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## **A STUDY ON ATTRIBUTABLE RISK ESTIMATES FOR RISK FACTORS ASSOCIATED WITH HYPERTENSION AT A TERTIARY CARE HOSPITAL**

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### **ABSTRACT**

Attributable risk quantifies the difference in disease risk between exposed and non-exposed groups. This study aims to estimate how individual risk factors—like substance use, obesity, pollution, family history, and comorbidities—contribute to hypertension. It helps identify the impact of lifestyle, genetics, and environment on disease prevalence. The focus is on hypertension among tertiary care patients. To estimate the various risk factors that lead to hypertension in a tertiary care hospital. A prospective observational study was conducted among 200 patients, and the attributable risk of several risk factors was estimated and evaluated. The study was conducted within the departments of General Medicine, Surgery, and OBG at MVJ Medical College and Research Hospital. On assessing the attributable risk of 7 risk factors, we can conclude by saying that among the 200 people analyzed and observed within the hospital, alcohol is the risk factor at the highest risk for hypertension.

Genetics and surgery are the 2 risk factors, where the risk was obtained in negative showing a protective effect towards the cause of hypertension. From this study, we can state that several risk factors cause hypertension in the premises of a tertiary care hospital, with obesity, alcohol, and smoking regarded as the most common and significant risk factors leading to the cause. Each risk factor evaluated should be monitored on an individual basis from time to time, as it has the potential cause leading to cause

hypertension. Therapeutic drug monitoring should be implemented strictly and thoroughly to avoid medication abuse.

**Keyword: attributable risk, hypertension, risk factors, tertiary care hospital**

## INTRODUCTION

### Hypertension

The World Health Organization defines hypertension, sometimes referred to as high or elevated blood pressure, as a disorder in which the pressure inside the blood vessels remains elevated over time. Heart, brain, kidney, and other disorders can all be made more likely by hypertension, a dangerous medical condition. Premature death is the leading cause globally, affecting up to 1 in 4 men and 1 in 5 women.

There are standard guidelines that are followed for the treatment of hypertension throughout the world. The 2 main guidelines followed are by JNC (Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure) and AHA (American Heart Association and American Stroke Association)

Using Attributable risk (AR), the risk factors of hypertension were analysed, and by the use of the formula, the ratios were compared and depicted.

The main Formula used is: -

**Attributable risk (Risk difference) =**

$$a/a+b-c/c+d$$

**a and b variables are exposed to the group c and d are the non-exposed group**

A critical examination of the factors influencing the prevalence of hypertension in a specialized healthcare setting is provided by the study on attributable risk estimates for risk factors linked to hypertension in a tertiary care.

### MATERIALS AND METHODS

A observational study was conducted in the General Medicine, Surgery, and OBG ward for six months in MVJ Medical College and Research Hospital, Hoskote. The study was conducted to gain approval from the Institutional Ethical Committee (ICC). All patients who met the study criteria were enrolled after obtaining informed consent from the patients or their legal representatives. After considering the inclusion criteria (Patients diagnosed with hypertension, Patients aged between 21-90 years, and patients with gestational hypertension) and exclusion criteria (Patients unwilling to participate in the study were excluded). To collect data, a patient data collection form standardized by the educational institute was used. The study involved a total of 200 patients.

The study parameters of the risk factors of the patients were analysed and compared. At the end of the study, the collected data were compiled and subjected to statistical analysis. Statistical analysis was performed using MS-Excel.

