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Assessment Of Hypertension Prevalence And Its Association With Lifestyle Risk Factors Among Adults

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ABSTRACT

A significant global public health issue, hypertension is a key risk factor for death and cardiovascular illnesses. The rising prevalence of hypertension is closely linked to demographic changes and lifestyle-related factors such as drinking alcohol, smoking, and not exercising. This study designed to assess the prevalence of hypertension among adults, examine its association with lifestyle risk factors, and identify independent predictors using multivariate analysis. A supplementary dataset was used in a cross-sectional analytical investigation. After data cleaning, 68,610 individuals were included in the analysis. Systolic blood pressure (SBP) ≥140 mmHg and/or diastolic blood pressure (DBP) ≥90 mmHg were considered indicators of hypertension. Descriptive statistics, chi-square tests, and multivariate logistic regression were performed to evaluate relations and predictors. The prevalence of hypertension was 34.28%. Smoking and alcohol consumption showed significant associations with hypertension ($p < 0.001$), while physical activity was not significant in bivariate analysis but showed a weak association in multivariate analysis. Age and BMI were identified as strong predictors, along with male gender, smoking, and alcohol intake. Hypertension affects a significant proportion of adults and is influenced by both lifestyle and demographic factors. Targeted interventions focusing on modifiable risk factors are crucial for prevention and control.

Keywords: Hypertension, Prevalence, Lifestyle Factors, Smoking, Alcohol Consumption, Body Mass Index

1. INTRODUCTION

Hypertension is a substantial universal public well-being issue and a primary hazard factor of cardiovascular diseases, stroke and early mortality throughout the world. It has turned into a major healthcare system burden in low- and middle-income countries.[1] There has always been a growing tendency in the prevalence of hypertension, which according to epidemiological studies in various regions is the direct result of demographic changes, ageing population and high urbanization.[2] The use of community-based studies has shown that a significant percentage of adults has hypertension, which may remain unnoticed or poorly treated.[3] The changes in lifestyle habits, such as poor dietary habits, lack of physical exercise, and increased exposure to risk factors, are some of the factors that contribute to the increasing burden.[4] Such lifestyle-related factors as smoking and alcohol intake have been cited as the major factors that contribute to high blood pressure rates and other cardiovascular risks.[5] In addition, sedentary lifestyles and absence of regular physical exercises have been associated with development and progression of hypertension.[6] It is also shown by evidence of the national surveys that the prevalence of hypertension is different across populations but consistently high, which provides the rationale of targeted intervention.[7] Research in both urban and semi-urban areas further confirm the fact that hypertension is increasingly becoming a common occurrence owing to the changing environmental and behavioral patterns.[8]
Although there has been a lot of research on hypertension, there have been a number of gaps in the available literature. Most of the researches have small sample sizes that limit the generalization of results on the general population.[9] Also, many studies concentrate on either the clinical or lifestyle factors in isolation, and not combining both of them in an analytical context.[10] High prevalence rates have been reported in population-based surveys but they have frequently lacked the detailed analysis of the combined lifestyle and physiological determinants.[11] In addition, inconsistencies in the presented results are caused by differences in the study design, population characteristics, and methods of measurements.[12] In particular, the issue of physical activity in the risk of hypertension is an inconclusive phenomenon with certain studies showing significant association and others showing minimal or no association.[13] These inconsistencies highlight the need to conduct large-scale studies involving a number of variables in order to increase a better understanding of the multifaceted interaction among risk factors connected with hypertension. The necessity to understand the prevalence and elements of hypertension with the use of large datasets is critical to producing reliable and generalizable evidence. The massive analyses allow a more accurate assessment of the modifiable and non-modifiable risk factors and, therefore, improve the accuracy of epidemiological findings.[14] There is also the need to determine lifestyle-related determinants, such as smoking, consumption of alcohol and physical inactivity in order to design effective preventive strategies and public health intervention.[15] Moreover, the combination of these factors and demographic and clinical factors can provide

more evidence about the multifactoriality of hypertension.[16] The secondary data analysis is an efficient low-cost method to study a large population and reveal pattern that might not be readily apparent in smaller studies.[17] Therefore, the aim of the research is to utilize a large secondary dataset in order to know the prevalence of hypertension and to examine how hypertension is related to key lifestyle risk factors in adults.

