: Diabetes and its complications are a major cause of morbidity and mortality in the United States and contribute substantially to health care costs. Hypertension is a progressive cardiovascular syndrome that emerges from a variety of complex and interconnected causes. Hence; the present study was conducted to analyze hypertension and its associated factors among type 2 diabetes mellitus patients.

Materials & Methods: A total of 200 patients were evaluated. Only patients with confirmed diagnosis of diabetes were enrolled. Diabetes mellitus was identified based on the 2010 guidelines established by the American Diabetes Association, which stipulate that a diagnosis can be made if the fasting plasma glucose (FPG) is equal to or greater than 126 mg/dl, the 2-hour post-challenge plasma glucose (2-h PG) is equal to or greater than 200 mg/dl, the HbA1C level is equal to or exceeds 6.5%, or if the patient is utilizing an oral hypoglycemic agent. Comprehensive demographic and clinical information for all patients was collected, and a structured form was developed to document anthropometric measurements. Blood pressure (BP) was evaluated and categorized according to the Seventh Report of the Joint National Committee on High Blood Pressure, with classifications including normal (<120 mm Hg systolic and <80 mm Hg diastolic), prehypertension (120–139 mm Hg systolic or 80–89 mm Hg diastolic), and hypertension (≥140 mm Hg systolic or ≥90 mm Hg diastolic, or the use of antihypertensive medication). Blood samples were collected, and biochemical profiles were assessed.

Results: A total of 200 patients were enrolled. The mean age of the patients was 51.3 years. 67.5 percent of the patients were males while the remaining were females. 59.5 percent of the patients were of rural residence. Hypertension was seen in 51.5 percent of the patients. Obesity, dyslipidemia, poor socio-economic status and cigarette smoking habit were found to be significant risk factor associated with occurrence of hypertension among diabetic patients.

Conclusion: T2DM is linked to an elevated risk of premature mortality and morbidity, primarily due to CVD including HTN, stroke, and end-stage renal disease. Hypertension stands out as the predominant cause of morbidity and mortality attributable to cardiovascular conditions.

KEYWORDS: Diabetes Mellitus, Hypertension, Obesity.

INTRODUCTION

Diabetes and its complications are a major cause of morbidity and mortality and contribute substantially to health care costs. Although a rise of diabetes has been seen over the past 2 decades, we can expect a continued

rise in the incidence of diabetes as the population ages, a continued increase in adult obesity rates, and an increase in the population of minority groups that are at high risk for diabetes.¹⁻³

The aetiology of diabetes in India is complex and influenced by a combination of genetic predispositions and environmental factors, including obesity linked to improved living standards, ongoing urban migration, and changes in lifestyle. Despite the significant prevalence of diabetes in the country, comprehensive nationwide studies and multi-centric research on the prevalence and complications of diabetes remain scarce.^{4, 5}

Furthermore, existing studies may be subject to inaccuracies due to the diverse cultural, ethnic, and socio-economic landscape of the Indian population, which complicates the generalization of regional findings to the national level. Nevertheless, certain patterns of diabetes prevalence can be observed in relation to geographical distribution across India. Preliminary estimates indicate that the prevalence of diabetes in rural areas is approximately one-quarter that of urban populations, a trend that is also evident in other countries within the Indian subcontinent, including Bangladesh, Nepal, Bhutan, and Sri Lanka.^{6, 7}

Hypertension is a progressive cardiovascular syndrome that emerges from a variety of complex and interconnected causes. Initial indicators of this syndrome frequently manifest prior to the establishment of sustained elevations in blood pressure; thus, hypertension cannot be defined exclusively by specific blood pressure thresholds. The advancement of this condition is closely linked to both functional and structural abnormalities in the heart and blood vessels, which can result in damage to the heart, kidneys, brain, vasculature, and other organs, ultimately contributing to early morbidity and mortality.⁷⁻⁹

Hence; the present study was conducted to analyze hypertension and its associated factors among type 2 diabetes mellitus patients.

