Acta Scientific MEDICAL SCIENCES (ISSN: 2582-0931)

Volume 5 Issue 3 March 2021

Research Article

Association Between Body Mass Index and Blood Pressure Among Rural Indian Adults

Partha Sarathi Datta*

Department of Public Health Research, Rural & Urban Social Welfare Organization, India

***Corresponding Author:** Partha Sarathi Datta, Department of Public Health Research, Rural & Urban Social Welfare Organization, India.

Received: January 21, 2021

Published: February 16, 2021

© All rights are reserved by **Partha Sarathi Datta.**

Abstract

Introduction: Measures of Body Mass Index (BMI) and blood pressure are important for assessing the health status of adults.

Objectives: To find out the association between the BMI and blood pressure among rural adults of Indian origin.

Methods: Anthropometric measurements, such as stature, body weight, were measured using standard methodology. Systolic (SBP) and Diastolic (DBP) blood pressure were recorded according to a proper methodology. A schedule was used to collect data on the socio-demographic profile, behavioral activity, weekly physical activity and family history of hypertension etc.

Results: Among the total study participants 259 (19.98%) were overweight and 98 (7.56%) were obese. 28.47% of the study participants had stage-I hypertension while 71.53% had normal blood pressure. A significant correlation was observed between BMI and Blood pressure.

Conclusion: The rural participants of studied area were prone to risk factors related to high blood pressure.

Keywords: Body Mass Index; Blood Pressure; Rural Indians

Introduction

Assessing nutritional status is the overall development of the human health class. Low nutrition frequencies are now the number one public health problem in developing countries around the world. Assessing nutritional level plays an important role in developing nutritional interventional plans for specific communities [1]. The major cause for malnutrition in India is economic differences. Due to the low socio-economic status of some communities, their diet often lacks both quality and quantity. Women who experience malnutrition are less likely to have healthy babies. In India, mothers mainly lack basic knowledge in feeding children. In addition, new born babies are not able to get proper amount of nutrition from their mothers. Nutritional deficiencies lead to long term damage to both individuals and communities.

Unlike their well-fed peers malnourished individuals are at higher risk of developing various infectious diseases such as pneumonia, tuberculosis etc, leading to higher mortality rates. In addition, malnourished people become less fertile at work. On the other hand, excess nutrition also has different consequences. Various non-communicable diseases such as cardiovascular diseases, diabetes, cancers and chronic respiratory diseases are strongly associated with obesity [2]. The overall trend of weight and obesity in India is expected to increase significantly by 2040, especially among rural residents and older Indians [3].

Body Mass Index (BMI) is emphatically and autonomously associated with death and disorders from hypertension, Type-II Diabetes Mellitus and other cardiovascular diseases globally [4]. Due to rapid modernization and urbanization a number of developing

countries have been observing nutritional transitions worldwide [5]. In various Asian countries, this nutritional transition is rapid. In rural India, the average living standards have been rising during the last thirty years which directly leads nutritional transition. Westernization of food has led to overweight and obesity, which are considering a major threat to the health of rural Indian people [6]. Several studies in India have found that this nutritional transition greets chronic diseases and obesity. Studies have revealed that obesity is strongly associated to high blood pressure, dyslipidemia, diabetes etc. [7].

Beside this, High blood pressure is one of the major risk factors for cardiovascular diseases. High blood pressure or hypertension is a public health concern due to its high prevalence among different age and sex groups of adult populations globally [8]. High blood pressure is considered to cause 7.5 million annual deaths worldwide which are estimated to be increased to 1.56 billion adults by 2025 [9]. In South Asian countries where the burden of cardiovascular disease is high, India is increasingly faced with the triple burden of hypertension and other cardiovascular diseases, along with infection and malnutrition [10]. The association between BMI and blood pressure has long been the subject of epidemiological research. A large number of studies have revealed the strong association between BMI and blood pressure among south Asian populations including Indians [11,12].

The present cross-sectional study was aimed to find out the association between the Body Mass Index (BMI) and blood pressure among rural adults of Indian origin.

Materials and Methods

This cross-sectional study was carried out among 1296 adults, aged 21 to 60 years, of these, males and females were 708 and 588 respectively from October 2017 to January 2020. Field survey was carried out in the rural areas to collect data. The participants were selected through simple random technique from ten villages under five Gram Panchayats of West Bengal, India.

