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"Prevalence of Hypertension in school going adolescents – A Prospective observational Cross-sectional study"

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ABSTRACT:

Introduction: Hypertension is a significant risk factor for cardiovascular diseases (CVDs) and premature mortality worldwide, affecting approximately one billion individuals, with a higher prevalence in developing countries. Globally, hypertension is defined as having an average systolic blood pressure of at least 140 mmHg, an average diastolic blood pressure of at least 90 mmHg, or the use of antihypertensive medication, with a prevalence of 31%. In India, the prevalence of hypertension among adults is slightly lower at 28%.
Materials and Methodology: This cross-sectional study focused on school adolescents aged 13-17 years, with a calculated sample size of 200. The study was conducted over four months at Shri Ambe Vidhyalaya School in Vadodara, Gujarat, India. Inclusion criteria included willingness to participate and being an adolescent aged 13-17 years, while exclusion criteria included unwillingness to participate, advised rest for more than 15 days due to sickness in the last 6 months, acute or chronic illness, and absence during the study period. Data collection included a self-administered questionnaire, anthropometric measurements, and blood pressure measurements.
Results: Out of 200 subjects, 52.2% were male and 47.5% were female. The prevalence of hypertension and pre-hypertension was 4.86% and 14.02%, respectively. Factors such as gender, junk food consumption, and sleep hours were not statistically significant, while family history was significantly associated with high blood pressure and hypertension.
Conclusion: The study concludes that among school adolescents, the prevalence of raised blood pressure is 14.02%, with hypertension at 4.86%. Family history was significantly associated with hypertension, while other factors such as gender, junk food consumption, and sleep hours were not statistically linked.

INTRODUCTION:

Globally, hypertension is linked to early mortality and is a major risk factor for cardiovascular diseases (CVDs) [1]. One billion people worldwide suffer from high blood pressure, and the majority of those affected—roughly two-thirds—live in poor countries [1]. An average systolic blood pressure of at least 140 mmHg, an average diastolic blood pressure of at least 90 mmHg, or the use of antihypertensive medication is described as hypertension. It is estimated that 31% of adults worldwide have hypertension [2]. Adults in India are slightly less likely to have hypertension than in other countries (28%) [3].
Chronic kidney disease, hypertensive retinopathy, and stroke are examples of target organ damage that can arise from long-term, undiagnosed, or untreated HT that has lasted longer than five years [4]. Globally essential hypertension in teenagers varies among varied races from 0.3 to 21% [5]. Its frequency is rising in the younger generation. Stress, early atherosclerosis development, and the growing burden of paediatric obesity raise the risk of critical HT at a considerably younger age range [6–9].
Twenty-one percent of Indians are adolescents [10]. According to recent data, teenage hypertension is another growing health issue. A meta-analysis of cross-sectional studies on teenage hypertension from India revealed that the prevalence of hypertension among adolescents varied between 2% and 20.5% across studies, with a pooled estimate of 7.6% [11]. According to the most recent National Family Health Survey-5 (NFHS-5) [12], the prevalence of hypertension among teenagers in India is 4.6% for boys and 3.3% for girls. Early HTN development has been linked to a longer treatment cycle, more difficult blood pressure control, and a worse prognosis, according to earlier research [13, 14]. Thus, it is crucial for both public health and clinical practice to comprehend the prevalence and risk factors of hypertension in children and adolescents [15].

As there is dearth of data about the magnitude of HT and its determinants in adolescent age group, we sought to find out prevalence and risk determinants of HT in school going adolescents of age 13-17 years.

