



Prevalence of Hypertension and its Association with Physical Inactivity: A Cross-sectional Study among the Bhumij Tribal Community of North 24 Parganas, West Bengal

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Abstract: *Background:* A growing burden of hypertension is a major public health challenge worldwide. Previous findings indicate that it is typically higher among older age groups, but nowadays individuals tend to develop elevated blood pressure at an earlier age due to lifestyle changes. The tribal people's lifestyle has been changing, which has led them to develop different health conditions. Therefore, the present study was designed to examine the association between physical activity and hypertension among the Bhumij tribal community of Jioldanga village. *Methodology:* In this cross-sectional study, only adult males aged ≥ 18 years were selected. The sample size consists of 107 male participants. A simple random sampling method was used to select the participants. All statistical analyses were performed using SPSS (IBM version 25) with a $p < 0.05$ level of significance (two-tailed). *Findings and recommendations:* The prevalence of hypertension is found to be high in this community; the prevalence of SBP and DBP was 59.8% and 63.6%, respectively. Approximately 27.12% of the participants were classified as having a low level of physical activity. Significantly higher odds (OR = 56.00, 95% CI: 6.409 to 24.338, $p < 0.001$) were observed in the low PAL category when compared with high PAL.

Keywords: Bhumij, hypertension, lifestyle, physical activity

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Introduction

Hypertension (HPT) has become a burden not only in India but globally; it has become the leading cause of death worldwide. Hypertension is now seen among young adults (18-24) and people of the middle-aged group (25-44), showing a serious issue for public health worldwide (Godara et al., 2021). Hypertension is associated with the development of chronic kidney disease, ischemic heart disease, heart failure and stroke (Meher et al., 2023). Approximately 57% of strokes and 24% of coronary artery disease-related deaths are caused by hypertension (Meher et al., 2023). This increase in the burden of hypertension is mainly caused by an unhealthy diet, heavy salt intake, lack of exercise, excess body fat, consuming alcohol, less consumption of fruit and vegetables and doing less physical activity (Godara et al., 2021).

According to the WHO, around 23% of the population in the world is physically inactive (Ramakrishnan et al., 2019). Low level of physical activity is associated with an increased risk of Type 2 diabetes mellitus, obesity, colon and breast cancer, depression, and high blood pressure (Ramakrishnan et al., 2019). Physical activity plays a beneficial role in our lives as it has many health benefits. Globally, high systolic blood pressure (SBP) was the foremost cause of 10.2 million deaths in 2017. A recent study reported that 207 million people were suffering from hypertension (HPT). HPT was the main cause of 1.63 million deaths in India in the year 2016.

In India, the overall prevalence of high SBP was 21.1% (Gupta et al., 2019). Globally, researchers have found that hypertension or elevated blood pressure is mainly the cause of several life-threatening diseases, such as stroke, congestive heart failure, coronary heart disease, a decrease in renal function, and chronic disease (Mathews et al., 2021). People of the younger age group are generally more vulnerable to elevated blood pressure because of risk factors such as smoking, physical inactivity and alcohol consumption. Nearly 1.9 billion and 650 million individuals, mainly adults, are overweight and obese. It was also reported that around 2.8 million people died due to being overweight or obese. Obesity and overweight have become a serious public health concern in both developed and developing countries, which is mainly due to a low level of physical activity (Huang et al., 2018).

In India, a developing country undergoing rapid industrialization and urbanization, more than 135 million people were found to be suffering from obesity (Ahirwar et al., 2019). Generally, blood pressure (BP) normally increases

with growth and with the increase in development, but nowadays, studies have reported that individuals have an elevated BP at an early age, which increases the risk of cardiovascular diseases (CVDs) (Huang et al., 2018). Hypertension is one of the major public health concerns because of its high risk of kidney diseases and cardiovascular diseases, such as renal failure, strokes, and myocardial infarction, which makes it the leading cause of mortality and morbidity worldwide (Sisay et al., 2022). Numerous studies reveal that males are at a higher risk of HPT at a very early age compared to females (Kalantari et al., 2017; Tirosh et al., 2010). A cross-sectional study reported that males had had 84.0% higher risk of the prevalence of hypertension than females (Niu et al., 2024). The burden of hypertension is increasing and is increasingly associated with low levels of physical activity. Our study aims to assess the prevalence of hypertension and its association with physical activity among males of the Bhimij population in Jioldanga village of North 24 Parganas, West Bengal, India.