MATERIALS & METHODS

A total of 200 patients were evaluated. Only patients with confirmed diagnosis of diabetes were enrolled. Diabetes mellitus was identified based on the 2010 guidelines established by the American Diabetes Association, which stipulate that a diagnosis can be made if the fasting plasma glucose (FPG) is equal to or greater than 126 mg/dl, the 2-hour post-challenge plasma glucose (2-h PG) is equal to or greater than 200 mg/dl, the HbA1C level is equal to or exceeds 6.5%, or if the patient is utilizing an oral hypoglycemic agent. Comprehensive demographic and clinical information for all patients was collected, and a structured form was developed to document anthropometric measurements. Blood pressure (BP) was evaluated and categorized according to the Seventh Report of the Joint National Committee on High Blood Pressure, with classifications including normal (<120 mm Hg systolic and <80 mm Hg diastolic), prehypertension (120–139 mm Hg systolic or 80–89 mm Hg diastolic), and hypertension (≥140 mm Hg systolic or ≥90 mm Hg diastolic, or the use of antihypertensive medication). Blood samples were collected and biochemical profile was assessed. All the results were recorded in Microsoft excel sheet and was subjected to statistical analysis using SPSS software.

RESULTS

The mean age of the patients was 51.3 years. 67.5 percent of the patients were males while the remaining were females. 59.5 percent of the patients were of rural residence. Hypertension was seen in 51.5 percent of the patients. Obesity, dyslipidemia, poor socio-economic status and cigarette smoking habit were found to be significant risk factor associated with occurrence of hypertension among diabetic patients.

Table 1: Demographic data

Variable	Number	Percentage
Mean age	51.3 years	
Males	135	67.5
Females	65	32.5
Rural residence	119	59.5
Urban residence	81	40.5

Table 2: Incidence of hypertension

Hypertension	Number	Percentage
Present	103	51.5
Absent	97	48.5
Total	200	100

Table 3: Associated factors seen in diabetic patients with hypertension

Variable	T2DM with HTN	T2DM without HTN	p-value
Obesity	56	23	0.001*
Dyslipidemia	66	31	0.049*
Poor socio-economic status	59	28	0.016*
Cigarette smoker	43	27	0.021*

DISCUSSION

Diabetes mellitus is a chronic non-communicable disease resulting in increased blood glucose levels. In diabetes there is deficiency of insulin secretion by the pancreas or ineffectiveness of secreted insulin, which can either be inherited or acquired. There are several forms of diabetes, such as: Type 1 diabetes mellitus or insulin dependent diabetes mellitus. Type 2 diabetes mellitus or non-insulin dependent diabetes mellitus (NIDDM) (other specific types include damage to pancreas by specific causes – toxins, infections etc.).⁸⁻¹⁰ Approximately 177 million people worldwide are diabetic. This number is likely to double by 2030. Diabetes is responsible for every 1 in 20 deaths from all causes and approximately four million annual deaths are because of complications of diabetes i.e. six deaths every minute or one death every 10 seconds. More than 80 per cent of diabetes deaths occur in low- and middle-income countries. The problem of diabetes is not homogenous in India. Currently, 4.0-11.6 per cent of India's urban population and three per cent of the rural population above the age of 15 has diabetes. India has been called "the diabetes capital of the world," and it is estimated that 41 million Indians have the disease and "every fifth diabetic in the world is an Indian".^{9, 10}

A total of 200 patients were enrolled. The mean age of the patients was 51.3 years. 67.5 percent of the patients were males while the remaining were females. 59.5 percent of the patients were of rural residence. Hypertension was seen in 51.5 percent of the patients. Obesity, dyslipidemia, poor socio-economic status and cigarette smoking habit were found to be significant risk factor associated with occurrence of hypertension among diabetic patients.

Kim, MJ et al investigated the relationship of prehypertension and hypertension with type 2 diabetes in 7150 middle-aged, as well as the effect of BP control on diabetes development over 8 years. At 8 years, 1049 (14.7%) of the 7150 participants had newly developed diabetes, including 11.2, 16.7 and 21.5% of baseline normotensive, prehypertensive and hypertensive subjects, respectively. The overall incidence rate of diabetes was 22.3 events per 1000 person-years. Subjects with baseline prehypertension and hypertension were at higher risk of diabetes than normotensive subjects after

controlling for potential confounders. These associations persisted even when subjects were stratified by baseline glucose status, sex and body mass index (BMI). The risk of diabetes was significantly higher in subjects who had normal BP at baseline and progressed to prehypertension or hypertension at 8 years than those with controlled BP, but these associations were not observed in subjects with baseline prehypertension and hypertension. These findings showed that prehypertension and hypertension are significantly associated with the development of diabetes, independent of baseline glucose status, sex and BMI. Active BP control reduced incident diabetes only in normotensive individuals, suggesting the need for early BP management.¹¹