The participants were divided into four different age groups with ten years interval each to study the age trend of different variables like stature, body weight and BMI. Anthropometric measurements, such as stature and body weight were measured using standard instruments and techniques given by Weiner and Lourie (1981) [13]. Measurements have been taken on the subjects wearing minimal and light apparel. Systolic (SBP) and Diastolic (DBP) blood pressure were recorded according to a proper technique from each participant. BMI (weight/height^2) was calculated and classified according to the proposed criteria of World Health Organization (WHO) (underweight < 18.5, normal = 18.5-24.5, overweight = 25.0-29.9 and obese ≥30 [14]. In the present study, all the subjects having BMI ≥30 were taken as obese.

Normal blood pressure was taken as < 120 mmHg (SBP) and <80 mmHg (DBP). Blood pressure values of 120-139 mmHg for SBP and 80-89 mmHg for DBP were classified as prehypertensive. Stage-I hypertension was taken as 140-159 mmHg for SBP and 90-99 mmHg for DBP, whereas blood pressure of >160 mmHg for SBP and >100 mmHg for DBP were classified as stage II hypertension (JNC 2007) [15].

The data on behavioural activity and weekly physical activities were collected using a standard schedule. A food frequency schedule was used to collect data on weekly consumption of food.

Statistical software SPSS version 22 was used to carry out statistical analysis. Descriptive statistics of mean and standard deviation were used to examine the collected data. Beside descriptive statistics, to test the differences between the age groups, t-test was done. To determine the association between BMI and blood pressure, correlation analyses were done.

Results

Table 1 shows the basic measurements and calculation of males and females participants. Mean values of stature, body weight, SBP, DBP and BMI were found to be significantly higher in males as compared with females.

Table 2 shows the prevalence of hypertension (HTN) according to demographic and life style factors of the study participants. A total of 1296 rural adults were included in the present study of which 708 (54.63%) were males and 588 (45.37%) were females. Of the total study population, majority 403 (31.09%) were in the

Parameters	Males (Mean ± SD)	Females (Mean ± SD)
Stature (cm.)	164.2 ± 4.28	153.8 ± 5.76
Weight (kg.)	68.8 ± 6.42	61.5 ± 9.24
SBP (mmHg)	129.7 ± 8.02	121.3 ± 9.07
DBP (mmHg)	88.3 ± 7.43	84.2 ± 9.39
BMI (Kg/mt^2)	25.33 ± 3.92	23.88 ± 2.69

Table 1: Significance of the sex difference between various parameters (N = 1296).

age group 21-30 years and minimum number of the participants is present in the age group 51-60 years (18.29%). Among the total study participants 259 (19.98%) were overweight and 98 (7.56%) were obese. 38.34% participants were involved in little or no physical activities. A total of 17.59% study subjects were consumed alcohol and 32.17% were smokers. Majorities (96.37%) were involved in non-vegetarian diet and 36.26% participants were intake extra salt in their diet. Beside this, 54.74% males and 45.26% females were high blood pressure (Hypertension Stage-I). 29.27% participants aged 41-50 years had high blood pressure. 35.51% overweight participants and 50.41% physically inactive participants were hypertensive among study participants. Again 78.32% smokers were examined by high blood pressure but 74.53% non alcohol consumers were hypertensive. 97.83% and 80.76% participants were hypertensive who were non-vegetarian and took extra salt in their diet respectively.

Table 3 shows the Blood pressure profile of participants. 28.47% of the study participants had stage-I hypertension while 71.53% had normal blood pressure.

Table 4 shows the correlation between body mass index and blood pressure of participants. An association was observed between BMI and Blood pressure. The r value shows a significant correlation between body mass index and blood pressure.

