



Original Research Article

PREVALENCE OF HYPERTENSION AMONG ADULTS WITH TYPE 2 DIABETES MELLITUS IN A RURAL AREA OF KANYAKUMARI DISTRICT

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ABSTRACT

Background: The occurrence of hypertension and diabetes mellitus is rapidly increasing world-wide. Frequently these two conditions coexist which will predispose to an increased risk of premature death due to cardiovascular diseases, stroke and renal diseases. When hypertension and diabetes mellitus coexist, the risk of CVD is increased by 75%, which further contributes to the overall morbidity and mortality of an existing high-risk population.

Objectives: 1) To estimate the prevalence of hypertension among adults with type 2 diabetes mellitus in the rural field practice area of Kanyakumari government medical college. 2) To find out the association of hypertension with socio-demographic and behavioural characteristics of the study population.

Materials and Methods: A community based cross-sectional study done between July to August 2021 in the rural field practice area of Rajakamangalam PHC .300 adults who were above 30 years of age and known cases of type 2 diabetes mellitus participated in our study. Informed verbal consent was obtained from them after explaining the purpose of the study. Details regarding the socio-demographic variables and behavioural risk factors were obtained using a pre-structured and pre- tested questionnaire. Height and weight were recorded, and BMI was calculated. Blood pressure was measured with a standard sphygmomanometer, two values taken 30 minutes apart, average of which was taken.

Results: The prevalence of hypertension among type 2 diabetic patients was 25.6%. Among them, the prevalence was more in females (56.3%) and highest in the age group >65 years (45.4%). There is a significant association between smoking, alcoholism and physical inactivity with hypertension. 63% of the hypertensives were obese. 61% of the hypertensives had higher salt intake. There was no statistically significant association with obesity and high salt intake.

Conclusion: Hypertension was more prevalent among Type 2 diabetes. Smoking, alcoholism and lack of physical activity were found to be significant risk factors. Longer the duration of diabetes, higher is the prevalence of hypertension.

Keywords: Diabetes, Hypertension, Adults, Rural area.

INTRODUCTION

Hypertension and Type 2 Diabetes Mellitus are the two most common preventable causes of morbidity

and premature mortality in developed and developing countries. The prevalence of hypertension in diabetes patients is almost twice that of general population ranging between 32% to 82%

in urban studies. The coexistence of Hypertension and diabetes are the major contributor to the development of macro and microvascular complications. The risk of CVD increases by 75% when hypertension coexist with diabetes mellitus. Hypertension (HTN) is the most common comorbidity among people with type 2 diabetes.^[1] Hypertension with diabetes increases mortality risk by 7.2 times with a higher risk of death in developing countries.^[2]

Objectives

1. To estimate the prevalence of hypertension among adults with type 2 diabetes mellitus in the rural field practice area of Kanyakumari government medical college.
2. To find out the association of hypertension with socio-demographic and behavioural characteristics of the study population.

MATERIAL AND METHODS

A community based cross-sectional study done between July to August 2021 in the rural field practice area of Rajakamangalam Primary Health Centre. Three hundred adults above the age of 30 years with diagnosis of type 2 diabetes mellitus participated in our study. Informed consent was obtained from them after explaining the purpose of the study. The details regarding the socio-demographic variables and behavioural risk factors were obtained using a pre-structured and pre-tested questionnaire. Height and weight were recorded, and Body mass index was calculated. Blood pressure was measured with a standard sphygmomanometer, two values taken 5 minutes apart, average of which was taken as the final value. Institutional Ethical Committee clearance was obtained. Data was entered into MS-Excel. Data was analyzed using SPSS V.22. Proportions and chi square test were done to find out the prevalence of hypertension among the Type 2 diabetes patients

and to find out the association between the categorical variables respectively.

RESULTS

Majority of the study population were males (56%) and belong to the age group between 51-60 years (30.7%). [Table 1]

25.7% of the type 2 diabetic patients had coexisting hypertension [Table 2]

48.8% of the smokers had coexisting hypertension while among non-smokers only 16.4% had hypertension. There is a significant association between smoking and prevalence of hypertension among the study population. ($p < 0.001$). [Table 3]

The chi-square statistic is 33.9254. The p-value is < 0.001 . Significant at $p < 0.05$ 44.4% of alcoholics had both diabetes and hypertension whereas among non-alcoholics only 17.6% had both diseases. The difference observed was found to be statistically significant. [Table 4] The chi-square statistic is 23.7618. The p-value is < 0.001 . Significant at $p < 0.05$.