MATERIALS AND METHODS:

The study was designed as a cross-sectional study, focusing on school adolescents aged 13-17 years, including both boys and girls. The sample size calculation was based on a prevalence of 6.7% from a previous study, using OPENEPI software, resulting in a calculated sample size of 91; however, for greater precision, a sample size of 200 was chosen. The study was conducted over a period of 4 months at Shri Ambe Vidhyalaya School in Vadodara, Gujarat, India. Inclusion criteria encompassed willingness to participate and being an adolescent aged 13-17 years. Exclusion criteria included unwillingness to participate, having been advised rest for more than 15 days due to sickness in the last 6 months, having any acute or chronic illness, and being absent during the study period.
Study was started after getting approval of Institutional Ethics Committee. Prior consent was obtained from school administration and from parents. After enrolment, each participant was informed about study protocol and written assent was taken. A pre-designed and pre-tested self-administered questionnaire was administered to students in their local language comprising of background characteristics, history of hypertension amongst parents, selected risk behaviour in relation to diet, physical activity, tobacco use and their mental health status. Anthropometric and blood pressure measurements were undertaken after explaining the procedure to the children, using standard calibrated equipment and methodology. Seca electronic scale was used for weight measurement. Height was measured using a stature meter to the nearest 0.1 cm. Data was collected when the student was at resting state. Those who were found hypertensive there BP was calculated thrice.

STATISTICAL ANALYSIS:

Collected data is compiled and analysed by using the Microsoft Excel sheet. Descriptive and Analytical statistical method is used for interpretation of results. In analytical methods chi-square is applied to find out significance level. P value <0.05 will be considered as statistically significant.

RESULT:

Characteristics of the study subjects: A total of 200 subjects were analyzed, out of which male accounted to 105(52.2%) and female 95(47.5%). The age range was 13years to 17years.

Table 1: Age and sex distribution of high school adolescents.

Age	Male (%)	Female (%)	Total (%)
13	25 (23.8)	26 (27.08)	51 (25.5)
14	36 (34.61)	23 (22.11)	59 (29.5)
15	23 (22.11)	38 (39.58)	61 (30.5)
16	16 (15.38)	7 (7.36)	23 (11.5)
17	5 (4.8)	1 (1.04)	6 (3)
Total	105	95	200

Figure 1. Age and sex distribution of high school adolescents

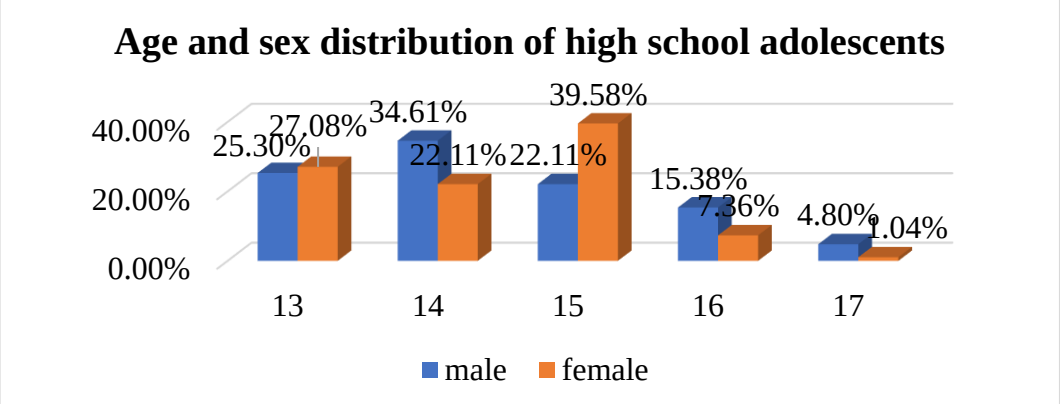


Table 2: Age wise distribution of mean systolic and diastolic blood pressure.

AGE	Mean systolic pressure (mmHg)	Mean diastolic pressure (mmHg)
13	116.024 ± 11.43	76.52 ± 10.22
14	117.32 ± 11.12	77.39 ± 9.61
15	118.26 ± 6.58	77.37 ± 9.57
16	123.70 ± 6.61	80.57 ± 7.47
17	122.49 ± 6.58	79.46 ± 7.58
TOTAL	118.46 ± 10.34	77.62 ± 9.37

Table 3: Prevalence of hypertension among study population.