Research Objectives

1. To evaluate the prevalence of hypertension among adults.
2. To examine the association between hypertension and lifestyle risk factors (smoking, alcohol intake, and physical activity).
3. To identify independent predictors of hypertension using multivariate analysis.

2. METHODOLOGY

2.1 Study Design

The cross-sectional study design adopted in the study was based on secondary data since it was required to ascertain the frequency of hypertension and its relationship with the chosen lifestyle risk factors in adults. Cross sectional type of the study can be used to determine association between variables at one point in time hence it is appropriate in estimating disease burden and identification of the potential risk factors.

2.2 Data Source

The research used secondary data of 70,000 participants that covered demographic, clinical, and lifestyle related variables as cardiovascular health. The data set was also obtained on a publicly available source.[18] After the data cleaning processes including the elimination of implausible values of blood pressure, height, and weight, a total of 68,610 people were retained to be finally analysed.

2.3 Study Variables

Hypertension, which was defined as an SBP of at least 140 mmHg and/or a DBP of at least 90 mmHg, was the primary outcome variable in this investigation. The key independent variables were lifestyle-related factors, includes alcohol intake, physical exercise, and smoking status, which were categorised most appropriately, depending on the data. Important covariates were also included to control potential confounding effects, including age (in years), gender (male/female), and BMI, which was computed using the weight and height values.

2.4 Data Processing

The preprocessing of data was carried out so that the accuracy and reliability of the analysis could be guaranteed. SBP, DBP, height and weight implausible and extreme values were identified and rejected according to predefined criteria to limit bias BMI was calculated based on the standard formula (body weight/height2). Variables were classified in an appropriate way in order to allow statistical tests. This was part of the quality assurance process for the dataset before conducting any analysis.

2.5 Statistical Analysis

Descriptive analysis, which consisted of calculation of mean SD and frequency (%) of variables that are categorical and continuous, respectively, was done to provide an initial analysis of the collected data. Hypertension prevalence was calculated using percentages. In order to establish whether there was a statistical relation between hypertension and lifestyle factors, the chi-square test was utilized while multivariate logistic regression model was performed to determine predictors independently after adjustment for age, gender and BMI. Odds ratios (OR) along with the accompanying confidence intervals (CIs) were presented; a p-value of less than 0.05 was deemed statistically significant.

3. RESULTS

3.1 Study Population and Baseline Characteristics

The data initially comprised 70,000 participants, out of which 68,610 people were left following the data cleaning and elimination of unrealistic values of blood pressure, height, and weight. The population under study was mainly made up of individuals who were in their middle age, with a mean age of 53.33 ± 6.76 years. The average BMI was 27.46 ± 5.26 kg/m^2, which would represent an average overweight population. The average SBP was 126.67 ± 16.68 mmHg, and the mean of DBP was 81.30 ± 9.42 mmHg, indicating borderline high average blood pressure levels in the study cohort (Table 1).

Table 1. Baseline Characteristics (n = 68,610)

Variable	Mean ± SD
Age (years)	53.33 ± 6.76
BMI (kg/m²)	27.46 ± 5.26
Systolic BP (mmHg)	126.67 ± 16.68
Diastolic BP (mmHg)	81.30 ± 9.42

3.2 Prevalence of Hypertension

The general prevalence rate of hypertension in the people studied was 34.28 per cent, and 65.72% of the respondents were divided as non-hypertensive founded on the specified criteria of SBP ≥140 mmHg and/or DBP ≥90 mmHg (Table 2). It means that about one-third of the number of adults in the sample were affected by hypertension, which demonstrates a significant burden of the condition.

Table 2. Prevalence of Hypertension

Hypertension Status	Frequency (n)	Percentage (%)
Non-hypertensive	45,089	65.72
Hypertensive	23,521	34.28

Figure 1 shows the dispersal of hypertension among the study participants.