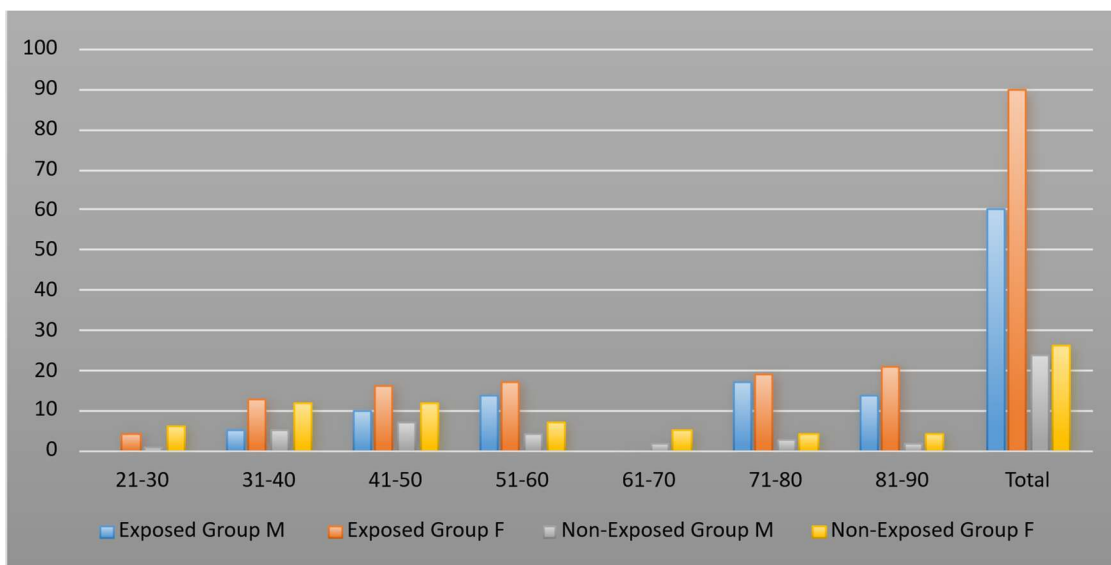
**RESULTS**

**SOCIO-DEMOGRAPHIC DETAILS**

200 patients were analyzed on the whole, out of which 150 of them belonged to the hypertensive group (exposed group) and 50 belonged to the non-hypertensive group (non-exposed group) (Table 1, Figure 1).

**Table 1: Age Distribution**

Age Group	Exposed Group		Non-Exposed Group	
	M	F	M	F
21-30		4	1	6
31-40	5	13	5	12
41-50	10	16	7	12
51-60	14	17	4	7
61-70	0	0	2	5
71-80	17	19	3	4
81-90	14	21	2	4
Total	60	90	24	26



**Figure 1: Age Distribution**

**RISK FACTORS**

The risk factors considered in the study were: alcohol, obesity, smoking, genetics, medication abuse, surgery, and drug abuse. The ratio of each factor was calculated and compared (Table 2, Table 3).

**For example:**

Alcohol

Similarly, the ratio of other risk factors was taken.

Table 2: A.R. Table for Alcohol

Risk Factor	Attributable Risk Ratio
Alcohol	0.06
Obesity	0.04666
Surgery	-0.02667
Smoking	0.04667
Genetics	-0.02
Medication Abuse	0.05333
Aspirin	0.03333
Steroids	-0.04
Drug Abuse	0
Caffeine	-0.02667
Beedi/ Betul Nut	0.02

Table 3: Attributable Ratio's for all the risk factors analyzed

Alcohol	Yes	No	total
Exposed	45	105	150
Non-Exposed	12	38	50
			200
			0.06

On evaluating the attributable risk of 7 risk factors as mentioned above, we can conclude by saying that among the 200 people analyzed and observed within the hospital, alcohol is the risk factor at the highest risk for hypertension. However, at 2<sup>nd</sup> place is medication abuse, followed by obesity, and then smoking. Ongoing in-depth analysis, in the case of drug abuse, there was a positive incidence of risk in the case of those patients abusing beedi and betel nut, whereas in medication abuse, drugs like steroids, NSAIDs, etc., were analyzed, showing a positive incidence of those consuming aspirin. Genetics and surgery are the 2 risk factors, where the risk was obtained in negative

showing a protective effect towards the cause of hypertension indicating that these risk factors do not cause hypertension.

From this evaluation, we can advise the healthcare staff and physicians to educate the patients regarding such factors to prevent the risk of hypertension cases in the hospital in the future.

### PAST MEDICAL HISTORY OF HYPERTENSION

Below is the data of the patients who were already diagnosed with hypertension when admitted to the hospital. Out of 150 people, 104 were already diagnosed with hypertension on admission (Table 4, Figure 2).