Classification	Systolic Or Diastolic Blood Pressure (in mmHg)	Number of Subject with SBP level (n)	%	Number of Subject with DBP level (n)	%
Normal	<120/<80	181	90.5	188	94
Elevated BP	120/<80 to 129/<80	14	7	7	3.5
Hypertension stage 1	130/80 to 139/89	4	2	4	2
Hypertension stage 2	>= 140/90	1	0.5	1	0.5

Figure 2. Prevalence of hypertension among study population

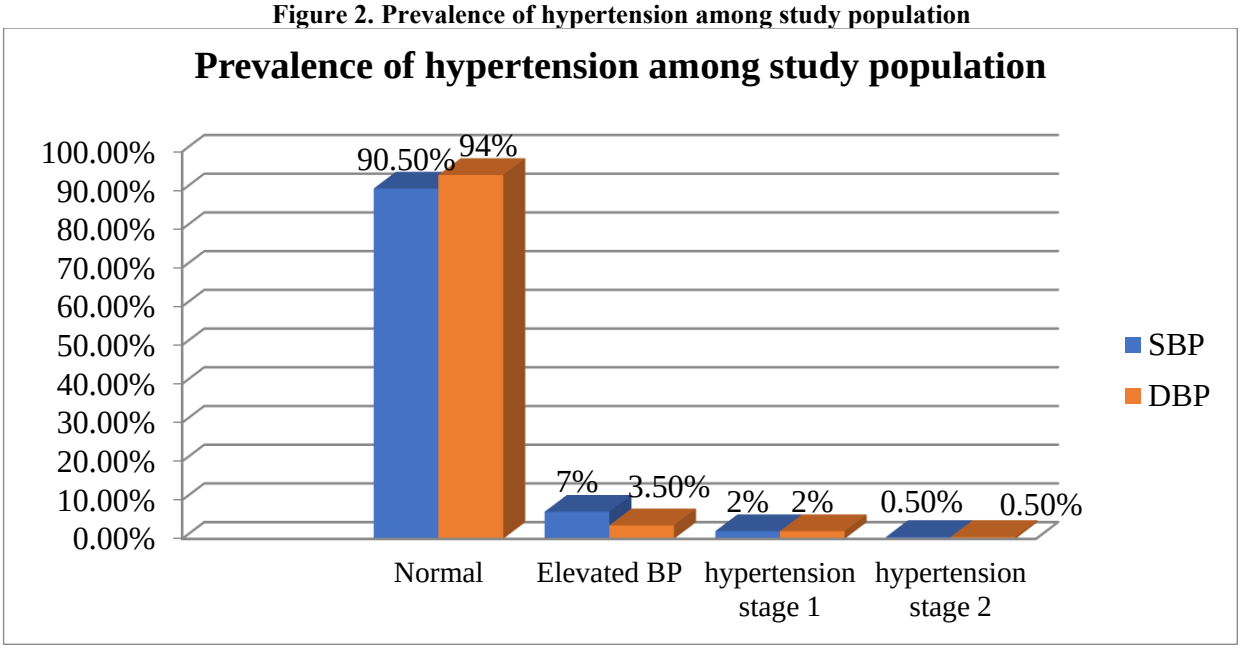


Table 4: Association between various determinants and elevated blood pressure and hypertension

TABLE 4.1: - Gender wise prevalence of blood pressure in adolescent:

PARTICULARS	NORMAL %	ELEVATED BP %	HIGH BLOOD PRESSURE %
MALE	94 (89.52%)	7 (6.66%)	4 (3.81%)
FEMALE	87 (91.58%)	7 (7.36%)	1 (1.05%)

