

# Modifiable Risk Factors of Hypertension: A Hospital based Case – Control Study at Bagalkot, Karnataka

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## Abstract

**Background of the Study:** Hypertension is the silent killer disease which increases the cardiovascular disease burden and mortality across the globe.

**Objectives of the study:** To estimate and compare the distribution of modifiable risk factors among hypertensive (cases) and non-hypertensive (controls) patients.

**Materials and Method:** A case–control study was conducted at Medical OPD of Hanagal Shri Kumareswar Hospital and Research Centre, Bagalkot, Karnataka using an interviewer-administered structured questionnaire based on the WHO STEPS instrument for chronic disease risk factor surveillance. Crude Odds Ratios were computed for estimating the relative of risk modifiable risk factors on Hypertension.

**Results:** A sample of 250 (125 cases and 125 controls) subjects was included in the study. Mean age of the sample was 52.82 years. Findings shows that, smoking (Odds ratio=7.289, P<0.001), use of smokeless tobacco (Odds ratio=1.4, P<0.05), alcohol consumption (Odds ratio=1.15, P<0.05), inadequate fruits (Odds ratio=1.19, P<0.05) and vegetables in diet (Odds ratio=5.2, P<0.05), diabetes (Odds ratio=5.21, P<0.001), obesity (Odds ratio=4.12, P<0.001) and family history of hypertension (Odds ratio=1.8, P<0.05) were significantly different in proportion among cases and controls and were found to be significant risk factors of Hypertension.

**Conclusion:** Hypertension is strongly associated many modifiable risk factors. An extensive public awareness programmes targeting risk factors is essential in controlling hypertension, especially concentrating on physical exercise and control of diabetes, obesity, and on quitting smoking and alcohol and healthy diet.

**Key words:** Hospital, Case-Control Study, Modifiable Risk Factors, Hypertension.

## Introduction

Hypertension is a disease entity of its own. It remains silent being asymptomatic during its clinical course. Because of its asymptomatic appearance, it

does immense harm to the body in the form of target organ damage, hence the WHO has named it the “silent killer.” Hypertension is a major cause of cardiovascular morbidity and mortality worldwide.<sup>1</sup> Excess dietary salt, low dietary potassium, overweight and obesity, physical inactivity, excess alcohol, smoking, socioeconomic status, psychosocial stressors, and diabetes are considered as modifiable risk factors for hypertension.<sup>2</sup>

Globally, hypertension is estimated to cause 7.5 million deaths a year which is roughly 12.8% of the total. Hypertension is directly responsible for 57% of all stroke deaths and 24% of all coronary heart disease in India.<sup>3</sup> A recent meta-analysis has shown prevalence

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of hypertension as 40.8% and 17.9% in urban and rural population of India respectively.<sup>4</sup>

Hypertension is a tip of iceberg disease and often diagnosed for seeking treatment for other health problems. Sometimes it is diagnosed when it results in severe complications and admission to hospital of a patient. Lack of awareness regarding hypertension among public often leads to fatal consequences due to hypertension and related morbidities. Lack of awareness also results in poor health seeking behavior and reluctance in adoption of healthy life style.<sup>5</sup>

Hence considering the fact that, hypertension is the silent killer disease carry many modifiable risk factors which would pose the individual at many other morbidities, the researcher has planned to undertake a hospital based case-control study to assess the modifiable risk factors for hypertension among hypertensive and non-hypertensive patients attending the medical OPD of Hanagal Shree Kumareshwar Hospital and Research Centre, Bagalkot, so that an estimate of modifiable risk factors among hypertensive patients compared to non-hypertensive patients could be made. Which could be addressed in future interventional studies.

## Material and Method

### Study Design and Participants

Present study was a cross sectional case-control study conducted between Aug 2017 to Sep 2017. The sample for the present study was patients who came to the medical outpatient department of Hangal Shri Kumareshwar Hospital and Research Centre, Bagalkot during the study period. From them, only those who qualified the inclusion criteria as either a case or control were included in the analysis.

