

A HOSPITAL BASED CASE-CONTROL STUDY ON MODIFIABLE RISK FACTORS OF HYPERTENSION AT MANGALORE, KARNATAKA**Satish S.^{1*}, Fathimathul Arifa³, Haritha Praveen⁴, Khatheeja Ramseena⁵, Mashitha, Nihala Afrath⁶ and Shabaraya A.R.⁷**¹Professor Department of Pharmacy Practice, ^{2,3,4,5,6}Student, B Pharm, ⁷Principal
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ABSTRACT

Hypertension is a major public health problem; identification of its risk factors supports intervention policies to minimize morbidity and mortality. The objective of present study was to identify association of modifiable risk factors of hypertension. A case control study was conducted at Srinivas Hospital, Mangalore, and Karnataka. Random sample of 100 cases and 100 controls were chosen. Data was collected using a questionnaire which included socio-demographic data, lifestyle, and BP, BMI were measured. Collected data was analyzed using MedCalc statistical software for odds ratio, confidence interval and P value. The most common modifiable risk factors of hypertension were smoking, alcohol physical inactivity, obesity, diabetes. Findings of relative risk estimation of effect of modifiable risk factors on hypertension reveal that, current smokers (OR:1.8824, CI:0.9871 - 3.5895), daily smokers (OR:2.5766, CI:1.2163- 5.4581), daily smokers in past (OR:1.8824, CI:0.9871 -3.5895), who were using smokeless tobacco (OR:2.5766, CI:1.2163 -5.4581) and who have habit of alcohol consumption (OR:2.0684, CI:0.9610-4.4520) were at high risk for hypertension. Similarly, inadequate fruits in diet (OR: 6.0926, CI: 2.3951 -15.4981), inadequate vegetables (OR: 0.6528, CI: 0.1785-2.3875) in diet were also the significant risk factors of hypertension, whereas people doing work with physical activity (OR: 0.4898, CI: 0.2456 -0.9767), having the habit of walking or jogging (OR: 0.7257, CI: 0.4161 -1.2655) were at less risk of hypertension. The most common non-modifiable risk factors were age and family history. Study suggests that significant predictors of hypertension were obesity, physical inactivity and social habits. In conclusion, hypertension is strongly driven by a set of modifiable risk factors. Massive public awareness campaign targeting on risk factors is essential in controlling hypertension, especially focusing on physical exercise and control of diabetes, obesity, and on quitting smoking.

KEYWORDS: Case-control, hypertension, Karnataka, risk factors, WHO STEPS.**INTRODUCTION**

Hypertension is a major cause of cardiovascular morbidity and mortality worldwide. Risk factors associated in development of hypertension viz, Modifiable risk factors includes unhealthy diets (excessive salt, saturated fat and trans fats, low intake of fruits and vegetables), physical inactivity, consumption of tobacco and alcohol, and being overweight or obese and Non-modifiable risk factors viz, family history, age over 65 years and co-existing diseases such as diabetes or kidney disease.

According to WHO hypertension is the major factor responsible for most deaths worldwide (12.8% / year or >7 million). Quarter of world's adult population: nearly 1 billion (26%) had hypertension(2000) and was predicted to increase to 1.56 billion (29% prevalence by 2025).^[1] Hypertension is strongly driven by a set of modifiable

risk factors. Massive public awareness campaign targeting risk factors is essential in controlling hypertension, especially focusing on physical exercise and control of diabetes, obesity, and on quitting smoking. Prevention and control of hypertension can be achieved by application of targeted and/or population-based strategies.^[2] The present study was a hospital-based observational study using case-control study design to understand the prevalence of selected modifiable risk factors associated with hypertension.

METHODOLOGY

Study Design and Participants: Present study was a cross sectional case-control study conducted among case (hypertensive patients) and control (non hypertensive), met inclusion criteria, who visited hospital during the study period, were included in the study.