Figure 3. Gender Distribution in relation to Blood Pressure

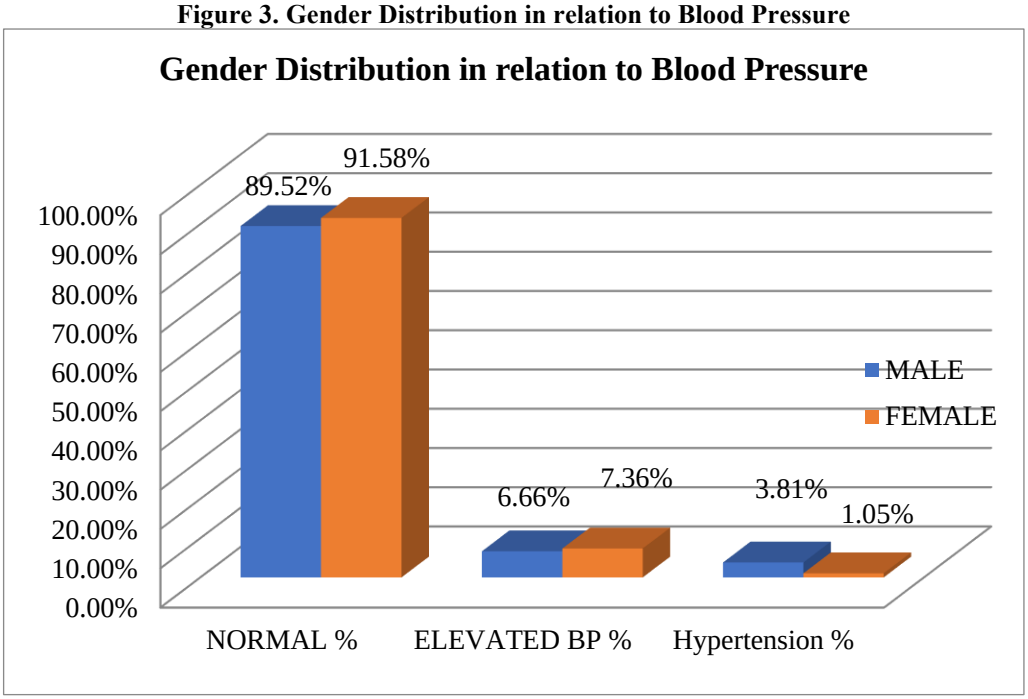


TABLE 4.2: Prevalence of hypertension based on family history:-

PARTICULARS	NORMAL %	ELEVATED BP%	HYPERTENSION %
Positive family history	70.21%	21.28%	8.51%
Negative Family history	96.73%	2.61%	0.65%

