

Association of Hypertension and its risk factor in Type II diabetes mellitus patients



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ABSTRACT

Background: There are few reports in India about the correlation of hypertension, its risk factors and its relationship with type II diabetes. Several studies have shown that Type II diabetes in India is increasingly widespread. **Aims and Objective:** The main purpose of this research is to determine the association between hypertension and type II mellitus diabetes. **Materials and Methods:** The Department of Physiology, Era Medical College & Hospital, Lucknow and the Department of Internal Medicine, Hind Institute of Medical Sciences and Research, Sitapur, performed a cross-sectional study on 520 patients with type II diabetes. The structured questionnaire was prepared to collect history of hypertension, social and demographical parameters and diabetes duration. A trained staff has measured anthropometric data like height, weight and also took blood pressure by digital blood pressure monitor (CITIZEN-CH-432). **Results:** This study indicated a significant ($p < 0.001$) relationship between BMI and hypertension in diabetes mellitus II patients. This study has also shown significant relationship between physical activity and hypertension in diabetes mellitus patients. The logistic regression study demonstrated that hypertension in diabetes mellitus patients has been positively associated with age ($p < 10^{-4}$) sensitivity level ($p < 10^{-3}$) and period of diabetes ($p < 10^{-2}$). **Conclusion:** Hypertension is a common issue among diabetic Indians. This research focused primarily on the association of hypertension and its related risk factors in patients with diabetes. The study showed that hypertension in diabetic patients is associated with age, physical activity, awareness level and BMI. More studies on larger sample sizes are needed to validate the current findings.

Key words: Hypertension; Type II diabetes; BMI

INTRODUCTION

Type II Diabetes is estimated to affect 150 million people worldwide. The prevalence is increasingly growing due to improvements in the diagnosis criteria.¹ Type II diabetic patients have a high risk of premature death from kidney failure, stroke and cardiovascular disease.² Hypertension is a well-recognized risk factor for cardiovascular disease in adults along with diabetes.¹ stroke and ischemic heart disease. Diabetes and hypertension develops together and hence hypertension is the key source of premature mortality in both developing and developed countries.³ In the diabetic population the incidence

of hypertension is greater than in the non-diabetic population^{4,5} (Figure. 1).

MATERIALS AND METHODS

Subjects and collection of samples

The present research was performed in the Department of Physiology at Era Medical College & Hospital, Lucknow and Department of Internal Medicine, Sitapur, Hind Institute of Medical Sciences and Study. In this study, patient of fasting blood glucose ≥ 126 gm/dl have been included in this study. Total 520 Type II diabetic patients with hypertensive symptoms have been enrolled in this study