Table 4: People who have a medical history of Hypertension

Gender	Past Medical History of HTN		
	No	Yes	Total
F	28	62	90
M	18	42	60
Total	46	104	150

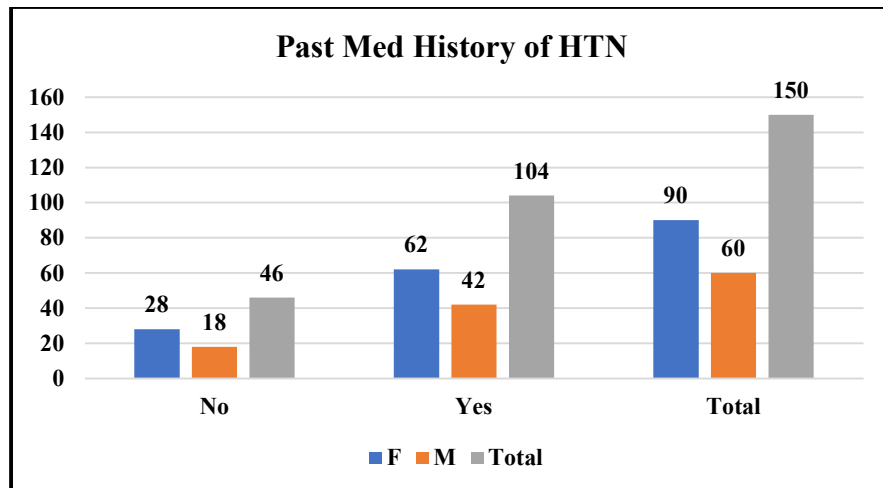


Figure 2: People who have a medical history of Hypertension

**BP GRADING SCALE**

150 hypertensive patients, the average BP of the patients were measured and graded with the help of the grading scale used by AHA (American Heart Association). With the help of this, the patients were graded into categories I.e. stage 1, stage 2, and hypertensive crisis. (The grading scale is shown below in **Table 5**.)

The scale depicts are as follows: For elevated BP the systolic measures are less than 120 and diastolic measures are less than 80. for stage 1 systolic BP to be between 130-139 and diastolic 80-89, for stage 2 systolic range more than 140 and diastolic more than 90. Finally, in the hypertensive crisis state, systolic measures above 180 and diastolic measures above 120 (all measures of Bp in mm/hg).

Table 5: BP Grading Scale

Age	Elevated			Stage 1			Stage 2			Crisis			Total
	F	M	Total	F	M	Total	F	M	Total	F	M	Total	
21-30				2		2	1		1	1		1	4
31-40				1		1	8	4	12	4	1	5	18
41-50				6	3	9	3	4	7	7	3	10	26
51-60	2		2	6	5	11	3	4	7	6	5	11	31
61-70													0
71-80	2	2	4	3	5	8	9	3	12	5	7	12	36
81-90	1		1	9	2	11	5	7	12	6	5	11	35
			7			42			51			50	150

**DISCUSSION**

Within the scope of observations, it was observed that the prevalence of the estimated risk factors for hypertension was high, and

this observation aligned with the findings of a study conducted within the US among black adults [1]. Similarly, the study that estimated the population attributable risk factors

associated with hypertension in Indian patients, done in 2013, had an agreement with our study [2] as in both the results conveyed that alcohol consumption was considered to be the highest risk factor that led to hypertension.

The findings of the study that took place in Iran, where people were screened to check whether obesity was attributed to high blood pressure and prevalence in high blood sugar patients [3] can be directly related to our research as both indicated that the people having blood pressure and being obese attributed to the incidence of hypertension along with diabetes having a prevalence rate of 53.1%. However, a research article [4] on multiple risk factors and population-attributable risk for IHD mortality disagreed with our analysis as no incidents of death took place during our study. The same instance can be interpreted from this paper's associations and attributable burden between risk factors and all-cause and cause-specific mortality at different ages in patients with hypertension [5].