Ethical approval was obtained by the Institutional Ethics Committee (IEC) of Srinivas Institute of Medical Science, Mukka, Mangalore.

Inclusion criteria: All willing patients aged between 35 to 65 years were included in the study as below

Cases (Hypertensive patients): Patients who were already diagnosed with hypertension by physician and Patients who are already on Antihypertensive treatment.

Controls (Non hypertensive patients): Patients attending the same outpatient service with no history of hypertension and with the blood pressure recorded on the day of study was normal.

Exclusion criteria

Cases (Hypertensive patients): Patients who are known cases of secondary hypertension and antenatal females were excluded from the study.

Controls (Non hypertensive patients): Patients whose blood pressure is not normal on the day of study were also excluded from the study

Study Method: Inform consent form was prepared in English and Kannada and same were used before selection of subjects. The inform consent form was explained to the participants and consent only participated in the survey. The data were collected by using prevalidated questionnaire from the study individuals. The pre-validated questionnaire was used in the study which was divided into three sections. The collected data(s) were kept confidential.

Data(s) were collected using a modified WHO STEPS instrument Questionnaire [3] for chronic disease risk factor surveillance through direct interaction with the subjects in out-patients visited Srinivas Hospital Mukka. The current study included participants from a various socio demographic backgrounds. Each participants took approximately for 15 to 20 minutes time to complete the procedure.

Data analysis: Collected data was entered in Microsoft Excel. The analysis was performed using MedCalc statistical software. Simple proportions were done for all the relevant variables studied among cases and control and the overall sample with confidence interval (CI) fixed at 95%. The proportions of relevant risk factors were compared between cases and controls and its statistical significance was analyzed. Crude odds ratios (ORs) and adjusted ORs by logistic regression analysed to understand the interplay of relevant risk factors.

RESULTS

Sample characteristics of the Study Population is given in Table 1. Age of participants were categorized as 35 – 54 case (40%) control (60%) and 55 – 64 case (73.3%) control (26.6 %) gender equality was observed in both groups. Analyzing literacy majority in case group (64%) were literate and only (36%) were illiterate. whereas in control group it was (96%) literate and only (4%) were illiterate. The prevalence of hypertension was higher in illiterate with (90%) among cases and only (10%) among controls. The difference between low and high education is statistically significant with OR = 0.0741(0.0251-0.2182).

Almost in all cases (100%) and control (99%) was married. The burden of HTN was insignificantly lower among married subjects that could be referred to age and sample variation due to unavailability of participants of unmarried.

Also analyzing their economic status, monthly income in both case and control majority was found to be >10,000. Low socioeconomic status is associated with the occurrence of the hypertension. The present study showed low risk of hypertension among subjects with <10,000 with (55%) among cases compared to (45%) among controls with statistical significant differences OR = 0.7159 (0.457–1.2634).

Table 1: Sample characteristics of subjects.

Sl. no.	N=(cases + control)		Case (%)	Control (%)	Odds Ratio (95% CI)	P value
		Total	100 (50)	100 (50)		
1	Gender	Male	50 (25)	50 (25)	1.000	1.0
		Female	50 (25)	50 (25)		
2	Age group	35-54	56 (40)	84 (60)	0.2424	< 0.0001
		55-64	44 (73.3)	16 (26.6)		
3	Education	Literate	64 (40)	96 (60)	0.0741	<0.001
		Illiterate	36 (90)	4 (10)		
4	Household income	>10000	54 (45.76)	64 (54.23)	0.7159	<0.2480
		<10000	44 (55)	36 (45)		
5	Marital status	Married	100	99	3.0302	1.49
		Unmarried	0	1		

