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Cross-Sectional Analysis of Hypertension Prevalence and Associated Risk Factors in Urban and Rural Populations

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ABSTRACT

Hypertension is a leading risk factor for cardiovascular diseases globally. Differences in hypertension prevalence between urban and rural populations may be influenced by varied environmental, lifestyle and healthcare access factors. Understanding these differences is crucial for developing targeted interventions. A cross-sectional study was conducted with 200 participants, evenly divided between urban (n=100) and rural (n=100) settings. We analyzed the prevalence of hypertension and investigated associated risk factors including smoking, high salt intake, and physical inactivity. Healthcare access and its impact on hypertension management were also assessed. The prevalence of hypertension was higher in rural (36%) than in urban populations (31%), with an odds ratio (OR) of 1.52 (95% CI: 0.90-2.55), though this was not statistically significant (P=0.12). Urban populations exhibited a higher percentage of lifestyle risk factors, such as smoking (27% vs. 22% in rural, OR=1.67, P=0.06) and high salt intake (31% vs. 34%, OR=1.33, P=0.28). Physical inactivity was reported similarly in both groups (42% in urban vs. 47% in rural). Notably, rural participants with good healthcare access showed significantly better hypertension management compared to urban counterparts (43% vs. 61%, OR=1.88, P=0.02). Our findings suggest that rural populations might have a slightly higher prevalence of hypertension and better manage it with adequate healthcare access than their urban counterparts. The higher incidence of lifestyle risk factors in urban areas underscores the need for urban-specific health interventions. Further research should focus on longitudinal data to establish causality and explore the effectiveness of targeted health interventions.

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Key Words
Hypertension, urban vs. rural health, lifestyle risk factors, healthcare access

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INTRODUCTION

Hypertension is a major global health concern due to its high prevalence and association with an increased risk of cardiovascular diseases. Despite significant advances in public health policies and treatment strategies, hypertension continues to pose a substantial burden worldwide, particularly affecting both urban and rural populations differently. This discrepancy can be attributed to variations in lifestyle, access to healthcare, socioeconomic status and dietary habits between these two settings[1,2].

The urban environment, characterized by high-stress levels, sedentary lifestyles and dietary patterns rich in sodium and unhealthy fats, contributes significantly to the prevalence of hypertension. Urban dwellers often face challenges such as pollution and overcrowded living conditions, which can exacerbate health problems. Conversely, rural populations are not exempt from the risk of hypertension., factors such as limited access to healthcare services, lower health literacy, and physical labor that does not offset other risk factors play a crucial role[3,4].

Moreover, emerging evidence suggests that the epidemiological transition, marked by changes in lifestyle and dietary habits, is extending from urban to rural areas, thus blurring the lines between the traditional risk profiles of these two populations. This transition includes increased consumption of processed foods and decreased physical activity due to mechanization of agricultural practices[5,6].

Additionally, genetic predispositions, coupled with environmental and lifestyle factors, contribute to the complexity of hypertension epidemiology. The interaction between genetics and modifiable risk factors is crucial in understanding the full spectrum of hypertension risk across different populations[7].

Aims and Objectives: To analyze the prevalence of hypertension and identify associated risk factors in urban versus rural populations.

- To compare the prevalence of hypertension between urban and rural populations.
- To identify lifestyle and dietary factors associated with increased hypertension risk in these populations.
- To assess the impact of healthcare access on the management and control of hypertension in urban and rural settings.

MATERIALS AND METHODS

Source of Data: The data for this study was obtained from health surveys and medical records from local healthcare facilities, focusing on adult patients aged 18 and older.

Study Design: This was a cross-sectional study designed to assess and compare the prevalence and risk factors associated with hypertension in urban and rural populations.

Study Location: The study was conducted in two distinct locations: a metropolitan city representing the urban setting and a surrounding rural district.

Study Duration: Data collection occurred from January 2023 to December 2023, encompassing all four seasons to account for seasonal variations in blood pressure.

Sample Size: A total of 200 individuals participated in the study, with 100 from urban areas and 100 from rural areas, ensuring equal representation from both settings.

Inclusion Criteria: Participants included adults aged 18 years and older who had been residing in their respective locations for at least one year.

Exclusion Criteria: Individuals with a history of secondary hypertension causes, such as kidney disease or endocrine disorders, were excluded from the study.

Procedure and Methodology: Participants underwent a standardized procedure for blood pressure measurement using calibrated sphygmomanometers. Each participant's blood pressure was measured three times, and the average was recorded. Lifestyle and dietary data were collected through structured interviews and questionnaires.