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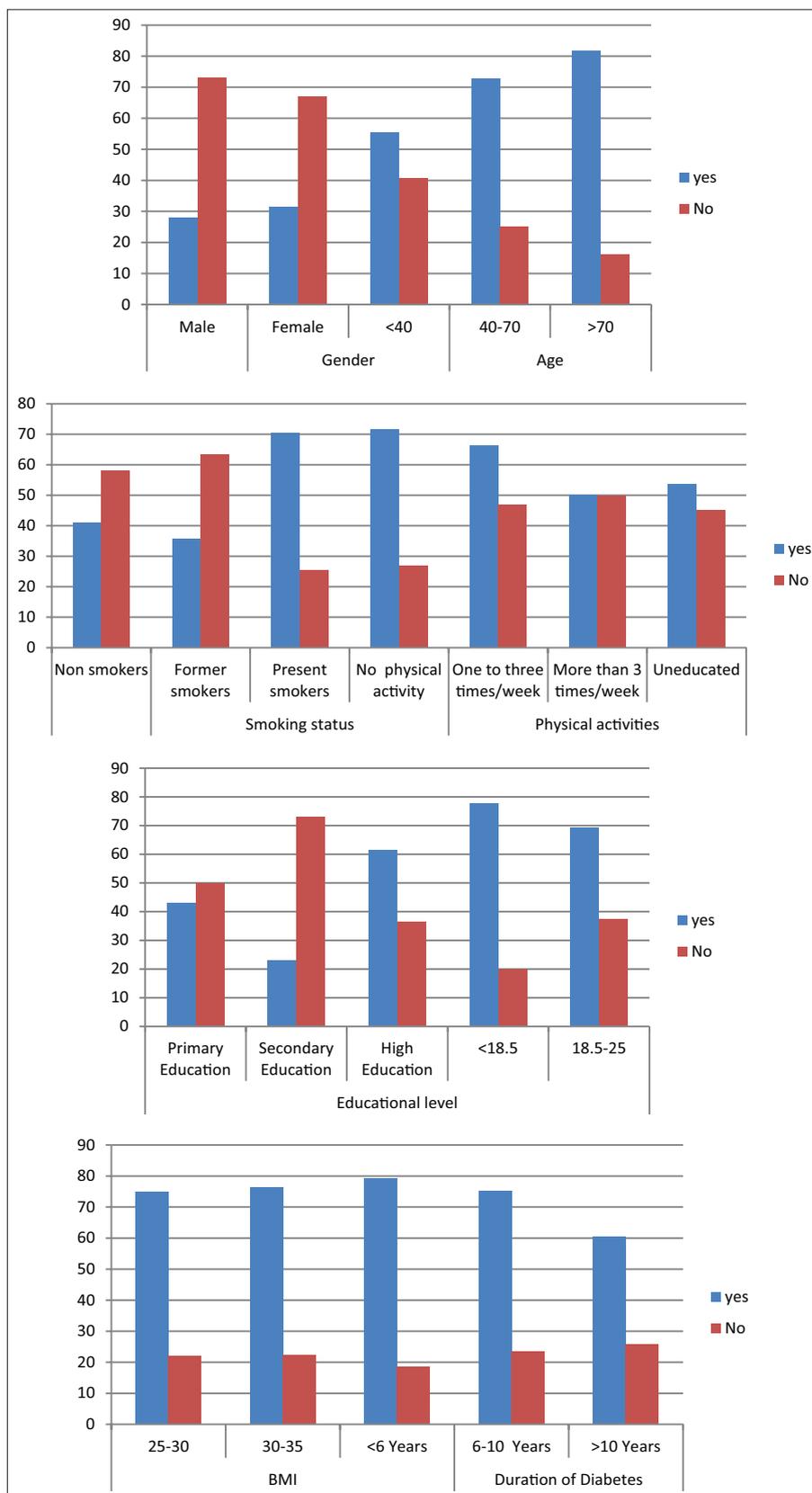


Figure 1: Graphical representation of Sociodemographical parameters and Hypertension in Diabetes mellitus II patients

and have given their written consent in writing. The research was accepted by ELMC&H Ethical Committee, Lucknow.

For this analysis the patients were chosen according to the parameters of inclusion and exclusion as seen below.

Inclusion criteria

Within this study were included all type II Diabetic patients displaying signs of hypertension, able to participate in this study.

Exclusion criteria

Major/chronic disorder (Asthma, Tuberculosis, seizure and renal disorders) and patients who have any immunodeficiency disorder.

For this study, a professional staff conducted the tests and took two blood pressure readings from each patient, and then the average reading of all readings was taken. Hypertension is classified as ≥ 140 mmHg systolic BP and / or level of diastolic BP ≥ 90 mmHg. The grey area which falls between 120–139 mmHg systolic BP and 80–89 mmHg diastolic BP, is known as “prehypertension”.^{6,7} Even Prehypertension is not in itself a pathological disorder, prehypertensive subjects are more at risk of developing HTN.⁸ These results have been analyzed by version 16 of SPSS. The chi square method was used to evaluate the relation between different variables and obtained a p value of 0.05 or less.