Gress TW et al investigated the relationship of prehypertension and hypertension with type 2 diabetes in 7150 middle-aged, as well as the effect of BP control on diabetes development over 8 years. At 8 years, 1049 (14.7%) of the 7150 participants had newly developed diabetes, including 11.2, 16.7 and 21.5% of baseline normotensive, prehypertensive and hypertensive subjects, respectively. The overall incidence rate of diabetes was 22.3 events per 1000 person-years. Subjects with baseline prehypertension and hypertension were at higher risk of diabetes than normotensive subjects after controlling for potential confounders. These associations persisted even when subjects were stratified by baseline glucose status, sex and body mass index (BMI). The risk of diabetes was significantly higher in subjects who had normal BP at baseline and progressed to prehypertension or hypertension at 8 years than those with controlled BP, but these associations were not observed in subjects with baseline prehypertension and hypertension. These findings showed that prehypertension and hypertension are significantly associated with the development of diabetes, independent of baseline glucose status, sex and BMI.¹²

CONCLUSION

T2DM is linked to an elevated risk of premature mortality and morbidity, primarily due to CVD including HTN, stroke, and end-stage renal disease. Hypertension stands out as the predominant cause of morbidity and mortality attributable to cardiovascular conditions.

REFERENCES

1. Kirkness CS, Marcus RL, LaStayo PC, et al. Diabetes and associated risk factors in patients referred for physical therapy in a national primary care electronic medical record database. *Phys Ther.* 2008;88:1408–16.
2. Tull ES, Roseman JM. Diabetes in African Americans. In: Harris MI, Cowie CC, Stern MP, et al, eds. *Diabetes in America*. 2nd ed. Bethesda, MD: National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases; 1995:613–30.
3. Wang PH, Lau J, Chalmers TC. Meta-analysis of effects of intensive blood-glucose control on late complications of type I diabetes. *Lancet.* 1993;341:1306–09.
4. Mogensen CE. Long-term antihypertensive treatment inhibiting progression of diabetic nephropathy. *Br Med J (Clin Res Ed).* 1982;285:685–88.
5. Jermendy G, Ruggerenti P. Preventing microalbuminuria in patients with type 2 diabetes. *Diabetes Metab Res Rev.* 2007;23:100–10.
6. Chaturvedi N. The burden of diabetes and its complications: trends and implications for intervention. *Diabetes Res Clin Pract.* 2007;76(suppl 1):S3–S12.
7. Diez Roux AV, Jacobs DR, Kiefe CI. Neighborhood characteristics and components of the insulin resistance syndrome in young adults: the coronary artery risk development in young adults (CARDIA) study. *Diabetes Care.* 2002;25:1976–82.
8. Schootman M, Andresen EM, Wolinsky FD, et al. The effect of adverse housing and neighborhood conditions on the development of diabetes mellitus among middle-aged African Americans. *Am J Epidemiol.* 2007;166:379–87.
9. Renders CM, Valk GD, Griffin SJ, Wagner EH, Eijk Van JT, Assendelft WJ. Interventions to improve the management of diabetes in primary care, outpatient, and community settings: a systematic review. *Diabetes Care.* 2001;24(10):1821–33.
10. Kumar A, Goel MK, Jain RB, Khanna P, Chaudhary V. India towards diabetes control: Key issues. *Australas Med J.* 2013 Oct 31;6(10):524-31.
11. Kim, MJ., Lim, NK., Choi, SJ. et al. Hypertension is an independent risk factor for type 2 diabetes: the Korean genome and epidemiology study. *Hypertens Res* 2015; 38: 783–89.
12. Gress TW, Nieto FJ, Shahar E, Wofford MR, Brancati FL. Hypertension and antihypertensive therapy as risk factors for type 2 diabetes mellitus. Atherosclerosis Risk in Communities Study. *N Engl J Med* 2000; 342: 905–12.

Source of Support: Nil.

Conflict of Interest: None Declared.

Copyright: © the author(s) and publisher. IJMRP is an official publication of Ibn Sina Academy of Medieval Medicine & Sciences, registered in 2001 under Indian Trusts Act, 1882.

This is an open access article distributed under the terms of the Creative Commons Attribution Non-commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

Cite this article as: Mohammad Rashid Farooqui. Analysis of Hypertension and its Associated Factors Among Type 2 Diabetes Mellitus Patients: An Institutional Based Study. *Int J Med Res Prof.* 2016, 2(2); 429-32.