Parameters	Number (%)	HTN (%)	P value
Sex			
Male	708 (54.63)	202 (54.74)	0.05
Female	588 (45.37)	167 (45.26)	
Age Group(Yrs)			
21-30	403 (31.09)	92 (24.93)	0.01
31-40	305 (23.53)	86 (23.31)	
41-50	351 (27.09)	108 (29.27)	
51-60	237 (18.29)	83 (22.49)	
BMI			
Under nutrition	106 (8.18)	19 (5.15)	0.33
Normal	833 (64.28)	166 (44.98)	
Overweight	259 (19.98)	131 (35.51)	
Obese	98 (7.56)	53 (14.36)	
Physical Activity			
Heavy	193 (14.89)	74 (20.05)	0.21
Moderate	606 (46.75)	109 (29.54)	
Sedentary	497 (38.34)	186 (50.41)	
Alcohol Consumption			
Yes	228 (17.59)	94 (25.47)	0.45
No	1068 (82.41)	275 (74.53)	
Smoking Tobacco			
Yes	417 (32.17)	289 (78.32)	0.64
No	879 (67.82)	80 (21.68)	
Diet			
Vegetarian	47 (3.62)	8 (2.17)	0.46
Non-vegetarian	1249 (96.37)	361 (97.83)	
Added salt intake			
Yes	470 (36.26)	298 (80.76)	0.62
No	826 (63.73)	71 (19.24)	

Table 2: Prevalence of hypertension according to demographic and life style factors (N = 1296).

Discussion

In this present cross-sectional study several socio-economic, demographic and lifestyle variables are taken into consideration for the examining the nutritional status through BMI and blood pressure level among rural adults. The present study was conducted among adults living in rural areas under North 24 Parganas district of West Bengal, India. In North 24 Parganas district, most of the villagers follow Hinduism. Beside this, the other major religion in the villages of North 24 Parganas is Islam. The villages of North 24 Parganas are home to the ethnic groups like Santals, Oraon, Munda,

Blood Pressure	Total n (%)	Male n (%)	Female n (%)	P value
High (Stage-I)	369 (28.47)	202 (15.58)	167 (12.89)	0.79
Normal	927 (71.53)	506 (39.05)	421 (32.48)	

Table 3: Blood pressure profile of participants (N = 1296).

Blood Pressure	High n (%)	Normal n (%)	P value	r
BMI			0.33	0.84
Under nutrition	19 (1.47)	87 (6.71)		
Normal	166 (12.81)	667 (51.46)		
Overweight	131 (10.11)	128 (9.88)		
Obese	53 (4.08)	45(3.48)		

Table 4: Correlation between body mass index and blood pressure of participants (N = 1296).

Lodha, Shabar etc. In rural North 24 Parganas, there are several villages in which the percentage of Scheduled Tribe (ST), Scheduled Caste (SC) and Other Backward Classes (OBC-A and OBC-B) population is nearly 90 percent.

In this study, BMI is classified according to the WHO as underweight, normal, overweight, and obese. Overweight and obesity are risk factors for many diseases, including high BP [16-18]. In this present study, 259 participants (19.98%) were overweight and 98 (7.56%) were obese. Out of total overweight and obese participants, 52.05% were stage-I hypertensive.

Physical activity is generally recommended as an important lifestyle change that can help high blood pressure [19,20]. In this study, 38.34% rural people were engaging in low or no physical activities. Out of them, 37.57% were examined by stage-I hypertensive. A study revealed that heavier consumption of alcohol (>20 g/day) is associated with the risk of development of high blood pressure in both sexes. In case of women, light to moderate consumption of alcohol (<20 g/day) had a reduced risk of high blood pressure, while men had an increased risk [21]. In this present study 74.53% study participants didn't consume alcohol while examined hypertensive. Tobacco smoking causes high blood pressure, although many studies have showed that smokers have the same or lower blood pressure than non-smokers [22]. 78.32% study participants were hypertensive who smokes tobacco daily. The close relation between high blood pressure and extra intake of salt in diet is widely recognized by several studies. Extra intake of salt in diet has increased the chances of cardiovascular diseases [23]. In this present study, 80.76% participants took extra salt in their diet and also examined hypertensive.

Conclusion

The present study found that rural participants of studied area were prone to risk factors related to high blood pressure. The tendency to hypertension begins in middle and late adulthood, but if this trend continues in rural India, people will have a higher rate of illness and death in later life. Thus, lifestyle changes and regular health check-ups with awareness in rural areas will help to improve the present unhealthy condition and reduce the tendency of hypertension among rural residents.