63.3% of the diabetics who had coexisting hypertension were obese. The difference observed was not found to be statistically significant. [Table 5] The chi-square statistic is 1.6823 The p-value is 0.1946. Not Significant at $p < 0.05$.

68.8% of the coexisting diabetes and hypertensives participants had no regular physical activity and the association was found to be statistically significant. [Table 6] The chi square statistic is 4.6968. p value is 0.030. Significant at $p < 0.05$.

61% of the study population who had coexisting diabetes and hypertension had a high salt intake. The difference observed was not found to be statistically significant. [Table 7]

The chi square statistic is 0.1249. p value is 0.7237. Not significant at $p < 0.05$.

The longer the duration of diabetes, higher is the prevalence of hypertension. [Table 8]

Table 1: Age and Sex distribution of the study population (N=300)

Age group (in years)	Male	Female	Total (%)
31-40	11	13	24 (8)
41-50	37	42	79 (26.3)
51-60	54	38	92 (30.7)
61-70	43	30	73 (24.3)
>70	23	9	32 (10.7)

Majority of the study population were males (56%) and belong to the age group between 51-60 years (30.7%).

Table 2: Prevalence of hypertension among diabetes patients (N=300)

Disease	Frequency	Percentage (%)
Diabetes with hypertension	77	25.7
Diabetes without hypertension	223	74.3
Total	300	100

25.7% of the type 2 diabetic patients had coexisting hypertension.

Table 3: Association of smoking with hypertension (N=300)

Disease	Smokers	Non smokers	Total
Diabetes with hypertension	42 (48.8%)	35 (16.4%)	77
Diabetes without hypertension	44 (51.2%)	179 (83.6%)	223
	86	214	300

* figures in the parenthesis are column percentages

The chi-square statistic is 33.9254. The **p-value is < 0.001**. Significant at $p < 0.05$

Table 4: Association of alcoholism with hypertension (N=300)

	Alcoholic	Non alcoholic	Total
Diabetes with hypertension	40 (44.4%)	37 (17.6%)	77
Diabetes without hypertension	50 (55.6%)	173 (82.4%)	223
Total	90	210	300

* figures in the parenthesis are column percentages

The chi-square statistic is 23.7618. The **p-value is < 0.001**. Significant at $p < 0.05$.

Table 5: Distribution of study subjects according to Body mass index (N=300)

Disease	BMI <22.9	BMI ≥ 23	Total
Diabetes with hypertension	28 (36.7%)	49 (63.3%)	77
Diabetes without hypertension	100 (44.9%)	123 (55.1%)	223
Total	128	172	300

* figures in the parenthesis are row percentages

The chi-square statistic is 1.6823 The p-value is 0.1946. Not Significant at $p < 0.05$.

Table 6: Distribution of study subjects based on physical activity (N=300)

Disease	Regular physical activity	No regular physical activity	Total
Diabetes with hypertension	24 (31.2%)	53 (68.8%)	77
Diabetes without hypertension	101 (45.3%)	122 (54.7%)	223
Total	125	175	300

* figures in the parenthesis are row percentages

The chi square statistic is 4.6968. **p value is 0.030**. Significant at $p < 0.05$.

Table 7: Distribution of study subjects according to salt consumption (N=300)

Disease	Reduced salt intake	High salt intake	Total
Diabetes with hypertension	30 (39%)	47 (61%)	77
Diabetes without hypertension	92 (41.3%)	131 (58.7%)	223
Total	122	178	300

* figures in the parenthesis are row percentages

The chi square statistic is 0.1249. p value is 0.7237. Not significant at $p < 0.05$.

Table 8: Proportion of hypertensives according to the duration of diabetes (N=300)

Duration of diabetes mellitus (in years)	Frequency of hypertensives	Percentage (%)
1-5	10	12.5
6-10	20	26.5
11-15	19	25
>15	28	36

Longer the duration of diabetes, higher is the prevalence of hypertension. [Table 8]

DISCUSSION

Hypertension among diabetics

A total of 300 participants of age above 30 years, 77 (25.7%) had coexisting diabetes mellitus and hypertension. The finding was similar to a study done in Karnataka by Priya et al., in the year 2014, where the coexisting diabetes mellitus and hypertension was found to be 28.4% In a study done by Ahana et al., in Manipur the overall prevalence of diabetes and hypertension in the entire study population was found to be 16.63% and 18.16% respectively. About 13.8% individuals had shown co-prevalence of Diabetes Mellitus and Hypertension. The effect of risk factors on the co-prevalence of DM and HT shows difference when compared with the occurrence of only DM or HT.

