

## A study of Blood Pressure and BMI among Tribal adolescents of Narmada district, Gujarat, India

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**Received:** 16<sup>th</sup> April 2020; **Accepted:** 25<sup>th</sup> August 2020; **Published:** 01<sup>st</sup> October 2020

**Abstract:** *Background:* Hypertension has emerged as a leading health problem in developing countries. *Aim:* The present study aims at assessing the prevalence of hypertension and BMI of Bhil adolescents. *Methods:* The present study was conducted among 225 Bhil adolescents of Narmada, district, Gujarat, India. *Results:* Overall, 27.55% and 8.44% were found to be hypertensive and pre-hypertensive, respectively. More males (23.37%) were underweight as compared to females (21.21%). *Conclusion:* As adolescents form a considerable amount of society, it is crucial to prepare standard BMI and BP percentile charts for Indian adolescents for better classification of nutritional status and hypertension.

**Keywords:** Anthropometry, Adolescents, Blood Pressure, BMI, Bhil.

### Introduction

The period of transition from childhood to adulthood can be hazardous for adolescent health, because they often develop behavioral problems and unhealthy lifestyles which have its reflection in the form of various diseases in later life. One such disorder is hypertension, the risk factors of which have its initiation during childhood and adolescence. In 2000, approximately 1 billion adult world population was found to be hypertensive and it is expected to increase to 1.56 billion by 2025 [1]. Studies have reported the prevalence of systemic hypertension around 5-10% in developing countries like India [2]. A report by WHO revealed the prevalence of hypertension in India to be around 33.2%, more females (34%) suffer from hypertension as compared to males (32.4%) [3].

Various environmental and genetic factors such as age, sex, body size, physical activity, dietary pattern, increased stress levels, socio-economic status, family history of hypertension plays an important role in hypertension among children and adolescents [4]. Early detection of elevated or high levels of blood pressure is a key factor in prevention and management of future complications of hypertension. In India, there is a

paucity of information on nutritional status and hypertension among tribal adolescents. This study is an attempt to shed some light on the ongoing trend of BMI and hypertension among them.

### Material and Methods

*Study design and population:* The present cross-sectional study was conducted among 225 Bhil adolescents (107 boys and 118 girls) belonging to the 13-18 year age group of Narmada district, Gujarat. Bhil is the second largest tribe in India. They constitute about 46% of total tribal population of the state of Gujarat. In the state, Bhil tribe is divided into major groups as Bhil Garasia, Vasava Bhil, Pawra Bhil and Tadavi Bhil. The present population belongs to Vasava and Tadavi Bhils.

They reside in interiors of Narmada district at Kevadiya Colony which is surrounded by Satpura hills on one side and Vidhyanchal hills on the other side with Narmada river flowing in the district. The area is now a major tourist spot due to the Sardar sarovar dam and the statue of unity. Data was collected from 3 schools of Kevadiya colony

using stratified random sampling. The ethical clearance was taken from the ethical committee of the Department of Anthropology, University of Delhi. Written consent was obtained from the concerned authorities and parents before the collection of data. A pre-tested schedule which included basic socio-demographic information (name, age and sex), somatometric and physiological measurements was used.

*Somatometric measurements:* Measurements were taken as per standard protocol given by International Society for the Advancement of Kinanthropometry [5]. Height was measured to the nearest 0.5 cm using anthropometric rod, while weight was measured to the nearest 0.5 kg using a floor type weighing scale.

*BP measurement:* Measurement of BP was done as per standardized procedures recommended in updated BP guidelines given by Flynn et al. [6]. Participants were classified into four groups based on BMI percentiles specific to age and sex [7]. BP categories were classified using

guidelines for screening and management of high blood pressure in children and adolescents [6]. Both isolated systolic and isolated diastolic hypertension cases are counted in the hypertension category.

*Statistical analysis:* Analysis of data was done by statistical software SPSS version 25 (Statistical Package for the Social Sciences, IBM Corporation, Armonk, New York). Statistical test implemented was Chi-square test.  $P < 0.05$  was considered to be statistically significant. Generation of tables were done by Microsoft Word and Excel.

### Results

Table 1 shows the distribution of BMI categories among Bhil adolescents. In males, 23.37% were underweight, 76.63% were normal, no male participants were reported in overweight and obese category. In case of females, 21.21% were underweight, 73.72% were normal, 4.23% were overweight and only one was found to be in obese category.

Sex	N	Underweight	Normal	Overweight	Obese
Male	107	25 (23.37)	82 (76.63)	0 (0)	0 (0)
Female	118	25 (21.21)	87 (73.72)	5 (4.23)	1 (0.84)
Total	225	50 (22.22)	169 (75.11)	5 (2.22)	1 (0.45)

Percentages are given in parentheses.

Table 2 shows the prevalence and type of hypertension among Bhil adolescents. More females (66.10%) were in the normal category as compared to males (61.68%). 9.34% males and 7.62% females were having elevated levels of BP. High prevalence of hypertension was found in both males (28.98%) and females (26.28%). Out

of 40 cases of hypertension in females, 27.5% were of isolated SBP, 32.5% of isolated DBP and 40% of both, whereas out of 41 cases of hypertension in males, 31.7% were of isolated SBP, 24.4% of isolated DBP and 43.9% of both.