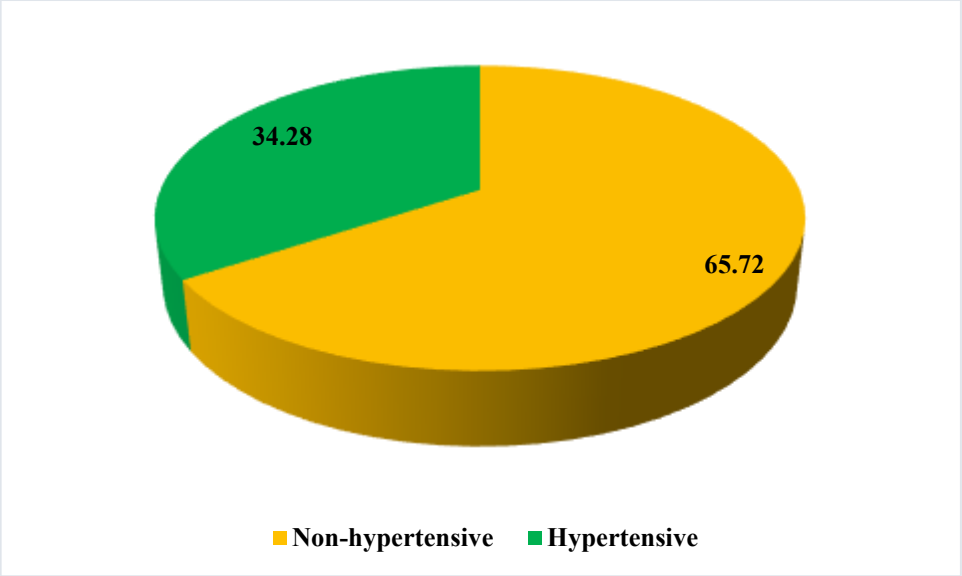

Figure 1. Hypertension Prevalence

The figure shows a clear dominance of non-hypertensive individuals in the study population although a significant proportion is affected which shows a significant burden of hypertension.

3.3 Distribution of Lifestyle Risk Factors

The distribution of the lifestyle-related risk factors revealed that the most common ones were non-smokers (91.22%), non-alcohol consumers (94.67%), and the largest proportion reported to be physically active (80.33%). Conversely, smokers comprised 8.78 percent of the population, alcohol drinkers constituted 5.33 percent and physically inactive individuals were 19.67 percent of the research population, which was relatively lower exposure to these lifestyle risk factors among the cohort (Table 3).

Table 3. Lifestyle Risk Factors (n = 68,610)

Variable	Category	Frequency (n)	Percentage (%)
Smoking Status	Non-smoker	62,574	91.22
	Smoker	6,036	8.78
Alcohol Intake	No	64,949	94.67
	Yes	3,661	5.33
Physical Activity	Active	55,117	80.33
	Inactive	13,493	19.67

Figure 2 shows the trend of the lifestyle-related features which were observed among the study population.

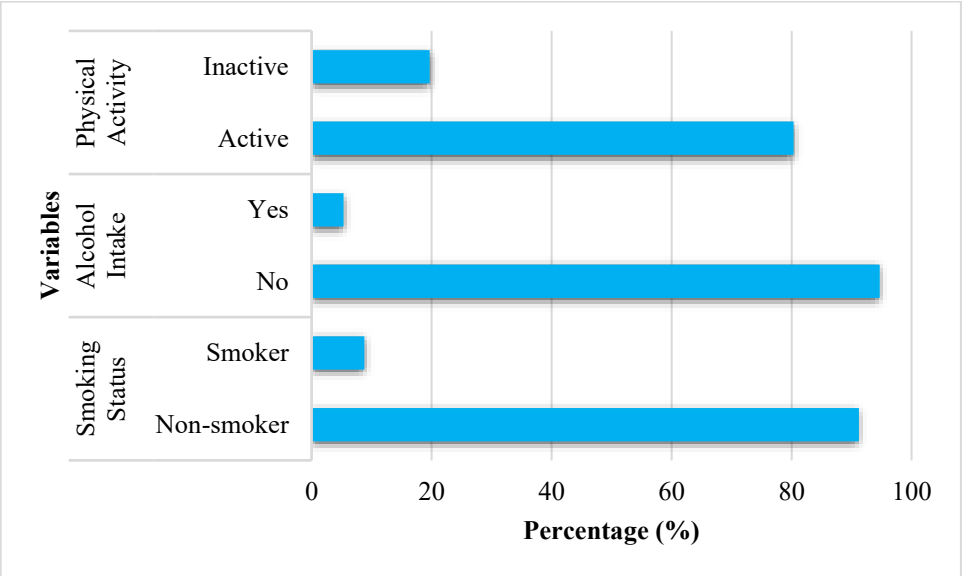

Figure 2. Distribution of Lifestyle Risk Factors

The graphical illustration implies that the prevalence of protective behaviors was detected to be higher as linked to risk-related habits where the prevalence of behaviors like smoking, alcohol use or absence of physical activity was found to be low.

