

VARIATIONS IN BLOOD PRESSURES AMONGST DAY SCHOOL CHILDREN AND BOARDING SCHOOL CHILDREN IN WESTERN MAHARASHTRA

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ABSTRACT

Introduction: School children majorly face stress due to the pressure and expectations from their parents besides academics, athletics, etc. It is known that depression, stress increases blood pressure. Such wide variations in blood pressure at such a young age can increase the incidence of cerebrovascular accidents, ischemic heart diseases, renal failure and preterm death in the adulthood of such children. This survey will guide the parents and teachers to the various problems student face and how can they help the student cope with it. **Method:** The blood pressure of each student was taken three times to reduce them to minimise the possibility of errors and the blood pressures of all the students were compared according to their age (13-16 years) and the schooling type (boarders and day scholars). **Results:** On comparing the prehypertensive stage, the numbers of pre-hypertensives are found to be greater in the age group of 15 years in both day scholars and boarders i.e. 14% and 8% respectively. The on comparing the schooling type the day scholars have a greater number of prehypertensive i.e. 25% than boarders which is 17%. Though pre-hypertensives are higher in the age group of 15 years, but the numbers of hypertensives are more in 14 years of age which is 7% (6% in hypertension stage I and 1% in hypertension stage II) in day scholars and 4% (3% in hypertension stage I and 1% in hypertension stage II) in boarders. In schooling type, a similar trend as that of prehypertension is seen i.e. in day scholars 14% students are in hypertension stage I and 3% students are in hypertension stage II making a total of 17% of hypertensive in day scholars. Similarly, in boarders there are 6% in hypertension stage I and 1% in hypertension stage II making 7% hypertensive in boarders, thereby showing a higher percentage of hypertensive in day scholars. **Conclusion:** The study revealed Percentage of students in hypertension stage I and hypertension stage II were found more in day scholars (14% HT STAGE I and 3% HT STAGE II) than boarders (6%HT STAGE I and 1% HT STAGE II) respectively. Thus, it can be very well concluded that 17% of day school children and 7% boarders were found to be in hypertensive.

Keywords: Variations in blood pressures, Day school; Boarding school Children; Western Maharashtra.

INTRODUCTION

Boarding schools and Day schools the both categories were facing a lot of stress in their day to day life but the stresses that they face are different. Boarding school children may face depression, anxiety and stress due to various causes. The main reason for depression may be being away from home and family. Other stressors may be academics, managing work load, interpersonal and intrapersonal problems, coping up with the new surroundings, teachers and teachings [1]. Whereas, day school children majorly face stress due to the pressure and expectations from their parents besides the academics, athletics, peer pressure etc. It is known that depression stress increases blood pressure i.e. hypertension [2]. Such wide variations in blood pressure at such a young age can increase the incidence of cerebrovascular accidents, ischemic heart diseases, renal failure and preterm death in the adulthood of such children [2].

Hypertension in young: epidemiology, sequelae and therapy states that in adults long standing hypertension

leads to coronary artery diseases, stroke and kidney damage whereas in school aged population long standing hypertension may lead to secondary hypertension, coarctation of aorta, chronic kidney disease and hypertensive target organ damage [1]. Blood pressure profile of school children of 6-15 years in a rural setting of Maharashtra have estimated that 20 million people will die from cardiovascular disorders mainly from heart disease and stroke [2]. Prevalence of hypertension and variation in blood pressure in children in Maharashtra note that though hypertension is a problem in adults, but its etiologic process starts in childhood [3].

School going children are hypertensive and have also associated the cause of this sustained hypertension to be their sedentary lifestyle, altered eating habits, increased fat content in diet, decreased physical activity and increased stress levels [4].

Blood pressures of school going children increase with the age; which falls in accordance [5], hypertension in children and adolescents' states that 48% of the population had elevated systolic BP whereas 41% had elevated diastolic BP [6, 7].