In a study in France, Marre et al. reported hypertension in almost one-third of diabetic cases.^[3] Among adult Afro-Americans, elevation of blood pressure is significantly higher in individuals with

impaired glucose tolerance and DM than in nondiabetics. The Action in Diabetes and Vascular Disease: Preterax and Diamicron MR Controlled Evaluation (ADVANCE) trial showing significant reduction in microvascular events, cardiovascular deaths and all-cause mortality with aggressive reduction in both systolic and diastolic blood pressure (mean achieved blood pressure of 134/74 mmHg versus 140/76 mmHg.^[4]

The occurrence of HT in diabetic patients significantly increases the risk of coronary artery disease, mortality and nephropathy. It is of significance that BP is controlled in diabetic patients. High blood pressure in diabetics hints at syndrome X or the metabolic syndrome which includes HT, hyperglycaemia, obesity and hyperlipidaemia.

Essential hypertension accounts for majority of HTN in diabetics (90%). The development of HTN in type 2 diabetics is attributed to insulin resistance which causes hyperinsulinemia resulting in renal

sodium retention and increased sympathetic nervous system activity.

Association of smoking with hypertension

Cigarette smoking is a considerable risk to public health, being responsible for nearly 6.3 million deaths and 6.3% of global DALYs worldwide.^[5] It is a major risk factor for several diseases, including lung cancer, coronary heart disease, and stroke.^[6] However, the relationship between smoking and blood pressure are not univocal, with some studies showing a positive and others an inverse association.^[7]

In our study 48% of the smokers had hypertension while only 16.4% of the non-smokers had hypertension. There is significant association between smoking and prevalence of hypertension among the study population ($p < 0.05$). Smoking had significant association with the prevalence of HTN among diabetics similar to a study done by Kokiwar Prasanth R et al.^[8]

Alomari reported that smoking immediately increases DBP and MAP. Studies indicated that elevated nicotine mediated an increase of sympathetic nervous system activities and released of epinephrine, norepinephrine, and vasopressin hormones.^[9] However, the long-term effect is controversial. A cohort study conducted in Japanese men found that the adjusted mean of change in blood pressure of current smokers was lower than in non-smokers.^[10]

But a study in Japanese men showed that there were no relationships between smoking amount and systolic blood pressure or diastolic blood pressure when lifestyle and other confounding factors were considered.^[10] A meta-analysis of 23 population-based studies including a total of 141,317 individuals also found that there was no causal association between smoking heaviness in current smokers and SBP or DBP.^[11]

Association of alcoholism with hypertension

The regular consumption of alcohol elevates blood pressure, with global estimates that the attributable risk for hypertensive disease from alcohol is 16%. The increase in blood pressure is approximately 1 mmHg for each 10 g alcohol consumed and is largely reversible within 2-4 weeks of abstinence or a substantial reduction in alcohol intake. Several possible mechanisms have been proposed for consumption of alcohol increasing the risk of hypertension such as an imbalance of the central nervous system, impairment of the baroreceptors, enhanced sympathetic activity, stimulation of the renin-angiotensin-aldosterone system, increased cortisol levels, increased vascular reactivity due to increase in intracellular calcium levels, stimulation of the endothelium to release vasoconstrictors and loss of relaxation due to inflammation and oxidative injury of the endothelium leading to inhibition of endothelium-dependent nitric oxide production.

In the present study, 44% of the alcoholic participants had both diabetes and hypertension whereas among non-alcoholics only 17.6% had both

the disease. The difference observed was found to be statistically significant.

A study conducted in Kenya also concluded that non-alcoholics had nearly 70% less chance of suffering from hypertension, compared to those who drank alcohol. Hypertension was significantly higher in individuals who take alcohol than those who did not.^[12]

Association of obesity with hypertension

In present era, overweight and obesity are considered as an escalating pandemic. The measurement of BMI is considered as a representative of obesity, and it is one of the recognized predisposing reasons of CVD. Our study showed that 63.3% of the diabetics who had co existing hypertension were obese and 36% were non obese but the difference observed was not statistically significant.