3.4 Association Between Lifestyle Factors and Hypertension

Bivariate analysis using the chi-square test revealed statistically substantial correlations between hypertension and both smoking status and alcohol consumption, meaning that the proportion of hypertension was superior among the smokers or alcohol consumers than their counterparts (Table 4). Conversely, no statistically substantial correlation was found between physical activity and hypertension, which suggests that physical activity alone did not show a measurable relationship with hypertension.

Table 4. Association Between Lifestyle Factors and Hypertension

Variable	Category	No HTN	HTN	χ^2 Value	p-value
Smoking	Non-smoker	41,369	21,205	48.884	<0.001
	Smoker	3,720	2,316		
Alcohol	No	42,960	21,989	97.866	<0.001
	Yes	2,129	1,532		
Activity	Inactive	8,912	4,581	0.800	0.371
	Active	36,177	18,940		

The distribution of hypertension status with various lifestyle factors is shown in figure 3.

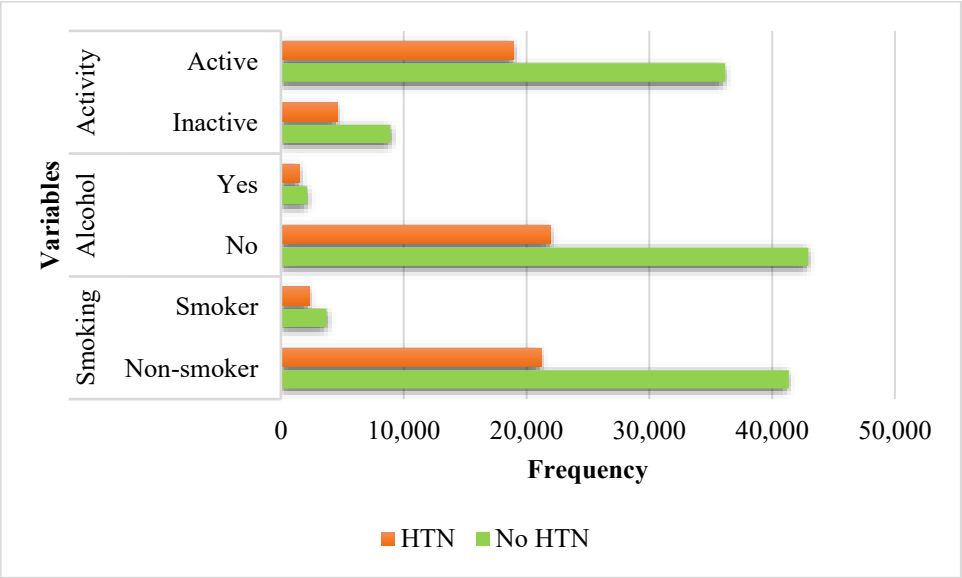

Figure 3. Hypertension Status Across Lifestyle Risk Factors

As Figure 3 indicates, the number of people who do not have hypertension is higher in all types of lifestyle products; but relatively, there are higher numbers of those with hypertension who are involved in risk products such as smoking and alcohol.

3.5 Multivariate Logistic Regression Analysis

Multivariate logistic regression found significant predictors of hypertension, with the model being statistically substantial as well as explaining 6.3% of the variance (Pseudo R^2 = 0.063). Age and BMI were strong predictors. Male gender, smoking, and alcohol consumption were also significantly associated with hypertension, while physical activity presented a weak but significant association (Table 5).

Table 5. Logistic Regression Analysis

Variable	AOR	95% CI	p-value
Gender (Male)	1.316	1.27 - 1.36	<0.001
Smoking	1.116	1.05 - 1.19	0.001
Alcohol Intake	1.250	1.16 - 1.35	<0.001
Physical Activity	1.044	1.00 - 1.09	0.044
Age (years)	1.047	1.04 - 1.05	<0.001
BMI	1.102	1.09 - 1.11	<0.001

The prevalence of hypertension in adults is 34.28%. Smoking and alcohol drinking are significantly related to hypertension, while physical exercise was not significantly related to hypertension in the bivariate analysis and slightly related in the multivariate examination. Age and BMI were strong predictors of hypertension.