Bibliography

1. Rao S. "Nutritional status of the Indian population". *Journal of Bioscience* 26.4 (2001): 481-489.
2. Swain S and Chowdhury S. "Trends of nutritional status among rural adults in six states of India: findings from national survey data". *Clinical Epidemiology and Global Health* 6 (2018): 181-187.
3. Luhar S., *et al.* "Forecasting the prevalence of overweight and obesity in India to 2040". *PloS one* 15.2 (2020): e0229438.
4. Bays H E., *et al.* "The relationship of body mass index to diabetes mellitus, hypertension and dyslipidaemia: comparison of data from two national surveys". *International Journal of Clinical Practice* 61.5 (2007): 737-747.
5. Popkin B M., *et al.* "Global nutrition transition and the pandemic of obesity in developing countries". *Nutrition Reviews* 70.1 (2012): 3-21.
6. Kearney J. "Food consumption trends and drivers". *Philosophical transactions of the Royal Society of London. Series B, Biological Sciences* 365.1554 (2010): 2793-2807.
7. Shetty P S. "Nutrition transition in India". *Public Health Nutrition* 5 (2002): 175-182.

8. Chataut J., *et al.* "Prevalence and Associated Factors of Hypertension among Adults in Rural Nepal: A Community Based Study". *Kathmandu University Medical Journal* (KUMJ) 13.52 (2015): 346-350.

9. Singh S., *et al.* "Prevalence and Associated Risk Factors of Hypertension: A Cross-Sectional Study in Urban Varanasi". *International Journal of Hypertension* (2017): 5491838.

10. Gaziano TA., *et al.* "Growing epidemic of coronary heart disease in low- and middle-income countries". *Current Problems in Cardiology* 35.2 (2010): 72-115.

11. Gupta R., *et al.* "Prevalence and determinants of hypertension in the urban population of Jaipur in western India". *Journal of Hypertension* 13.10 (1995): 1193-1200.

12. Kapoor S S. "Blood pressure, waist to hip ratio and body mass index among affluent Punjabi girls of Delhi". *Acta Medica Auxologica* 32.3 (2000): 153-157.

13. Weiner JS and Lourie JA. "Practical human Biology Anthropometry". New York: Academic Press (1981): 27.

14. WHO Expert Consultation. "Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies". *Lancet (London, England)* 363.9403 (2004): 157-163.

15. JNC 7. "The seventh report of the joint national committee on prevention, detection, evaluation and treatment of high blood pressure". *JAMA* 289 (2003): 2560-2571.

16. Dua S., *et al.* "Body mass index relates to blood pressure among adults". *North American Journal of Medical Sciences* 6.2 (2014): 89-95.

17. Wang H., *et al.* "Blood pressure, body mass index and risk of cardiovascular disease in Chinese men and women". *BMC Public Health* 10 (2010): 189.

18. Cassani Roerta SL., *et al.* "Relationship between blood pressure and anthropometry in a cohort of Brazilian men: A cross-sectional study". *American Journal of Hypertension* 22 (2009): 980-984.

19. Diaz K M and Shimbo D. "Physical activity and the prevention of hypertension". *Current Hypertension Reports* 15.6 (2013): 659-668.

20. Shanthirani CS., *et al.* "Prevalence and risk factors of hypertension in selected South Indian population - The Chennai Urban Population Study". *Journal of the Association of Physicians of India* 51 (2003): 20-27.

21. Briasoulis A., *et al.* "Alcohol consumption and the risk of hypertension in men and women: a systematic review and meta-analysis". *Journal of Clinical Hypertension* (Greenwich, Conn.) 14.11 (2012): 792-798.

22. Omvik P. "How smoking affects blood pressure". *Blood Pressure* 5.2 (1996): 71-77.

23. Grillo A., *et al.* "Sodium Intake and Hypertension". *Nutrients* 11.9 (2019): 1970.

Assets from publication with us

- Prompt Acknowledgement after receiving the article
- Thorough Double blinded peer review
- Rapid Publication
- Issue of Publication Certificate
- High visibility of your Published work

Website: www.actascientific.com/
Submit Article: www.actascientific.com/submission.php
Email us: editor@actascientific.com
Contact us: +91 9182824667