#### Criteria for Sample selection:

##### Inclusion Criteria:

##### Cases (Hypertensive patients):

- Patients who were already diagnosed with hypertension by a physician.
- Patients who are already on blood pressure-lowering medication(s).

- Both old and newly diagnosed patients were included.

- All willing patients aged between 35 and 65 years were included in the study.

##### 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 are normal.

- All willing patients aged between 35 and 65 years were included in the study.

##### 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.

##### Sample size

Sample size is 125 cases (Hypertensive patients) and 125 controls (Non-hypertensive patients).

##### Instruments

A modified WHO STEPS instrument (Questionnaire) for chronic disease risk factor surveillance was used to collect data. The questionnaire consisted of 7 items related to socio-demographic characteristics of sample, 19 items related to behavioral characteristics of sample and 6 items related to the physical characteristics of sample.

##### Data Collection Procedures

Prior permissions were taken from Hospital authority before the beginning of data collection procedure. The study participants were indentified during the study period at medical outpatient department of Hangal Shri Kumareshwar Hospital and Research Centre, Bagalkot. Every subject who fulfilled the inclusion criteria as either case or control was approached for data collection. Consent was obtained by the researcher

before participants underwent the structured interview which lasted approximately for 15 to 20 minutes. Purpose of the study was explained to the participants and they were interviewed in Kannada or in the language understandable to them. All the information collected was based on patient's self report, but the information related to physical characteristics such height, weight and blood pressure were assessed by the researcher at the time of interview.

### Data Analysis

Numerical data obtained from the sample was organized and summarized with the help of descriptive statistics like frequency, percentage, mean, standard deviation. A simple proportion was done for all the relevant variables studied among cases and controls and the overall sample with confidence interval (CI) fixed

at 95%. The proportions of relevant risk factors were compared between cases and controls. Significance was ascertained by using Crude Odds Ratios (ORs). Statistical analysis was done using SPSS Ver. 25.

## Results

### A: Sample characteristics

Mean age of cases was  $56.78 \pm 8.65$  and mean age of controls was  $48.87 \pm 11.01$ . Most of both cases (63.2%) and controls (51.2%) were males. Majority of both cases (91.2%) and controls (98.4%) were Hindu. Nearly same percentage of cases (34.4%) and controls (39.2%) had no formal education. All most all cases and controls were married. Nearly same number of cases (29.6%) and controls (35.2%) were housewives. Mean family monthly income of cases was  $11896 \pm 5537$  and that of controls was  $11568 \pm 2837.92$ .

### B. Physical Characteristics of Sample

**Table I: Description of physical characteristics of subjects.**

Variables	Groups	Mean	Std. Deviation
Height in cms	Cases	158.93	6.44
	Controls	155.18	5.02
Weight in kg	Cases	61.97	11.23
	Controls	56.86	7.68
BMI	Cases	24.54	4.3
	Controls	23.63	3.1
Systolic Blood Pressure	Cases	156.91	8.28
	Controls	121.60	4.44
Diastolic Blood Pressure	Cases	99.97	13.61
	Controls	78.93	7.58