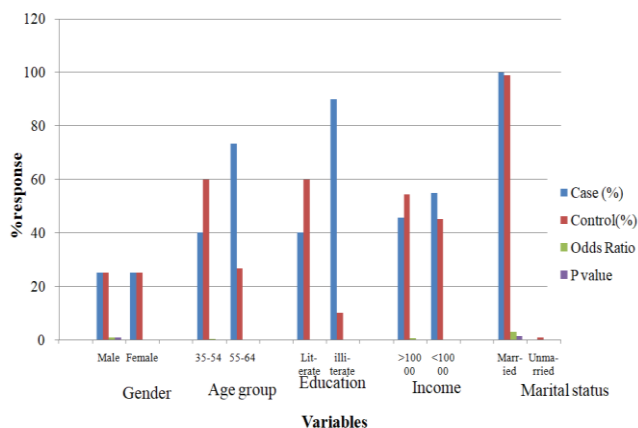


Figure no. 1: Sample characteristics of subjects.

Table 2: Description of physical characteristics of participants.

Variables	Case Mean ± SD	Category (%)	Control Mean ± SD	Category
BMI	27.10±5.070	Underweight (4) Healthyweight (34) Overweight (34) Obese (28)	25.79±5.072	Underweight (0) Healthy weight (50) Over weight (28) Obese (22)
Systolic BP	149±21.86	Normal (8) Prehypertension (18) Stage I (36) Stage II (38)	120.9±19.41	
Diastolic BP	85.06±15.94		77.04±12.36	

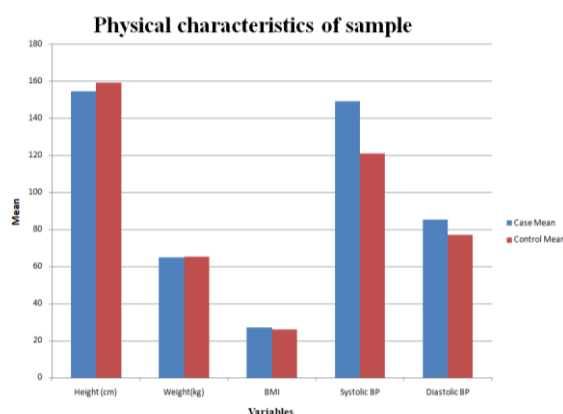


Fig. no. 2: Physical characteristics of sample.

Modifiable risk factors of hypertension

Current smoking and daily smoking were significantly different in proportion among cases and controls; proportion of current smokers among cases was more

compared to controls (32% vs. 26%). It was found that 12% total cases were currently using alcohol, details of which are provided in Table 4. 32% of study subjects were obese.

Table 4: Smoking and alcohol.

Variables	Response	Control %	Cases %	Total %	P value
Current smoking	Yes	32	20	52 (26)	0.76
	No	68	80	148 (74)	
Daily smoking	Yes	26	12	38 (19)	<0.01
	No	74	88	162 (81)	
Daily smoking in past	Yes	32	20	52 (26)	0.76
	No	68	80	148 (74)	
Use of smokeless tobacco	Yes	26	12	38 (19)	<0.01
	No	74	88	162 (81)	

Habit of alcohol consumption	Yes	22	12	34 (17)	<0.05
	No	78	88	166 (83)	

Similarly, inadequate fruits in diet (6% among controls vs. 22% among cases, $P < 0.01$), inadequate vegetables (6% among controls vs. 4% among cases, $P < 0.01$) in diet were also the significant risk factors of hypertension, whereas people doing work with no physical activity (72% among controls vs. 84% among cases, $P < 0.05$),

not having the habit of walking or jogging (54% among controls vs. 46% among cases, $P < 0.06$) were at risk of hypertension. Obesity varied significantly between cases and control (22% among controls vs. 32% among cases, $P < 0.1$). Comparison of other risk factors analyzed is summarized in Table 5

Table 5: Diabetes, Diet and Physical activity.