Materials and Methods

Study area and population: For this particular study, data were systematically collected from the Bhumij tribal population living in Jioldanga village, Habra, North 24 Pgs, West Bengal. In this area, around 130 families have been staying since 1950. Most of the families are small families. The total population of the studied area is around 480. They were mainly engaged in agriculture as their primary occupation. Some of them are involved in iron smelting, carpentry, day labour, construction work, and some run small shops, and very few people were engaged in white-collar jobs. They can speak and write the Bengali language. They have their own religion and cultural beliefs. They have certain taboos related to food. But with an increase in urbanization their lifestyles are constantly changing, they come in contact with the people of the cities and day by day they prefer more of eating fast food, and show an increased affinity towards a sedentary lifestyle.

Study participants: In this cross-sectional study, only the adult males were selected of age greater than or equal to 18 years. The inclusion criteria include individuals who were neither physically nor mentally challenged. Individuals who were not well, or were undergoing any treatment for any type of disease and females of this population were excluded from this study. The sample size consists of 107 male participants, and by using the simple random sampling method, only the males of this community were selected.

Data collection: The chronological age of each participant was recorded using a structured interview method. The systolic and diastolic blood pressure were measured by using a Sphygmomanometer and a Stethoscope (Flack et al., 2020). The classification of blood pressure was done according to the American College of Cardiology (ACC) and American Heart Association (AHA) of 2017 guidelines (Flack et al., 2020), according to the guideline: Normal: SBP < 120 mmHg and DBP < 80 mmHg, Elevated: SBP 120–129 mmHg and DBP < 80 mmHg, Hypertension Stage 1: SBP 130–139 mmHg or DBP 80–89 mmHg and Hypertension Stage 2: SBP $\geq$ 140 mmHg or DBP $\geq$ 90 mmHg. Information regarding physical activity level was collected and categorised into three categories: High, Moderate and Low.

Data Analyses: All statistical analyses were performed using SPSS (IBM version 25) with a $p < 0.05$ level of significance (two-tailed). For comparing more than two groups, a one-way analysis of variance (ANOVA) with post hoc was conducted. Binary logistic regression analysis was performed to assess the odds in moderate and low levels of Physical activity.

Results

Figure 1 shows the distribution of systolic blood pressure levels among the studied population. From this figure, it is clear that the majority of the participants (44.86%) were in Stage 2 of hypertension, while 21.48% were classified under normal SBP levels. It was found that 18.68% of the participants had elevated SBP, and 14.99% were in Stage 1 of hypertension. This pattern tells us that the burden of uncontrolled systolic hypertension is high in this population.

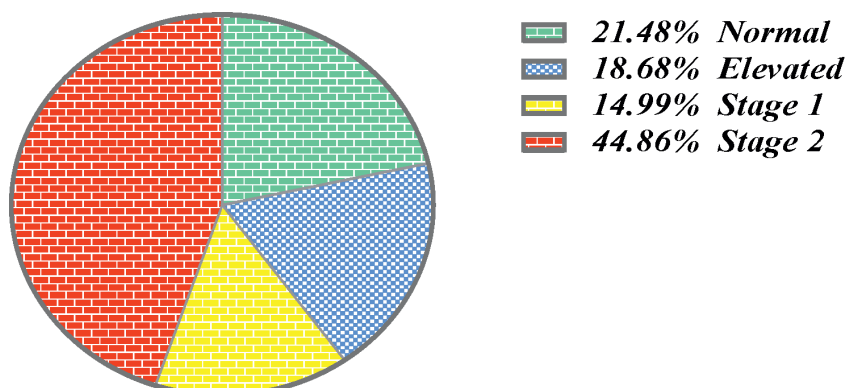


Figure 1: Prevalence of Systolic Blood Pressure (SBP) Categories among the Study Participants

Figure 2 shows the distribution of diastolic blood pressure levels in the population. Here, the most interesting thing is that the proportion of individuals with Stage 1 of hypertension and Stage 2 of hypertension was equal, which accounts for 31.80% of the participants. The other 36.40% of individuals were classified as normal/elevated. It suggests a higher prevalence of diastolic hypertension, as nearly two-thirds of the population fell under the hypertensive categories.

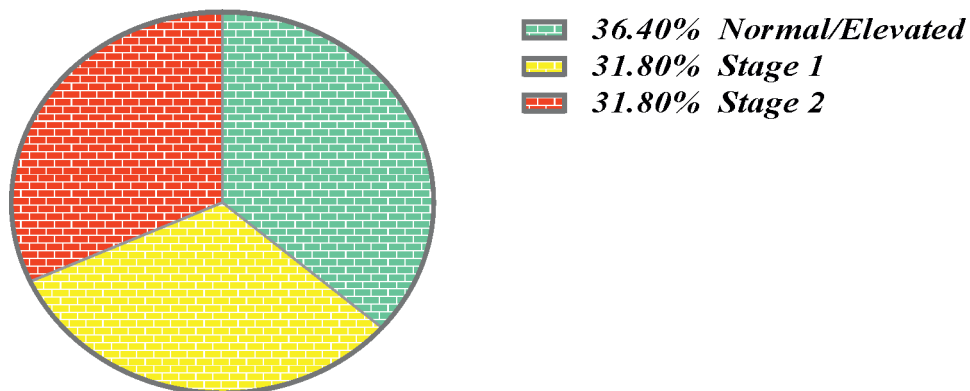


Figure 2: Prevalence of Diastolic Blood Pressure (DBP) Categories among the Study Participants