Referring to the paper published in 2006 accounting for the people in Gun Gezi Hei yi Zhuang and Han populations in China [6] stated the effects of demographic characteristics and lifestyle factors on the prevalence of hypertension for the middle-

aged disagreed with our hypothesis as the paper stated demographics and genetics played an important role in leading to hypertension in middle age. In contrast, our hypothesis, barring almost the whole adult population age bracket within the tertiary care hospital, stated that genetic factors have a protective effect and don't play an important role in leading to hypertension.

Among the 200 participants studied, and on comparison with the case-controlled study [7] conducted in the lands of Peshawar, Pakistan, it caught the eye that smoking, stress, diet measures, obesity, and the prevalence of diabetes had a huge impact, leading to stroke and hypertension, respectively. The cohort study conducted in Rwanda in 2017 [8] and the Northern Manhattan Study [9] implicated the surge in hypertension and other cardiovascular diseases, aligned with our observations.

Our learnings regarding the number of people who on average, had uncontrolled levels of BP (stage 2 and hypertensive crisis categories) agreed on similar terms from the cross-sectional study analysing the risk factors and diseases in India, just barring the difference in age group selection criteria [10].

The research articles, namely. Attributable risk is present in case-control studies [11], attributable risk: Advantages of a broad

definition of exposure gets access arrow [12] and interpretation and estimation of attributable risk in health research [13] were referred to get a better understanding of the statistical tool attributable risk which was implemented and used in our study.

## CONCLUSION

To conclude, there is no doubt that modernization is having a great impact on health-related factors. The sedentary lifestyle, the comforts, the access, and the availability of rich food are all making us more and more prone to a sick nation.

The saying “Health Is Wealth” implies, in simple words, there is no point in having Wealth without Health. Many diseases are arising rapidly at present, with hypertension being one of them. Almost every 1 in 3 people is diagnosed with hypertension after attaining a certain age.

An observational study was carried out to evaluate Attributable Risk Estimates For Risk Factors Associated With Hypertension in patients At Tertiary Care Hospital at Department of General Medicine, Surgery, and OBG, MVJ Medical College and Research Hospital, Bengaluru. In our study, several risk factors were estimated and the attributable risk was performed, indicating which risk factor led to the highest incidence of hypertension.

200 people were taken in the study, with 150 being grouped into the exposed group (those diagnosed with hypertension) and 50 being in the non-exposed group (those who weren't exposed to hypertension).

## The results obtained were:

- 1) On evaluating the attributable risk of 7 risk factors as mentioned above, we can conclude by saying that among the 200 people analyzed and observed within the hospital, alcohol is the risk factor at the highest risk for hypertension.
- 2) However, at 2<sup>nd</sup> place is medication abuse, followed by obesity, and then smoking. Ongoing in-depth analysis, in the case of drug abuse, there was a positive incidence of risk in the case of those patients abusing beedi and betel nut, whereas in medication abuse, drugs like steroids, NSAIDs, etc., were analyzed, showing a positive incidence of those consuming aspirin.

Genetics and surgery are the 2 risk factors, where the risk was obtained in negative showing a protective effect towards the cause of hypertension indicating that these risk factors do not cause hypertension

From this evaluation, we can advise the healthcare staff and physicians to educate the patients regarding such factors to prevent the

risk of hypertension cases in the hospital in the future.

It was also seen that more females were hypertensive in comparison with males in the hospital.

Our study indicates that each risk factor evaluated should be monitored on an individual basis from time to time, which has the potential cause lead to hypertension. The risk factors and their consequences if misused. should be educated about the patients. Therapeutic drug monitoring should be implemented strictly and thoroughly to avoid medication abuse.