4. DISCUSSION

The current study evaluated the prevalence of hypertension and its relationship with lifestyle risk factors in adults based on a large secondary data. The results showed that about a third of the study population (34.28%), had hypertension, which is a significant burden of the condition. This trend indicates the increasing public health issue of high blood pressure especially among the adult population facing demographic and lifestyle changes. The research also established that age and BMI were good predictors of hypertension and therefore it was established that both old age and excessive weight have a significant bearing in the rise of blood pressure. Moreover, lifestyle interventions, including smoking and alcohol use, were also significantly related to hypertension, and thus, they should be regarded as modifiable risk factors. Even though the physical activity did not display a significant effect in the bivariate analysis, it showed a weak but statistically significant effect in the multivariate model, which may indicate that its effect may be mediated by other factors.

The prevalence in this study as compared to previous studies is consistent with the findings in Bangladesh where a significant proportion of adults was reported to have hypertension or prehypertension.[19] On the same note, a study carried out in Sri Lanka showed that genetic predisposition and metabolic factors play an important role in the prevalence of hypertension, which is supporting the role of age and BMI as seen in the current study.[20] Similar prevalence rates and lifestyle-related factors such as smoking and alcohol use have also been reported in studies in South Africa and India.[21,22]

More so, a study that was done in the high-altitude areas of China and the urban population in India revealed the role of environmental and behavioral factors that further supported the multifactorial nature of hypertension.[23,24] Other studies in Iran also substantiate the correlation between lifestyle factors and hypertension with the significance of preventive measures aimed at the modification of modifiable behaviors.[25] However, as in the present findings, a few studies have reported inconsistencies in terms of the effect of physical activity on hypertension, which indicates that the relationship between the two may be diverse with respect to population attributes and measurement strategies.

The outcomes of this research have substantial implications on the public health. The fact that hypertension is strongly correlated with the modifiable lifestyle factors implies that special interventions that can be used to reduce smoking and alcohol intake are needed. Awareness, early screening and behavioral modification programs are all components that can be used in controlling the increasing burden of hypertension. The great role of BMI also highlights the importance of the strategies of weight management, including the change in diet and promotion of physical activity. The healthcare policy makers and providers should focus on the integrated approach which applies to the behavioural and clinical risk factors to improve cardiovascular outcome.

Although the study has its merits such as a big sample size and a detailed analysis, the study has its restrictions. The disadvantage of the cross-sectional design is the fact that it is not possible to make causal associations between risk factors and hypertension. Secondary data does not enable the inclusion of other variables such as dietary patterns, stress and socioeconomic status which may also contribute to the risk of hypertension. Also, the relatively low explanatory power of the regression model (Pseudo $R^2 = 0.063$) suggests that there are other unmeasured factors that can also result in the development of hypertension. The validity of the results might be weakened by the possible reporting bias of the lifestyle factors.

Subsequent studies should aim at longitudinal studies to have a greater understanding of the causal relations and the changes over time in the risk of hypertension. It would be more comprehensive to include other behavioral, environmental and genetic variables in the description of the determinants of hypertension. Stricter analytical models and machine learning could be sought as well to increase the predictive accuracy. In addition, population-specific studies are required to develop population-specific interventions that are effective in dealing with the unique risk profile of various communities.

5. CONCLUSION

The research indicates that hypertension among the adult population is a major issue and its occurrence has been found to be 34.28% in the current study population. This shows that almost a third of all people are affected, which highlights the increasing public health issue that hypertension has developed. The findings have shown that both modifiable and non-modifiable factors play central roles in the expansion of hypertension. The most robust predictors were found to be age and BMI, which suggests that as the age and the body weight increase, there is a greater risk of developing hypertension. The lifestyle factors found to be of great relevance in hypertension are smoking and alcohol consumption which supports the position that they are the important modifiable risk factors. The possible indirect effect is that even though physical activity did not contribute to a substantial association in the bivariate analysis, the weak association of physical activity with other variables in the multivariate analysis may suggest the existence of the indirect effect. These results indicate that the nature of behavioral and physiological determinants of hypertension is complicated. Overall, the article indicates a necessity to distinguish and manage risk factors at the early stage to reduce the burden of hypertension. The public health strategies have to be channelled towards encouraging better lifestyles, including smoking cessation, alcohol reduction, and weight reduction. In addition, constant screening and awareness of the disease is required in order to identify and prevent early. All these factors can be potentially used to improve cardiovascular health and reduced morbidity and mortality due to hypertension.

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