Figure 4. Family history of elevated BP and Hypertension

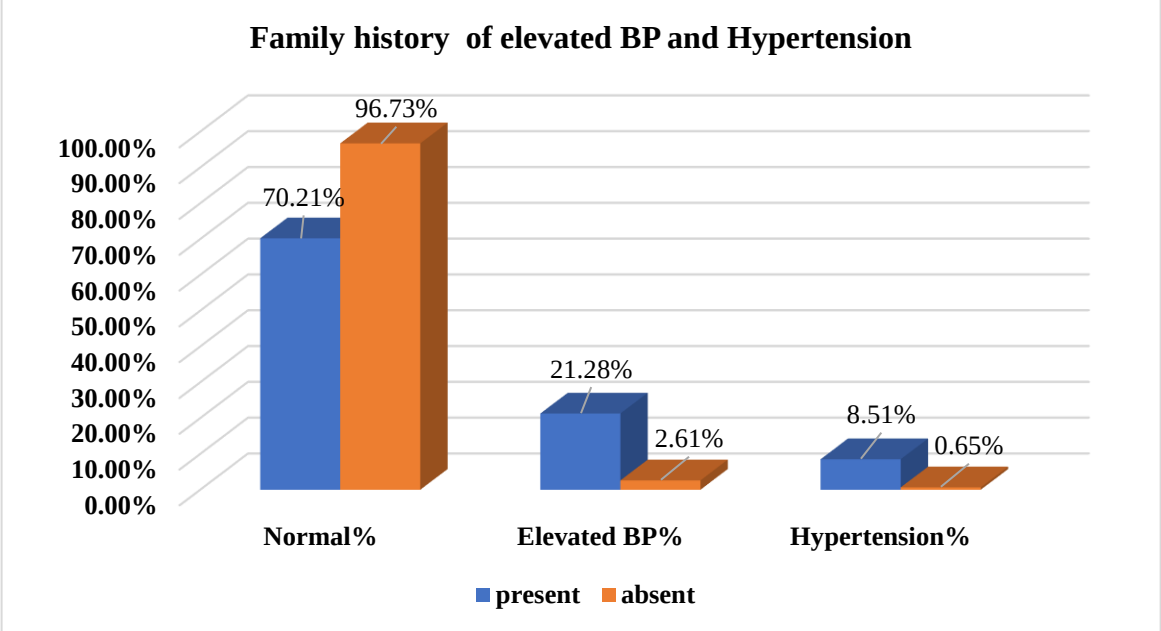


Table 4.3: Prevalence of elevated BP and hypertension based on sleep hours: -

PARTICULARS	NORMAL %	ELEVATED BP %	HIGH BP
>7 HOURS	92%	6%	2%
<7 HOURS	90%	7.33%	2.67%

Figure 4. Sleep hours and Blood pressure

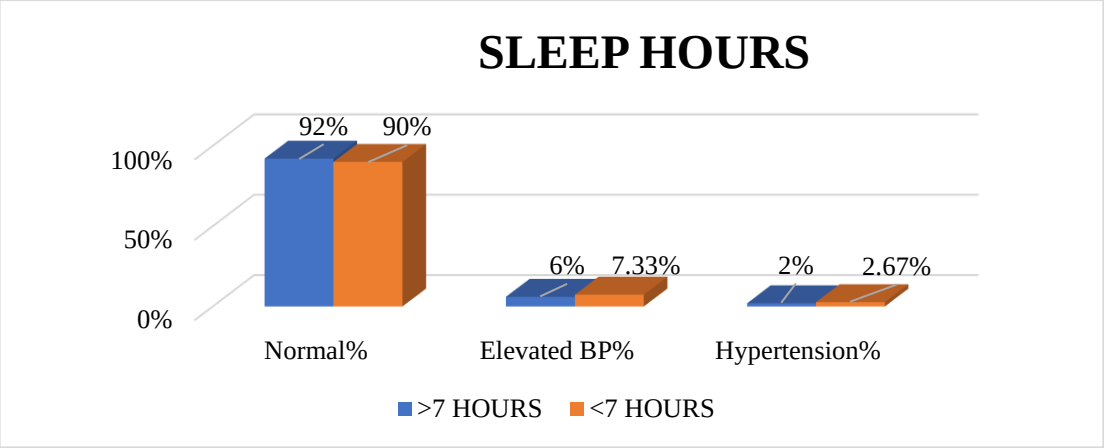
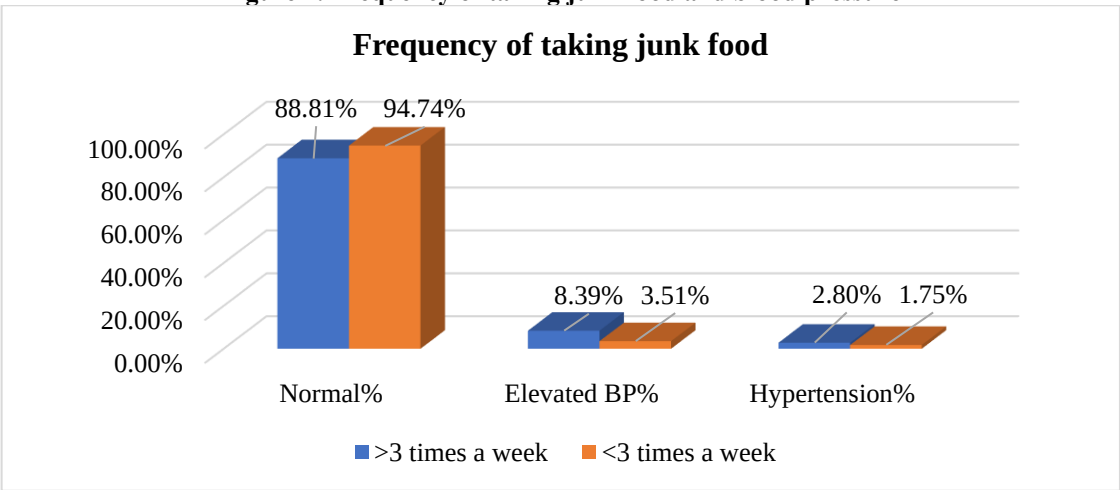


Table 4.4: - Prevalence of elevated BP and high BP based on intake of junk food:

PARTICULARS	NORMAL %	ELEVATED BP %	hypertension
>3 TIMES PER WEEK	88.81%	8.39%	2.80%
<3 TIMES PER WEEK	94.74%	3.51%	1.75%

Figure 4. Frequency of taking junk food and blood pressure



Prevalence of elevated BP among adolescent male was found to be 6.66% and for female it was 7.36% and hypertension in male was found to be 3.81% and in female was 1.05%.
To determine the association between various determinants and prevalence of Elevated Blood pressure and hypertension chi-square was calculated. Obesity/overweight students (4%) had elevated of stage I/II hypertension as compare to normal or thin BMI. Among various determinants, gender, junk food, and sleep hours were found to be insignificant (p-value >0.05) while family history was found to be statistically significant (p-value is <0.05).

DISCUSSION:

The fact that almost 25% of teenagers enrolled in school had high blood pressure (with the prevalence of hypertension and pre-hypertension being 4.86% and 14.02%, respectively) is concerning. On the other hand, it is noted that there are significant differences in the prevalence of both hypertension and pre-hypertension among studies, even those conducted in similar environments. About 30.3% of students in a Kolkata slum neighbourhood were found to have high blood pressure (HT-10.1%, pre-HT-20.2%) in a research [16]. In a recent study, teenage boys from four different schools in Delhi who were in the ninth to twelfth grades showed a lower prevalence of HT and pre-HT, with respective rates of 4.3% and 7.3% [17]. Our study's hypertension prevalence was greater than those of studies conducted in Eastern India (7.2%), Delhi (7%), and Surat (6.48%) by Gupta R et al., Anand T et al., and Buch N et al. [18–20]. However, compared to Anand T et al. in Delhi (30.1%) [19], Sharma A et al. [21] in Shimla (20%), and Kumar R et al. in Moradabad (15.8%) [22], the

prevalence of pre-hypertension was lower (10.6%). In a systematic review on the prevalence of HT among children under the age of 18, Nayak BS et al. reaffirmed this variability, noting that the prevalence of HT among children in North and South India varied from 0.6% to 25.6% and from 0.02% to 11.7%, respectively, in various studies [23]. distinct measuring criteria, geographic factors, and the inclusion of distinct age groups (early vs. late teenagers) are likely the causes of these discrepancies [23].

In line with other research on blood pressure in children, the SBP and DBP in the current study exhibited favourable correlations with age, height, and BMI [24–27]. According to the current study, there is a substantial link between rising age, height, and BMI and both SBP and DBP. According to Voors et al., BP had a stronger correlation with body mass and height than with age [28]. The current study's significant association between height and both systolic and diastolic blood pressure validates the existence of primary HT in children and raises the possibility that these children may go on to develop HT in the future. The results suggest that these children need to be examined for a close follow-up to modify risk variables and that they should be evaluated as having a high risk of acquiring type 2 diabetes and cardiovascular disease.

There is a no statistically significant correlation between increased junk food consumption and hypertension. In comparison to the 15 out of 176 individuals who consumed junk food fewer than three times per week, nearly 4 out of the 24 individuals who consumed junk food more than three times per week were found to have hypertension; however, this difference was not statistically significant. Similar studies by Kumar et al. and Fadnis VP found a substantial ($p < 0.001$) relationship between the type of food and hypertension in adolescents aged 5-19 [29–30].

It is widely acknowledged that eating more fresh fruits, vegetables, and fibre along with less sodium is beneficial for those with hypertension. Increased consumption of potassium, magnesium, and folic acid—all of which are found in abundance in fruits and vegetables—has been linked to lower blood pressure in children and adolescents [31]. There was no statistically significant relationship seen in our study between the prevalence of hypertension and regular physical activity. There is no correlation found in this study between hypertension and sleep problems. Similar findings were noted in a study conducted by Vedavathy S. et al. [32].

CONCLUSION:

According to our study, among adolescents enrolled in school, the prevalence of raised blood pressure is 14.02%, whereas hypertension is 4.86%. There was a strong correlation between hypertension and high blood pressure and family history. It was not observed that other factors, such as gender, amount of sleep, or consumption of junk food, were statistically linked to high blood pressure and hypertension.