RESULTS

Questionnaire

This study included 520 diabetic participants as described in Table 1. A proposed questionnaire was designed to collect information on social and demographic criteria such as (gender, age and educational level), diabetic period, smoking habit, and history of hypertension. A specialized worker measured measurements of anthropometry such as weight and height etc. BMI was also measured by the professional workers by dividing weight (kilograms) by height in square meters. Standardized digital blood pressure monitor (CITIZEN-CH-432) have been used to measure the blood pressure.

This study recruited 520 hypertensive diabetic participants. 30.1 percent were females in this sample, and 69.0 percent were males (Figure.1).

Half the population (50.0 per cent) had experienced overt diabetes for less than 10 years. Unaware individuals were placed at the greater risk of hypertension in contrast to conscious people ($P < 10^{-3}$). Smoking status is greater in

Table 1: Relationship between Sociodemographical parameters and Hypertension in Diabetes mellitus II patients

Socio-demographical parameters	Total N%	Hypertension		p-value
		Yes	No	
		N%	N%	
Gender				
Male	360 (69.0%)	100 (28%)	260 (73.0%)	0.30
Female	160 (30.1%)	50 (31.3%)	110 (67.0%)	
Age				
<40	130 (24.2%)	74 (55.5%)	56 (40.5%)	<10 ⁻³
40-70	150 (28.8%)	110 (72.6%)	40 (25.1%)	
>70	240 (47.1)	200 (81.8%)	40 (16.1%)	
Smoking status				
Non smokers	30 (18.5%)	12 (40.9)	18 (58.0%)	<10 ⁻²
Former smokers	10 (7.5%)	4 (35.7%)	6 (63.3%)	
Present smokers	480 (70.6%)	340 (70.5%)	140 (25.5%)	
Physical activities				
No physical activity	434 (80.7%)	316 (71.8%)	118 (27.0%)	<0.01
One to three times/week	50 (10.4)	37 (66.3%)	13 (47.0%)	
More than 3 times/week	36 (5.7%)	18 (50.1%)	18 (50.0%)	
Educational level				
Uneducated	12 (2.3%)	7 (53.8%)	5 (45.2%)	<10 ⁻³
Primary education	62 (11.6%)	31 (43.0%)	31 (50.0%)	
Secondary education	406 (76.1%)	101 (23.0%)	305 (73.0%)	
High education	40 (7.5%)	15 (61.5%)	25 (36.5%)	
BMI				
<18.5	9 (1.8%)	7 (77.8%)	2 (20%)	0.01
18.5-25	125 (24.2%)	80 (69.1%)	45 (37.3%)	
25-30	223 (42.7%)	159 (74.9%)	64 (22.1%)	
30-35	163 (31.2%)	127 (76.4%)	36 (22.5)	
Duration of diabetes				
<6 Years	123 (23.5)	102 (79.3)	21 (18.7)	<10 ⁻²
6-10 Years	133 (24.2)	100 (75.3)	33 (23.5)	
>10 Years	264 (50.0)	168 (60.5)	96 (25.9)	

hypertensive patients in comparison to non-hypertensive patients. Hypertension get increased according to age as shown in Table I and Figure.1. A significant correlation ($p < 0.01$) have been observed for physical activities among hypertensive and non-hypertensive patients. The other factor BMI has also shown significant correlation between hypertensive and non-hypertensive participants with diabetes. Diabetic patients participated in this study has represented that 10 years diabetic patients are more hypertensive in comparison to 6 years diabetic patients; hence this study have shown the positive correlation between Hypertension and Diabetes.