Risk factor	Proportion among control (%)		Proportion among cases (%)	P value
	Diabetic			
Diabetes Mellitus	Diabetic	6	22	<0.01
Include fruits in diet	Inadequate	6	28	<0.01
Include vegetables in diet	Inadequate	6	4	0.74
Work with vigorous physical activity	No	72	84	<0.05
Habit of walking or jogging	No	54	46	0.0694
Obesity	obese	22	32	0.1

Table 6 displays the findings of relative risk estimation of effect of modifiable risk factors on hypertension. Findings reveal that, current smokers (OR:1.8824, CI:0.9871-3.5895), daily smokers (OR:2.5766, CI:1.2163-5.4581), daily smokers in past (OR:1.8824, CI:0.9871 -3.5895), who were using smokeless tobacco (OR:2.5766, CI: 1.2163-5.4581) and who have habit of alcohol consumption (OR:2.0684, CI:0.9610 -4.4520) were at high risk for hypertension. Similarly, inadequate

fruits in diet (OR:6.0926, CI:2.3951 -15.4981), inadequate vegetables (OR:0.6528, CI:0.1785 -2.3875) in diet were also the significant risk factors of hypertension. Whereas people doing work with physical activity (OR:0.4898, CI:0.2456 -0.9767), who have the habit of walking or jogging (OR:0.7257, CI:0.4161-1.2655) were at less risk of hypertension. Diabetes (OR:4.4188, CI:1.7067 -11.4408) and obesity (OR:1.6684, CI:0.8861 -3.1414) were also the major risk factors of hypertension.

Table 6: Results of relative risk estimation of modifiable risk factors on hypertension. N=100+100.

Sl. No.	Factors	Category	Total	Cases (n=100)	Control (n=100)	Odds Ratio (95% CI)	95% CI of ORS (Lower-upper)	p- Value
1	Current smoking	Yes	52	32	20	1.8824	(0.9871-3.5895)	0.0548
		No	148	68	80			
2	Daily smoking	Yes	38	26	12	2.5766	(1.2163-5.4581)	0.0135
		No	162	74	88			
3	Daily smoking in past	Yes	52	32	20	1.8824	(0.9871-3.5895)	0.0548
		No	148	68	80			
4	Use of Smokeless tobacco	Yes	38	26	12	2.5766	(1.2163-5.4581)	0.0135
		No	162	74	88			
5	Habit of alcohol consumption	Present	34	22	12	2.0684	(0.9610-4.4520)	0.0631
		Absent	166	78	88			
6	Include fruits in diet	Inadequate	34	28	6	6.0926	(2.3951-15.4981)	0.0001
		adequate	166	72	94			
7	Include vegetables in diet	Inadequate	10	4	6	0.6528	(0.1785-2.3875)	0.5191
		adequate	190	96	94			
8	Work with vigorous physical activity	Yes	44	16	28	0.4898	(0.2456-0.9767)	0.0427
		No	156	84	72			

9	Habit of walking or jogging	Yes	100	46	54	0.7257	(0.4161-1.2655)	0.2584
		No	100	54	46			

In this study, it was observed that having diabetes is 4.4148 times more risk for developing hypertension as compared to non diabetic and being Obese is 1.6684

times more risk for developing hypertension as compared to non obese (Table 4).

Table 4: Complications of hypertension.

Factors	Category	Total	Cases (n=100)	Control (n=100)	Odds Ratio (95% CI)	95% CI of ORS (Lower- upper)	p- Value
Diabetes Mellitus	Diabetic	28	22	6	4.4148	1.7067	11.4408
	Non-diabetic	172	78	94			
Obesity	Obese	54	32	22	1.6684	0.8861- 3.1415	0.1128
	Non Obese	146	68	78			

Family History of Hypertension.

Table 5 shows the findings of effect of family history of hypertension on hypertension. Presence of family history of hypertension (OR: 1.3899, CI: 0.7910- 2.4421) greatly increased the risk of hypertension. In this study, it was

observed that having the family history of hypertension is 1.3899 times more risk for developing hypertension as compared to those not having the history of hypertension.