In a study done in Southwest China the prevalence of obesity-related hypertension was high in people aged 40 to 79 years. Its prevalence was higher in women than in men and increased with age. Additionally, patients with obesity-related hypertension had a higher prevalence of Diabetes Mellitus, hypertriglyceridemia, high low-density lipoprotein and hyperuricemia than non-obesity-related hypertensive patients. A study conducted by Bhalerao et al. had reported that BMI is a significant predictor of development of diabetes.^[13] Similarly, a study done in rural India among geriatric population reported that higher BMI had twice the risk of having hypertension among both males (OR = 1.9; CI = 1.4–2.5) and females (OR = 2.2; CI = 1.7–2.8).^[14]

Physical activity and Hypertension

The strongest support for a cause-effect relationship between physical activity and hypertension prevention comes from randomized controlled trials. Dozens of trials have confirmed the favourable effects of exercise on BP reduction. Our study had found that that 68.8% of hypertensive with diabetics had no regular physical activity and the difference observed were statistically significant. ($p = 0.03$)

As the worldwide prevalence of hypertension continues to increase, the primary prevention of hypertension has become an important global public health initiative. Physical activity is commonly recommended as an important lifestyle modification that may aid in the prevention of hypertension. The 2008 Physical Activity Guidelines for Americans state that 'For most health outcomes, additional benefits occur as the amount of physical activity increases through higher intensity, greater frequency, and/or longer duration.'^[15]

In a quasi-systematic review, Murphy and colleagues reviewed the studies that have compared the effects of a single continuous bout of exercise versus the effects of short accumulated bouts of the same total duration and identified six studies that have reported BP measures pre- and post-intervention.^[16] Findings from the ASUKI Step study, a pedometer-based workplace intervention

with an overall goal to increase physical activity by walking 10,000 steps/day, found that BP was significantly reduced with BP changes shown to be linearly associated with steps taken.^[17] Coupled with diet, increased physical activity, such as walking for 30-45 minutes three to five days a week, has been shown to improve lipid profiles, BP and insulin resistance.^[18]

High salt intake associated with Hypertension.

A high-salt diet is one of the major risk factors in the development and maintenance of hypertension. The effects of a high-salt diet are related to the function of the renin-angiotensin system, which is normally suppressed by a high-salt diet. Endothelial dysfunction probably plays an important role in the influence of high sodium intake on blood pressure, although the exact mechanisms remain elusive.

In our study 61% of the study population who had coexisting diabetes and hypertension had a high salt intake. The difference observed was not found to be statistically significant ($p=0.7237$).

Experimental observations by Gu et al. in normal Sprague-Dawley rats. It was demonstrated that hypertension can be induced by a prolonged high-salt diet and that it is associated with increased renal injury and significant changes in renal cytokine gene expression profiles that are closely related to the proinflammatory response and endothelial dysfunction, and attenuated cell survival and differentiation.^[19] According to the American Heart Association, many experts now believe that lowering daily consumption to no more than 1,500 mg of sodium daily would be an effective way to prevent or lower Hypertension.

Ogden LG et al. estimated that reduction of salt intake by 3 g per day lowered systolic blood pressure by 5.6 mmHg in hypertensive individuals. They also found that it was the obese and not the non-obese who benefited.^[20] In a study by O'Donnell et al. the tendency of an excessive salt intake-induced increase in the incidence of cardiovascular diseases was also observed.^[21]

Prevalence of hypertension according to the duration of diabetes

EPIDIAM Study which is conducted in Morocco indicated that hypertension is associated with the duration of diabetes. Duration of diabetes is positively associated with the severity of macro- and micro-vascular complications, both of which contribute to the development of renal and/or atherosclerotic hypertension.^[22]

CONCLUSION

Hypertension was more prevalent among Type 2 diabetes. Smoking, alcoholism, lack of physical activity was found to be significant risk factors for development of hypertension among Type 2 diabetes patients. Longer the duration of diabetes, higher is the prevalence of hypertension.

Recommendation

People with diabetes and co-existing hypertension should be referred to behavioural counselling programs focussing on cessation of tobacco, alcohol, diet, and physical activity. Patients should be encouraged and monitored for self-care and progression of the existing illness through healthcare providers and self-help groups to halt the reversible complications and to maintain healthy lifestyles.

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