**Table I presents the mean and standard deviation physical characteristics of both cases and controls.**

**C: Modifiable Risk Factors of Hypertension**

**Table II: Description of modifiable risk factors of Hypertension.**

**N=125+125=250**

Risk Factors	Cases		Controls	
	F	%	F	%
1. Current smoking				
a. Yes	19	15.2%	3	2.4%
b. No	106	84.8%	122	97.6%
2. Daily smoking				
a. Yes	15	12%	2	1.6%
b. No	110	88%	123	98.4%
3. Daily smoking in past				
a. Yes	28	22.4%	9	7.2%
b. No	97	77.6%	116	92.8%
4. Use of smokeless tobacco				
a. Yes	40	32%	32	25.6%
b. No	85	68%	93	74.4%
5. Habit of alcohol consumption				
a. Present	29	23.2%	26	20.8%
b. Absent	96	76.8%	99	79.2%
6. Include fruits in diet				
a. Inadequate	46	36.8%	40	32%
b. Adequate	79	63.2%	85	68%
7. Include vegetables in diet				
a. Inadequate	5	4%	1	0.8%
b. Adequate	120	96%	124	99.2%
8. Work with vigorous physical activity				
a. Yes	21	16.8%	51	40.8%
b. No	104	83.2%	74	59.2%
9. Habit of walking or jogging				
a. Yes	35	28%	38	30.4%
b. No	90	72%	87	69.6%
10. Diabetes Mellitus				
a. Diabetic	36	28.8%	9	7.2%
b. Non-diabetic	89	71.2%	116	92.8%
11. Obesity				
a. Obese	15	12%	2	1.6%
b. Non Obese	110	88%	123	98.4%

Table II depicts the difference in proportion of various modifiable risk factors of hypertension between cases and controls.

**D: Estimation of relative risk of modifiable risk factors on Hypertension.**

The effect of various modifiable risk factors on hypertension was estimated using the crude odd ratios (cORs) and presented in Table III.

**Table III: Results of relative risk estimation of modifiable risk factors on hypertension.**

N=125+125=250

Variables	cOR	P value	95% CI of ORs	
			Lower	Upper
1. Current smoking				
a. Yes	7.289	<0.001	2.09	25.32
b. No	Reference			
2. Daily smoking				
a. Yes	8.386	<0.001	1.9	37.5
b. No	Reference			
3. Daily smoking in past				
a. Yes	3.721	<0.001	1.7	8.3
b. No	Reference			
4. Use of smokeless tobacco				
a. Yes	1.4	<0.05	0.8	2.4
b. No	Reference			
5. Habit of alcohol consumption				
a. Present	1.15	<0.05	0.63	2.09
b. Absent	Reference			
6. Include fruits in diet				
a. Inadequate	1.19	<0.05	0.7	2
b. Adequate	Reference			
7. Include vegetables in diet				
a. Inadequate	5.2	<0.001	0.6	44.9
b. Adequate	Reference			
8. Work with vigorous physical activity				
a. Yes	0.29	>0.05	0.16	0.53
b. No	Reference			
9. Habit of walking or jogging				
a. Yes	0.83	>0.05	0.48	1.42
b. No	Reference			
10. Diabetes Mellitus				
a. Diabetic	5.21	<0.001	2.39	11.4
b. Non-diabetic	Reference			
11. Obesity				
a. Obese	4.12	<0.001	1.33	12.8
b. Non Obese	Reference			

cOR: Crude Odds Ratios, CI: Confidence Interval

Table III displays the findings of relative risk estimation of effect of modifiable risk factors on hypertension. Findings reveal that, current smokers (OR: 7.289, CI: 2.09-25.32), daily smokers (OR: 8.386, CI: 1.9 -37.5), daily smokers in past (OR: 3.721, CI: 1.7-8.3), who are using smokeless tobacco (OR: 1.4, CI: 0.8-2.4) and who have habit of alcohol consumption (OR: 1.15, CI: 0.63-2.09) were at higher risk for hypertension.

Similarly, inadequate fruits in diet (OR: 1.19, CI: 0.7-2), inadequate vegetables (OR: 5.2, CI: 0.6-44.9) in diet were also the significant risk factors of hypertension. Whereas people doing work with physical activity (OR: 0.29, CI: 0.16-0.53), who have the habit of walking or jogging (OR: 0.83, CI: 0.48-1.42) were at less risk for hyper tension. Diabetes (OR: 5.21, CI: 2.39-11.4) and obesity (OR: 4.12, CI: 1.33-12.8) were the also the majors risk factors of hypertension.

In the present study, people doing work with physical activity (OR: 0.29, CI: 0.16-0.53), who have the habit of walking or jogging (OR: 0.83, CI: 0.48-1.42) were at less risk for hyper tension. Diabetes (OR: 5.21, CI: 2.39-11.4) and obesity (OR: 4.12, CI: 1.33-12.8) were also the majors risk factors of hypertension.