Table 5: Results of relative risk estimation of family history of hypertension on hypertension.

Variable	cOR	P Value	95% CI of ORs	
			Lower	Upper
1. Family history of hypertension				
a. Present	1.3899	0.2523	0.7910	2.4421
b. Absent	Reference			

DISCUSSION

The present study was a case control study aimed to estimate the effect of modifiable risk factors on hypertension. Total of 200 samples was analyzed. Odds ratios were computed for estimation of relative risk of modifiable risk factors on hypertension.

Gender: Present study observed relatively equal rate of hypertension among gender resembles to some studies reported that the rate of hypertension was nearly equal between men and women.^[4] But in many national and international studies showed that men had significantly lower rate of hypertension compared with women.^[5]

Age: our study indicated that hypertension disease increased strongly with age in both sexes and getting old is a risk factor for hypertension, as outward symptoms of high BP take a long time to appear. This is in agreement with many studies provided strong relationship between age and hypertension disease.^[6]

Literacy: This study found statistical significant association between hypertension and education statuses. Illiterate subjects tended to have significantly higher hypertension prevalence. This may be referring to the impacts of siege and closure after the second Intifada, as a result most of the Palestinian workers in Israeli areas lost their works.^[7]

Economy: The present study showed highest risk of hypertension among subjects who lived under poverty line with significant relationship between BP and subject's monthly income. There is incompatibility between the researchers regarding the association between hypertension and socioeconomic status as income.

Smoking and Alcohol: the present study findings reveal that, current smokers, daily smokers, daily smokers in past, who were using smokeless tobacco and who have habit of alcohol consumption were at high risk for hypertension. Similar findings were observed by Pilakkadavath Z and Shaffi M.^[8]

Diet Similarly, inadequate fruits in diet, inadequate vegetables in diet were also the significant risk factors of hypertension. These findings were supported by the study conducted by Wang L *et al.*, findings showed that, higher intake of all fruits but not all vegetables remained significantly associated with reduced risk of hypertension after adjustment for lifestyle and dietary factors.^[9]

Physical activity: In the present study, people doing physical activity, having the habit of walking or jogging were at less risk for hyper tension. Findings of the present study were supported by the study conducted by Abed Y and Abu-Haddaf S *et al.*, to assess the risk factors of hypertension, results showed that, the most

common modifiable risk factors of hypertension were physical inactivity (76.7% versus 15.9%), obesity (67.5% versus 29.2%), diabetes mellitus (19.2% versus 7.5%), and ex-smoking (15.5% versus 1%).

Diabetes and Obesity: Current Study revealed that diabetes and obesity were the also the majors risk factors of hypertension. Additionally, the chief reason why people with diabetes develop hypertension disease is hardening of the arteries. Diabetes tends to speed up the process of atherosclerosis. The other fact about diabetes is that it affects both large and small blood vessels in the body. Over time, blood vessels become clogged with fatty depots and lose their elasticity. The most common risk factors identified in this study were lack of physical activity, obesity, family history, smoking, diet. This is in agreement with many national and international studies which showed that hypertension was higher among participants with one or more of these risk factors.^[10]

CONCLUSION

The present study successfully identified the association of key risk factors in hypertension; smoking, alcohol consumption, inadequate fruits and vegetables in diet, physical inactivity, and family history of hypertension, diabetes and obesity validating the findings of various others studies conducted across the globe. Addressing these risk factors is essential in controlling the epidemic of hypertension.

Initial aim should be to identify borderline cases of HTN, by regular screening, followed by lifestyle modification at early stage to prevent hypertension. Community should be taught about the important of lifestyle diseases from school days itself. Promote formation of health clubs in schools, colleges and panchayat level to give adequate facilities in towns and city residential areas where people can go for walking or exercise. Population-based health registries should collect information about risk factors, which may help in planning and implementing specific interventions which will help reduce or modify risk factors of hypertension

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