DISCUSSION

Stress activates sympathetic system, which contributes to elevated blood pressure, the blood pressure returns to normal (or near normal) level after the stress is removed.⁹

Usually, Hypertension occurs simultaneously with diabetes in population.¹⁰ The present research reflects that hypertension in Indian patients with type 2 diabetes is a general issue. Hence, we reported a positive association between hypertension and BMI, diabetes age and length. This study found high rate of hypertension in 60 years old diabetic patients. This may be different for each country, because of different types of methods, surveillance, characteristics of population and ethnic varieties.¹¹ Hypertension was also associated with age amongst type II diabetic patients, this association were validated by different literatures of research and different findings of other studies.^{12,13} In fact, hypertension and obese diabetes have raises the risk of coronary disorders and a few other morbidities.^{14,15} In diabetic persons, hypertension has features reminiscent of hypertension in the elderly. In all cases, hypertension is distinguished by improved vascular resistance.¹⁶⁻¹⁸ and acute systolic hypertension is found in young diabetic patients, as well as in the elderly. Early atherosclerosis is likely to lead to early vascular ageing improvements in diabetic people with hypertension.¹⁹ This premature ageing of diabetics is likely to play a key role in the comparatively high incidence of elevated systolic hypertension and diminished baroreceptor sensitivity in young people with diabetes. The latter arises before clinical neurological dysfunction progresses in young diabetics. Reduced baroreceptor reflex sensitivity and impaired cardiac innervation can partially explain the significant instability in blood pressure and the susceptibility to orthostatic hypotension found in diabetics with hypertension.^{20,21} These latter traits, also found in elderly patients with hypertension, signify premature cardiovascular system

ageing in diabetic patients with co-existing hypertension. Other variables contribute to the pathophysiology of hypertension in diabetes, total exchangeable sodium, plasma renin activity, plasma norepinephrine, plasma aldosterone, susceptibility to baroreceptors, vascular compliance, peripheral vascular resistance, vascular pressure response, insulin resistance, irregular ca resistance, in addition to premature vascular ageing and its effect on vascular rigidity and resistance.

Our results showed that, hypertension is higher in unaware people in compare of aware people towards health. Smokers in this study have shown a positive correlation with hypertension in comparison to non-hypertensive patients with diabetes. Our study showed hypertension is linked with diabetes duration. This research draws attention to the value of blood pressure assessment and also the understanding of diabetic patient care. Hypertension occurs in the U.S. population in about 30 percent of patients with type 1 diabetes, and in 50 percent to 80 percent of patients with type 2 diabetes.²² A prospective U.S. observational study found that type 2 diabetes mellitus was almost 2.5 times more likely to occur in hypertensive subjects than in subjects with average blood pressure.²³ In fact, diabetes and hypertension are seen more often in the same person than happens by chance, while the overlap between dysglycemia and high blood pressure is far more significant than between diabetes and hypertension.²⁴

In our study, most of the patients are still under uncontrolled hypertension with formerly diagnosed hypertension. This finding is same as findings of other studies.²⁵⁻²⁷ Our study indicated that physical activities decrease the chances of hypertension. The study also indicated a significant correlation ($p < 0.01$) between hypertension and physical activities. The results also show that BMI in type II Diabetic patients were substantially ($p < 0.01$) associated with hypertension, so a large number of trials on large numbers of patients with hypertensive diabetic mellitus are required to determine the causal association between the patients with hypertension, blood pressure, BMI and diabetes mellitus.

CONCLUSION

The frequency and prevalence of undiagnosed hypertension is very high among Indian population with type II diabetes mellitus. This study indicated that hypertension is positively correlated with physical activity and BMI in diabetes mellitus patients. This study also proved that hypertension increases with age. Therefore, it has been concluded that hypertension is frequent in diabetes mellitus patients. And

more studies are required on larger sample size to validate these results.

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Author's Contribution:

SS - Concept and design of the study; interpreted the results, prepared first draft of manuscript and critical revision of the manuscript; **NRG** - Statistically analyzed and interpreted; reviewed the literature and manuscript preparation; **STR, AK** - Design of the study, statistically analyzed and interpreted, preparation of manuscript and revision of the manuscript; **PS** - Concept and coordination of the overall study.

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