LIMITATION:

The current study had a small sample size and did not include numerous schools from which additional samples were drawn. Other factors that affect blood pressure include atmosphere, whether or not one is fasting or not, and psychological stress, all of which were outside the control range for this study.

REFERENCES:

1. Hu J, Ding Z, Han D, Hai B, Lv H, Yin J, Shen H, Gu A and Yang H (2022) Prevalence of hypertension and related risk factors among children and adolescents at three separate visits: A large school-based study in China. Front. Pediatr. 10:976317. doi: 10.3389/fped.2022.976317
2. Romano I, Buchan C, Baiocco-Romano L, Ferro MA: Physical-mental multimorbidity in children and youth: a scoping review. BMJ Open. 2021, 11:10.1136/bmjopen-2020-043124
3. Mills KT, Bundy JD, Kelly TN, et al.: Global disparities of hypertension prevalence and control: a systematic analysis of population-based studies from 90 countries. Circulation. 2016, 134:441-50.
4. Tackling G, Borhade MB. Hypertensive heart disease. In: StatPearls [Internet]. Treasure Island (FL). StatPearls Publishing; 2020 [cited 2021 Mar 19] Available from: http://www.ncbi.nlm.nih.gov/books/NBK539800/.
5. Sabri M, Gheissari A, Mansourian M, Mohammadifard N, Sarrafzadegan N. Essential hypertension in children, a growing worldwide problem. J Res Med Sci Off J Isfahan Univ Med Sci [Internet; 2019 Dec 23, 24. [cited 2021 Mar 19] Available from: http s://www.ncbi.nlm.nih.gov/pmc/articles/PMC6950331/.
6. Brady TM. Obesity-related hypertension in children. In: Front Pediatr [Internet]; 2017 Sep 25, 5. Available from: http://www.ncbi.nlm.nih.gov/pmc/articles/PM C5622310/.
7. Mucci N, Giorgi G, De Pasquale Ceratti S, Fiz-P´erez J, Mucci F, Arcangeli G. Anxiety, Stress-Related Factors, and Blood Pressure in Young Adults. Front Psychol [Internet]; 2016 Oct 28, 7. [cited 2021 Mar 19] Available from: http://www.ncbi.nlm.nih. gov/pmc/articles/PMC5083786/.