Figure 3 presents the distribution of physical activity levels among the studied population. The majority of the participants (50.46%) reported a moderate level

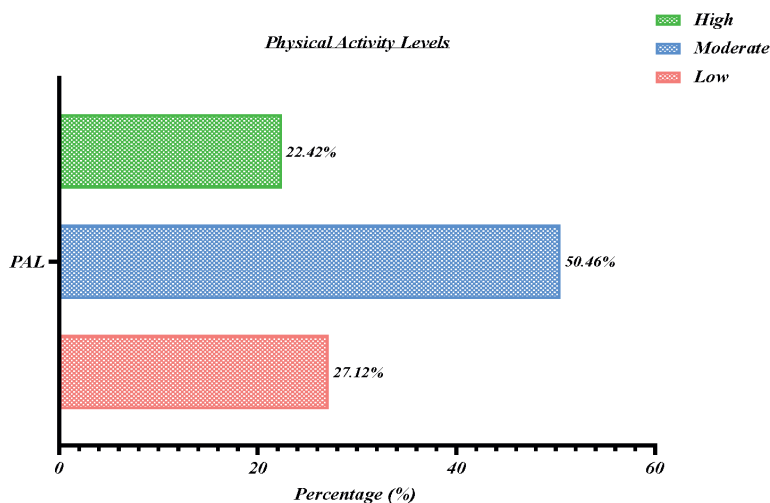


Figure 3: Comparison of Fasting Blood Glucose and Blood Pressure Levels Across Physical Activity Levels with Post Hoc Tukey Test Results

of physical activity, 27.12% of the participants were classified under a low level of physical activity, and only 22.42% of the participants reported a high level of physical activity. This indicates that although nearly half of the population does some degree of physical activity, a significant portion of the population still does less physical activity, which increases the risk of HPT.

Table 1 presents the effect of physical activity level (low, moderate, and high) on systolic blood pressure (SBP) and diastolic blood pressure (DBP). A one-way ANOVA was performed, which revealed a statistically significant difference in the two parameters across the PAL group. For SBP, a significant difference was observed ($F=24.203$, $p<0.001$). Participants with low physical activity had significantly higher SBP (148.66 ± 11.44 mmHg) than in the moderate (128.26 ± 19.16 mmHg) and high (116.75 ± 18.22 mmHg) groups. The comparison shows statistically significant difference ($p<0.05$), indicating a decrease in SBP with an increase in PAL. Similarly, a significant difference was also observed in the case of DBP across the groups ($F=29.709$, $p<0.001$), showing the highest mean DBP (90.31 ± 4.59 mmHg) in the low activity level group.

Table 1: Comparison of Fasting Blood Glucose and Blood Pressure Levels Across Physical Activity Levels with Post Hoc Tukey Test Results

Blood Pressures	Low $n = 29$ (Mean $\pm$ SD)	Moderate $n = 54$ (Mean $\pm$ SD)	High $n = 24$ (Mean $\pm$ SD)	F value	p value	Post-hoc test
SBP	148.66 $\pm$ 11.44	128.26 $\pm$ 19.16	116.75 $\pm$ 18.22	24.203	<0.001	Low vs Mod (0.001) Low vs High (0.001) Mod vs High (0.020)
DBP	90.31 $\pm$ 4.59	77.91 $\pm$ 10.42	72.46 $\pm$ 8.99	29.71	<0.001	Low vs Mod (0.001) Low vs High (0.001) Mod vs High (0.020)

SBP = Systolic blood pressure, DBP = Diastolic blood pressure, F = F-statistic, p = Probability value

Binary logistic regression analysis was performed to understand the effect of PAL on HPT. The odds ratio (OR) and 95% CI (confidence interval) for each category are presented in Table 2. It has been observed that low PAL was significantly associated with higher odds of HPT (OR = 56.00, 95% CI: 6.409 to 24.338, $p < 0.001$); similarly, moderate PAL also showed a significant effect on HPT (OR= 2, 909 %, 95%CI: 1.062 to 7.967, $p < 0.038$).