Prevalence of Hypertension				
Sex	N	Normotensive (%)	Pre-hypertensive (%)	Hypertensive (%)
Male	107	66 (61.68)	10 (9.34)	31 (28.98)
Female	118	78 (66.10)	9 (7.62)	31 (26.28)
Total	225	144 (64)	19 (8.44)	62 (27.56)
Type of Hypertension				
Sex	N	Isolated SBP (%)	Isolated DBP (%)	Both(%)
Male	107	31.7	24.4	43.9
Female	118	27.5	32.5	40

SBP (Systolic blood pressure), DBP (Diastolic blood pressure)

Table 3 shows cross tabulation of BP categories with nutritional status among Bhil adolescents. More females were malnourished in both normotensive and pre/hypertensive categories as compared to males. 17.1% males and 35.85%

females were found in the malnourished and pre/hypertensive category. Significant differences were found between nutritional status and BP categories in case of females.

**Table-3: Cross tabulation of BP categories with nutritional status**

Variable	Males		Females	
	Normal	Malnourished	Normal	Malnourished
Normotensive	49 (74.25)	17 (25.75)	53 (67.94)	25 (32.06)
Pre/Hypertensive	34 (82.9)	7 (17.1)	34 (64.15)	19 (35.85)
Chi <sup>2</sup> value	1.096		3.969*	
*P<0.05, Percentages are given in parentheses.				

### Discussion

Adequate Nutrition plays an important role in the physical growth of adolescents. Due to various lifestyle factors, under-nutrition has grown a lot among the young population of our country. Tribal population is more vulnerable owing to poor socio-economic, cultural, environmental factors and lack of awareness.

This cross sectional study assessed the nutritional status and blood pressure of Bhil adolescents in Narmada district, Gujarat, India. BMI is related to height and weight which are influenced by genetic, environmental, lifestyle and most importantly, nutritional factors. A report on diet and nutritional status of Tribal adolescents in 9 states of India reported that 39.5% of adolescent girls were suffering from undernutrition [8]. In the present study, 23.36% males and 21.21% females were underweight. Similar prevalence of underweight was found in another study among the adult Bhil population [9]. In the present study, prevalence of overweight and obesity was found to be 4.23% and 0.84% respectively among girls. None of the boys were reported in overweight/obese category. These findings are similar to a study conducted among adolescents of Sabarkantha district, Surat, Gujarat [10].

Elevated levels of blood pressure, especially high SBP, is the leading cause of chronic disease worldwide. It is estimated that high SBP accounts for 10.4 million deaths and 208.1 million disability adjusted life-years [11]. The results of the present study showed that prevalence of hypertension is high among Bhil adolescents of Narmada district, Gujarat, 28.97% in males and

26.27% in females. Similar prevalence was found in a study conducted among an urban population of Faridabad, India. It was found that 19.7% of the children were detected to be hypertensive and 13.4% were in pre-hypertensive category [12]. Various studies have shown a lower prevalence of hypertension in comparison to the present study. A study conducted among school going boys in Delhi, India reported 4.3% to be hypertensive and 7.3% to be pre-hypertensive [13]. In another study the prevalence of hypertension in school children of Aligarh, Uttar Pradesh, was found to be 9.36% in boys and 9.4% in girls [4]. A study conducted among children and adolescents in China, reported 6.7% prevalence of hypertension [14].

A study showed that BMI is an important factor for hypertension. They found that prevalence of hypertension was higher amongst those with BMI>85<sup>th</sup> percentile [15]. In the present study, a significant difference was found between nutritional status and BP categories among females on the other hand, no significant difference found for males. Previous studies have shown that overweight/obesity is associated with high prevalence of hypertension [2, 15] which is in contrast with the present study as prevalence of obesity was found to be quite low. On the other hand, there was high prevalence of underweight individuals and yet, there was high prevalence of stage 1 and 2 hypertension. High prevalence of undernutrition and elevated BP in the present population may be due to lack of awareness, imbalanced diet, sedentary

lifestyle, limited resources, genetic and environmental factors.

### Conclusion

Adolescent health is a major determinant of economic and social development and progress of society. Investing in it at the right time and identifying at risk individuals early in life offers an opportunity to change lifestyle patterns during this malleable time of life. The present study reported high prevalence of underweight and hypertension among Bhil adolescents. As adolescents are the future of the nation,

safeguarding their health should be the priority, the present study suggests that standard BMI and Blood Pressure percentile charts for Indian adolescents can be prepared for better classification of nutritional status and hypertension.

### Acknowledgement

Authors are grateful to school authorities for giving consent. We extend our gratitude to all the participants/ students for their willing co-operation. We are also grateful to the Department of Anthropology, University of Delhi for providing the necessary facilities to carry out this study.

**Financial Support and sponsorship:** Nil

**Conflicts of interest:** There are no conflicts of interest.

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**Cite this article as:** Singh N, Singh S and Chandel S. A study of Blood Pressure and BMI among Tribal adolescents of Narmada district, Gujarat, India. *Al Ameen J Med Sci* 2020; 13(4):291-294.

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