8. Luma GB, Spiotta RT. Hypertension in children and adolescents. Am Fam Physician. 2006 May 1;73(9):1558–1566.
9. Anyaegbu E, Dharnidharka V. Hypertension IN the teenager. Pediatr Clin. 2014 Feb; 61(1):131–151.
10. Office of the Registrar General & Census Commissioner, India . (2011). https://censusindia.gov.in/census.website/.
11. Daniel RA, Haldar P, Prasad M, Kant S, Krishnan A, Gupta SK, Kumar R: Prevalence of hypertension among adolescents (10-19 years) in India: a systematic review and meta-analysis of cross-sectional studies. PLoS One. 2020, 15:10.1371/journal.pone.0239929
12. India National Family Health Survey 2019-21 (FR375) . (2022). https://dhsprogram.com/pubs/pdf/FR375/FR375.pdf.
13. Yang L, Sun J, Zhao M, Liang Y, Bovet P, Xi B. Elevated blood pressure in childhood and hypertension risk in adulthood: a systematic review and metaanalysis. J Hypertens. (2020) 38:2346–55. doi: 10.1097/HJH.0000000000002550
14. Wang C, Yuan Y, Zheng M, Pan A, Wang M, Zhao M, et al. Association of age of onset of hypertension with cardiovascular diseases and mortality. J Am Coll Cardiol. (2020) 75:2921–30. doi: 10.1016/j.jacc.2020.04.038
15. Gartlehner G, Vander Schaaf EB, Orr C, Kennedy SM, Clark R, Viswanathan M. Screening for hypertension in children and adolescents: updated evidence report and systematic review for the US preventive services task force. JAMA. (2020) 324:1884–95. doi: 10.1001/jama.2020.11119
16. Maiti M, Bandyopadhyay L. Variation in blood pressure among adolescent schoolchildren in an urban slum of Kolkata, West Bengal. *Postgrad Med*. 2017 Nov;93 (1105):648–652.
17. Singh SK, Verma A. Prevalence of hypertension among school going adolescent boys in Najafgarh, Delhi, India. *Int J Adolesc Med Health*. 2020 Jan 18.
18. Gupta R, Goyle A, Kashyap S, Agarwal M, Consul R, Jain BK. Prevalence of atherosclerosis risk factors in adolescent school children. *Indian Heart J*. 1998 Oct;50 (5):511–515.
19. Anand T, Ingle GK, Meena GS, Kishore J, Kumar R. Hypertension and its correlates among school adolescents in Delhi. *Int J Prev Med*. 2014 Mar;5(Suppl 1):S65–S70.
20. Buch N, Goyal JP, Kumar N, Parmar I, Shah VB, Charan J. Prevalence of hypertension in school going children of Surat city, Western India. *J Cardiovasc Dis Res*. 2011;2(4): 228–232.
21. Sharma A, Grover N, Kaushik S, Bhardwaj R, Sankhyan N. Prevalence of hypertension among schoolchildren in Shimla. *Indian Pediatr*. 2010 Oct;47(10): 873–876.
22. Kumar R, Sharma M, Srivastava A. A cross sectional study of hypertension in adolescent girls of district Moradabad, Uttar Pradesh, India. *Int J Community Med Public Health*. 2017 Jan 5;3(6):1388–1392.
23. Nayak BS, Dsouza A, Shetty S, Ravishankar N. Prevalence of childhood hypertension in South Asia: a systematic review and meta-analysis [Internet] *J Clin Diagn Res*; 2018 [cited 2021 Mar 19] Available from: https://jcdr.net/article_fulltext.asp?iss n=0973-709x&year=2018&volume=12&issue=10&page=LC13&issn=0973-709x &id=12200.
24. Shetty SK, Shetty SS, Sasidharan S, Shenoy VM. Prevalence of pre-hypertension and hypertension in asymptomatic urban school going children of Mangalore and its correlation with BMI. IOSR Journal of Dental and Medical Sciences (IOSR-JDMS) e-ISSN: 2279-0853, p-ISSN: 2279-0861. Volume 9, Issue 1 (Jul.- Aug. 2013), pp. 76-79
25. Canner PL, Borhani NO, Oberman A, Cutler J, Prineas RJ, Langford H, et al. [21] The hypertension prevention trial assessment of the quality of blood pressure measurements. Am J Epidemiol. 1991;134:379– 92.
26. Sinaiko AR, Gomez Marin O, Prineas RJ. Diastolic fourth and fifth phase blood [22] pressure in 10-15 year old children: The children and adolescents blood pressure program. Am J Epidemiol. 1990;132:647–55.
27. Sarin D, Chaturvedi P. Normal blood pressure and prevalence of hypertension in [23] school going children. J MGIMS. 1997;1:32–35.
28. Voors AW, Webber LS, Frerichs RR. Body height and body mass as determinants [24] of basal blood Report of the Dietary Guidelines Advisory Committee, 2010 Dietary Guidelines for Americans. Evidence based guidelines: http://www.cnpp. usda.gov/DGAs2010-DGACReport.htm.
29. Kumar A, Atul K, Apeksha P, Neha G, Deba PB. Preva-lence and risk factors associated with hypertension in children and adolescents. Pediatr On Call J. 2015;12.
30. Fadnis VP, Poyekar SP, Ambike DA, Lazar S. Prevalence and risk factors for pre-hypertension and hypertension amongst school going adolescents in a rural area: an observational study. Int J Contemp Pediatr 2020;7:1292-7.
31. The fourth report on the Diagnosis, Evaluation and Treatment of high blood pressure in children and adolescents. National High Blood Pressure Education Program working group on High Blood Pressure in Children and Adolescents. Pediatrics. 2004;114:555-76.
32. Vedavathy S, Sangamesh. Prevalence of hypertension in urban school going adolescents of Bangalore, India. Int J Contemp Pediatr 2016;3:416-23.