### E. Family History of Hypertension

Percentage wise distributions of cases and controls according to family history of hypertension shows that, in case group majority (57.6%) of them had no family history of hypertension and 42.4% of them had family history of hypertension. Whereas in control group, 71.2% do not have family history of hypertension and remaining 28.8% have family history of hypertension.

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

N=125+125=250

Variables	cOR	P value	95% CI of ORs	
			Lower	Upper
<b>1. Family history of hypertension</b>				
a. Present	1.8	<0.05	1.08	3.08
c. Absent	Reference			

cOR: Crude Odds Ratios, CI: Confidence Interval

Table IV shows the findings of effect of family history of hypertension on hypertension. Presence of family history of hypertension (OR: 1.8, CI: 1.08-3.08) greatly increased the risk of hypertension.

### Discussion

The present case control study was conducted with the aim of estimating the effect of modifiable risk factors on hypertension. Study included a sample of 250 subjects (125 cases and 125 controls) selected using the purposive sampling technique. Odds ratios were computed for estimation of relative risk of modifiable risk factors on hypertension.

Findings of the study showed that, current smokers (OR: 7.289, CI: 2.09-25.32), daily smokers (OR: 8.386, CI: 1.9 -37.5), daily smokers in past (OR: 3.721, CI: 1.7-8.3), who are using smokeless tobacco (OR: 1.4, CI: 0.8-2.4) and who have habit of alcohol consumption (OR: 1.15, CI: 0.63-2.09) were at higher risk for hypertension.

Similar findings were observed by Pilakkadavath Z and Shaffi M<sup>6</sup> in their study conducted to assess modifiable risk factors of hypertension at Kerala, India. In their study, smoking and alcohol consumption were the significant risk factors of hypertension.

In the present study, inadequate fruits in diet (OR: 1.19, CI: 0.7-2), inadequate vegetables (OR: 5.2, CI:

0.6-44.9) in diet were also the significant risk factors of hypertension. These findings were supported by the study conducted by Wang L et al<sup>7</sup> on fruit and vegetable intake and the risk of hypertension in middle-aged and older women. 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.

In the present study, people doing work with physical activity (OR: 0.29, CI: 0.16-0.53), who have the habit of walking or jogging (OR: 0.83, CI: 0.48-1.42) were at less risk for hyper tension. Diabetes (OR: 5.21, CI: 2.39-11.4) and obesity (OR: 4.12, CI: 1.33-12.8) were the also the majors risk factors of hypertension.

Findings of the present study were supported by the findings of the study conducted by Abed Y and Abu-Haddaf S<sup>7</sup> 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%).

### Limitations

Although present study has able to explain to some extent the relative risk of modifiable risk factors of hypertension, some limitations need to be taken into account. Sample size was limited to 250 (125 cases and 125 controls), hence the results cannot be generalized to wider population. Limited variables were included in this, as other aspects like blood sugar control in diabetic patients; lipid profile could be also associated with hypertension. Hence further researches may consider these limitations to update the knowledge on modifiable risk factors of hypertension.

### Recommendations

Hypertension is strongly driven by a set of modifiable risk factors. An extensive public awareness campaign targeting risk factors is essential in controlling hypertension, especially focusing on physical activity and control of diabetes, obesity, and on quitting smoking and alcohol consumption, healthy diet. Future research should aim at evaluating the efficacy of risk reduction programmes on control of hypertension and their overall

quality of life.

## Conclusions

Hypertension is a highly prevalent risk factor for cardiovascular disease and it can also lead to other diseases which seriously harm the human health. Screening the risks and finding a clinical model for estimating the risk of onset, maintenance, or the prognosis of hypertension are of great importance to the prevention or treatment of the disease, especially if the indicator can be derived from simple health profile. In this direction the present study has been successful in finding the key risk factors of 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.

**Ethical Clearance:** Ethical clearance was obtained from the institutional ethical committee of BVVS Sajjalashree Institute of Nursing Sciences, Bagalkot.

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**Conflict of Interest:** Nil

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