Table 2: Binary Logistic Regression Model Showing the Association of Physical Activity Level with Hypertension

Variables	Sig.	Exp (B)	95% C.I. for EXP(B)	
			Lower	Upper
PAL High	(reference)			
PAL Moderate	0.038	2.909	1.062	7.967
PAL Low	<0.001	56.00	6.409	24.338

Sig. = Significance (p-value), Exp(B) = Odds Ratio (OR), 95% C.I. for Exp(B) = 95% Confidence Interval for the Odds Ratio, Lower/Upper = Lower and Upper bounds of the 95% Confidence Interval.

Discussion

The prevalence of hypertension is found to be high in this community; the prevalence of SBP and DBP was 59.8% and 63.6%, respectively. The majority of the participants (50.46%) in this population reported a moderate level of physical activity, 27.12% of the participants were classified under a low level of physical activity. Hypertension shows a significant association with Physical activity level, as we can see that the level of hypertension decreases with an increase in physical activity. Here, the most important thing to see is that people of the younger age group are at a higher risk of HPT, as they engage in low physical activity. A tribal population generally has a different lifestyle pattern, healthcare access, socioeconomic conditions, and a different disease pattern, which makes it different from the general population, they were historically known to have a healthy lifestyle since they were engaged in different types of physical activity in their daily life, but now a days due to rapid industrialization and urbanization there is a progressive change in their lifestyle pattern which is clearly visible from their health condition. The present study was done in a tribal population living in the Jioldanga village of Habra, North 24 Pgs, West Bengal, where it was seen that people with low physical activity have a high prevalence of hypertension, which influences their cardiovascular health.

The findings of the present study showed that people who were less engaged in physical activity had a higher prevalence of hypertension, aligning with a cross-sectional study conducted among Rang Bhotias, a tribal population where researcher studied around 288 participants, including both males and females, and found that physical inactivity played a significant role towards the development of hypertension, the prevalence of hypertension was 43.4%, and it is the most prevalent risk factor found in the population (Kandpal et al., 2016). In another study, which included

14,266 Chinese adults aged 45 years or older, it was found that a high frequency of moderate and vigorous physical activity for long hours was associated with a lower risk of hypertension (Zhou et al., 2022). Similar findings were observed in a study conducted in South Asian countries, namely India, Bangladesh, and Nepal, which found that lifestyle factors, including PAL, were important risk factors for the development of HPT (Zhou et al., 2022). A cross-sectional study conducted in Nepal found that adults who were more engaged in physical activity, such as walking and cycling, contributed more to reducing the risk of hypertension (HPT) (Paudel et al., 2021). A similar pattern was observed in a study which was conducted among the Nepalese adults, which showed that physical activity contributed to a greater extent in reducing the burden of various non-communicable diseases, including HPT (Shrestha et al., 2019). As per the World Health Organisation (WHO), nearly one in three adults globally has HPT, but in our study, it was observed that there is a higher prevalence of hypertension. In our study, 59.8% of the participants had elevated SBP, and 63.3% of the participants had elevated DBP, which is very high compared to the global burden of the WHO (WHO, 2025).

The majority of the participants (50.46%) in this population reported a moderate level of physical activity, 27.12% of the participants were classified under a low level of physical activity. This is mainly because they were moving towards a sedentary lifestyle. This decrease in physical activity is associated with the risk of hypertension and CVDs (Kshatriya et al., 2022). In a study which comprises nine tribal groups in India, it was observed that due to an increase in modernisation, there is a decrease in physical activity among the participants, thereby increasing the risk of CVDs (Sachdeva et al., 2016). Another study reported that, due to lifestyle transition, a shift from a traditional occupation increases the risk of non-communicable diseases (Kapoor et al., 2023). In another study, it was observed that due to rapid urbanization and mechanization there is a constant increase in physical inactivity across India (Anjana et al., 2023). All these findings clearly suggest that the decline in physical activity is an important risk factor for hypertension even within tribal communities,

Conclusion

The present study shows the significant prevalence of hypertension, which is increasingly associated with physical inactivity. It shows that rapid urbanisation and industrialisation have made a tremendous impact on the people living in Jioldanga

village. Their lifestyle has been changed to a greater extent, which is clearly visible in the rise in hypertension cases. Earlier, it was thought that hypertension was only prevalent among the urban, but this study suggests that the tribal communities, like the Bhumij population who live in Jioldanga village, are at risk of having cardiovascular diseases, since day by day, they are less engaged in physically demanding activities. So, they should be made aware of the importance of physical activity to decrease the burden of hypertension, which is very much associated with CVDs.

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Ethical Consideration

All the studied participants were pre-informed before data collection. The study was conducted after taking permission from the head of the Department of Anthropology, West Bengal State University, Barasat, West Bengal, India.

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