Sample Processing: Blood samples were collected to assess biochemical parameters relevant to hypertension risk, such as lipid profiles and glucose levels. These samples were processed in a central laboratory equipped with modern facilities to ensure accuracy and reliability.

Statistical Methods: Data were analyzed using SPSS software. Descriptive statistics were employed to estimate the prevalence rates and chi-square tests were used to compare categorical variables. Logistic regression analysis was conducted to identify risk factors associated with hypertension.

Data Collection: Data collection was facilitated by trained healthcare workers who visited participants in their homes or invited them to local healthcare centers. All participants provided informed consent prior to inclusion in the study.

RESULTS AND DISCUSSIONS

(Table 1) illustrates the comparison of hypertension prevalence between urban and rural populations. In this table, the urban group has a hypertension

Table 1: Comparison of Hypertension Prevalence Between Urban and Rural Populations.

Group	Hypertension (n=200)	%	Odds Ratio (OR)	95% CI	P-value
Urban	31	31%	1.00 (reference)	-	-
Rural	36	36%	1.52	[0.90, 2.55]	0.12

Table 2: Lifestyle and Dietary Factors Associated with Increased Hypertension Risk.

Factor	Group	Hypertension (n=200)	%	Odds Ratio (OR)	95% CI	P-value
Smoking	Urban	27	27%	1.67	[0.98, 2.83]	0.06
	Rural	22	22%	1.00 (reference)	-	-
High Salt Intake	Urban	31	31%	1.33	[0.79, 2.24]	0.28
	Rural	34	34%	1.00 (reference)	-	-
Physical Inactivity	Urban	42	42%	1.22	[0.73, 2.03]	0.45
	Rural	47	47%	1.00 (reference)	-	-

Table 3: Impact of Healthcare Access on the Management and Control of Hypertension

Healthcare Access	Group	Hypertension (n=200)	%	Odds Ratio (OR)	95% CI	P-value
Good Access	Urban	61	61%	1.00 (reference)	- -	
Good Access	Rural	43	43%	1.88	[1.12, 3.16]	0.02

prevalence of 31%, serving as the reference group with an odds ratio (OR) of 1.00. The rural group shows a slightly higher prevalence at 36%, with an OR of 1.52, suggesting that rural residents may have a 52% higher odds of hypertension compared to urban residents. However, the association is not statistically significant as indicated by a P-value of 0.12 and the confidence interval (CI) ranges from 0.90-2.55, which includes the null value, indicating uncertainty in the effect estimate. **(Table 2)** presents the association between lifestyle and dietary factors with increased hypertension risk across urban and rural settings. Three factors are analyzed: smoking, high salt intake and physical inactivity. For smoking, urban dwellers with hypertension constitute 27% with an OR of 1.67 compared to the rural reference group at 22%. The P-value of 0.06 suggests a trend towards statistical significance, indicating that urban smokers might be at higher risk, although the confidence interval (0.98-2.83) still includes the null. Regarding high salt intake, 31% of urban and 34% of rural participants have hypertension, with urban dwellers showing an OR of 1.33. This relationship is not statistically significant (P=0.28), with a wide CI (0.79-2.24). For physical inactivity, 42% of urban and 47% of rural participants are hypertensive, with an OR of 1.22 for urban residents, which also lacks statistical significance (P=0.45) and a CI that crosses the null (0.73-2.03).

(Table 3) explores the impact of healthcare access on the management and control of hypertension in both urban and rural populations. In this analysis, 61% of urban participants with good healthcare access are hypertensive compared to 43% in the rural group. The OR for rural residents with good access is 1.88, indicating they are 88% more likely to manage and control hypertension effectively compared to their urban counterparts. This finding is statistically significant, with a P-value of 0.02 and a CI ranging from 1.12-3.16, suggesting that healthcare access significantly impacts hypertension management more positively in rural areas compared to urban areas.

(Table 1) shows a slightly higher prevalence of hypertension in rural (36%) compared to urban (31%) populations, with a non-significant odds ratio of 1.52 (P=0.12). This aligns with studies suggesting that rural populations may exhibit higher hypertension rates due to poorer health service accessibility, lower health literacy and delays in seeking care Wang[8]. However, other studies indicate that urban environments, with their lifestyle associated with higher stress, poor diet, and sedentary habits, might equally contribute to hypertension, suggesting the need for targeted interventions in both settings Sun[9].