Finally, the study calls for a change in the attitude of the people. A change in the mindset to prioritize and give the utmost importance to health. **“INVEST IN HEALTH”**

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#### **REFERENCES**

- [1] Clark D, Colantonio LD, Min YI, Hall ME, Zhao H, Mentz RJ, *et al*. Population-Attributable Risk for Cardiovascular Disease Associated With Hypertension in Black Adults. *JAMA Cardiology* [Internet]. 2019 Oct 23;1. Available from: <https://jamanetwork.com/journals/jamacardiology/article-abstract/2753609>
- [2] Shankarishan P, Borah PK, Mohapatra PK, Ahmed G, Mahanta J. Population attributable risk estimates for risk factors associated with hypertension in an Indian population. *European Journal of Preventive Cardiology*. 2012 Sep 20;20(6):963–71.
- [3] Babae E, Tehrani-Banihashem A, Eshrati B, Purabdollah M, Nojomi M. How Much Hypertension is Attributed to Overweight, Obesity, and Hyperglycemia Using Adjusted Population Attributable Risk in Adults? *International Journal of Hypertension*. 2020 Aug 14;2020:1–7.
- [4] Ruixing Y, Jiaqiang D, Dezhai Y, Weixiong L, Shangling P, Jinzhen W,

- et al.* Effects of Demographic Characteristics, Health-Related Behaviors and Lifestyle Factors on the Prevalence of Hypertension for the Middle-Aged and Elderly in the Guangxi Hei Yi Zhuang and Han Populations. *Kidney and Blood Pressure Research*. 2006;29(5):312–20.
- [5] Nahimana MR, Nyandwi A, Muhimpundu MA, Olu O, Condo JU, Rusanganwa A, *et al.* A population-based national estimate of the prevalence and risk factors associated with hypertension in Rwanda: implications for prevention and control. *BMC Public Health* [Internet]. 2017 Jul 10;18(1). Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5504833/>
- [6] Arkwright PD, Beilin LJ, Rouse I, Armstrong BK, Vandongen R. Effects of alcohol use and other aspects of lifestyle on blood pressure levels and prevalence of hypertension in a working population. *Circulation*. 1982 Jul;66(1):60–6.
- [7] Shah SMA, Shah SMS, Khan S, Rehman SU, Khan ZA, Ahmed W, *et al.* “Addressing the impact of stroke risk factors in a case control study in tertiary care hospitals”: a case control study in Tertiary Care Hospitals of Peshawar, Khyber Pakhtoonkhwa (KPK) Pakistan. *BMC Research Notes*. 2013 Jul 12;6(1).
- [8] Ajinkya Kothavale, Parul Puri, Purvi G. Sangani. Quantifying population level hypertension care cascades in India: a cross-sectional analysis of risk factors and disease linkages. *BMC Geriatrics* [Internet]. 2022 Feb 1;22(1):1–12. Available from: <https://eds.p.ebscohost.com/eds/detail/detail?vid=0&sid=0635351a-5d15-4e5c-9896-cad0af77aa26%40redis&bdata=JnNpdGU9ZWRzLWxpdmU%3d#AN=edsdoj.095dbd0b82f54768969936a446dc8176&db=edsdoj>
- [9] Sarki AM, Nduka CU, Stranges S, Kandala NB, Uthman OA. Prevalence of Hypertension in Low- and Middle-Income Countries. *Medicine*. 2015 Dec;94(50):e1959
- [10] Wacholder S, Benichou J, Heineman EF, Hartge P, Hoover RN. Attributable Risk: Advantages of a Broad Definition of Exposure. *American Journal of Epidemiology*. 1994 Aug 15;140(4):303–9.

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- [11] Nilsson PM, Nilsson JA, Berglund G. Population-attributable risk of coronary heart disease risk factors during long-term follow-up: the Malmo Preventive Project. *Journal of Internal Medicine*. 2006 Aug;260(2):134–41.
- [12] Park TH, Ko Y, Lee SJ, Lee KB, Lee J, Han MK, *et al*. Identifying Target Risk Factors Using Population Attributable Risks of Ischemic Stroke by Age and Sex. *Journal of Stroke [Internet]*. 2015 Sep 30;17(3):302–11. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4635707/>
- [13] Wang F, Yu Y, Mubarik S, Zhang Y, Liu X, Cheng Y, *et al*. Global Burden of Ischemic Heart Disease and Attributable Risk Factors, 1990–2017: A Secondary Analysis Based on the Global Burden of Disease Study 2017. *Clinical Epidemiology*. 2021 Sep;Volume 13:859–70.