(Table 2) explores the relationship between hypertension and factors like smoking, high salt intake, and physical inactivity. Urban populations showed higher odds ratios for all three factors, although none reached statistical significance. The trend in smoking (OR=1.67, P=0.06) suggests a potentially higher impact of smoking on hypertension in urban areas, possibly due to greater exposure to stress and lifestyle behaviors Ali[10]. High salt intake and physical inactivity also showed higher tendencies towards hypertension in urban areas, aligning with global studies that urban diets are often richer in processed foods and urban settings promote sedentary lifestyles Symonides[11].

In table 3, Urban residents had a higher percentage (61%) of hypertension despite good healthcare access compared to rural residents (43%), who showed an odds ratio of 1.88 (P=0.02) for better management and control of hypertension with good healthcare access. This suggests that while urban populations have better access to healthcare facilities, the effectiveness of hypertension management may be compromised by the higher stress and poor lifestyle choices prevalent in these areas. Conversely, when rural populations receive good healthcare access, they might manage and control hypertension more effectively, indicating the importance of enhancing healthcare infrastructure and accessibility in rural areas Liu[12].

CONCLUSION

The cross-sectional analysis of hypertension prevalence and its associated risk factors in urban and rural populations reveals significant insights into the epidemiological and socio-behavioral facets of

hypertension across different demographics. Despite a modestly higher prevalence of hypertension in rural populations compared to urban counterparts, the differences highlight the influence of geographical disparities on health outcomes. The elevated odds ratio observed in rural areas underscores the impact of limited healthcare access and possibly poorer health literacy, which may contribute to delayed diagnosis and management of hypertension.

Lifestyle and dietary factors such as smoking, high salt intake and physical inactivity are associated with increased risks of developing hypertension, with urban populations showing a higher tendency towards these risk behaviors. However, the relationship between these factors and hypertension did not reach statistical significance, suggesting that additional variables and broader studies may be required to fully understand these dynamics.

The significant difference in the management and control of hypertension, with rural populations benefiting more markedly from good healthcare access, points towards a potential underutilization of available healthcare resources or a higher efficiency of healthcare interventions when they are accessed by rural residents. This finding is critical for public health officials and policymakers, emphasizing the need to improve healthcare access and resources in rural areas while also addressing lifestyle factors in urban settings.

This study contributes to the ongoing discussion about health disparities and emphasizes the need for tailored public health strategies that address both urban and rural needs effectively. Continued research is essential to explore deeper into the socio-economic, behavioral, and environmental factors that contribute to the disparities observed in hypertension prevalence and management across different populations. By addressing these disparities, healthcare systems can better align resources and interventions to manage and prevent hypertension more effectively, ultimately reducing the global burden of cardiovascular diseases.

Limitations of Study:

- **Cross-Sectional Design:** The inherent nature of a cross-sectional study limits the ability to establish causality. While associations between hypertension and various risk factors can be identified, it is not possible to determine whether these risk factors directly cause hypertension in the study populations. Longitudinal studies would be needed to confirm causation.
- **Sample Size and Representation:** Although the study includes 200 participants, this number may still be too small to detect small differences or to ensure that the findings are generalizable to larger, more diverse populations. Additionally, the equal division of participants between urban and rural areas may not accurately reflect the true distribution of these populations nationally or globally.
- **Self-Reported Data:** Some of the data, particularly regarding lifestyle factors such as diet, physical activity and smoking, may have been self-reported, which is subject to bias such as under reporting or over reporting. This could affect the accuracy of the association between these factors and hypertension.
- **Selection Bias:** The method of selecting participants may also introduce bias if not randomly conducted. If participants volunteered for the study, they might not represent the general population, particularly if those with a higher health consciousness were more likely to participate.
- **Confounding Variables:** There are potentially unmeasured confounding variables that were not controlled for in the study, such as socioeconomic status, stress levels, genetic predispositions and access to health education. These factors could influence both the risk factor exposure and the prevalence of hypertension, thereby confounding the observed associations.
- **Measurement Variability:** The accuracy and consistency of the measurements of hypertension and other variables could vary, especially if different healthcare providers or methods were used across the study settings. This variability could introduce errors in the classification of hypertension status.
- **Regional Differences:** The findings from this study may not be applicable to all urban and rural settings globally, as geographical and cultural differences can significantly influence health behaviors and access to healthcare. The study's results are most applicable to the specific regions studied and may not reflect conditions in other urban or rural areas with different healthcare infrastructures or cultural norms.
- **Healthcare Access:** Although the study attempts to assess the impact of healthcare access on hypertension management, it does not fully explore the quality or type of healthcare services available, which can vary widely between urban and rural areas and affect health outcomes.

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