Early diagnosis of hypertension is necessary to initiate preventive measures, but this seems difficult due to lack of symptoms [3]. Early detection of hypertension will also help us allow the children to lead healthy life later. Hypertension being prevalent at such a younger age will



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lead to a lot of cardiovascular diseases including angina, myocardial infarction, coarctation etc. much before than they are estimated [6]. This study will help the school authorities to know the students who are at risk of developing any cardiovascular disorders and will guide them for the overall health evaluation of the children in their school.

Aims and objectives: To find out the percentage of hypertensive children in boarding school and day school. To compare the variation in blood pressures of boarding school and day school children.

MATERIAL AND METHODOLOGY

Study design: Descriptive longitudinal study

Ethics approval: Study was commenced after the approval from school authorities and ethical committee. The identity of students involved in the study was kept in strict confidence. The data was made available only to the investigator involved in the study and to the regulatory authorities. Break in the confidentiality is possible only after detail review by the investigator and with the permission of the ethical committee.

Research place: The research was conducted in collaboration with Pravara Public School at Pravaranagar, students studying in std. VIIIth to Xth are included in the study.

Study duration: 2 Months

Following were the exclusion and inclusion criteria for this study:

Inclusion Criteria: All the students within the age group of 13 to 16 years, students willing to participate in the study.

Exclusion Criteria: Students absent on the either days of study, students having a history of hypertension, congestive heart diseases, renal failure and congenital anomalies and students having a family history of hypertension.

Sample size: Two hundred (100 Day school + 100 Boarding school children)

Methodology: All students satisfying the inclusion and exclusion criteria were studied for the following parameters:

Demographic profile: It includes Name, age, gender, standard, residence (Address), and boarding or day school

Blood pressure: The school was visited 4 times a week at a specific time and date according to the convenience of the school authorities. Blood pressures of all eligible students were recorded 3 times in a week at the same time by the principle investigator with the same instrument. Systolic and diastolic blood pressures were recorded in well-structured performs.

Criteria for hypertension: According to the 4th report on the diagnosis, evaluation, and treatment of high blood pressure in children and adolescents [8].^[13]

Visits scheduled for data collection: 4 Visits were arranged each for day school and boarding school chil-

dren. **Visit 1:** Introduction of the project Obtaining consent and Questionnaire, **Visit 2-4:** Measurement of blood pressure

Statistical data: Data collected was pooled, tabulated, and subjected to appropriate statistical tests and results were noted.

RESULTS

This study included 266 radiographs with cases of In my study a total of 200 students were selected based on the inclusion criteria in the age group of 13 to 16 years. Half of the total students were boarders and the other half day scholars. Out of the total students (n=200) only 25% were females whereas the rest were males. On the consideration of age 44% students are of 15 years of age, 30% of 14 years of age and the age group of 13 and 16 years have 13% students each.

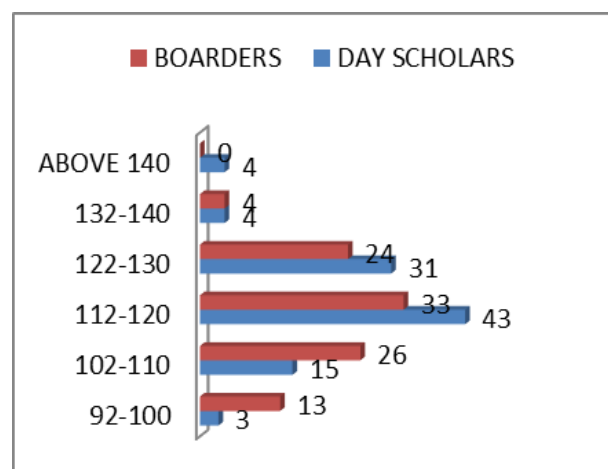


Fig 1: Comparison of Average Systolic blood pressure (mm/Hg) among Day Scholars and Boarders.

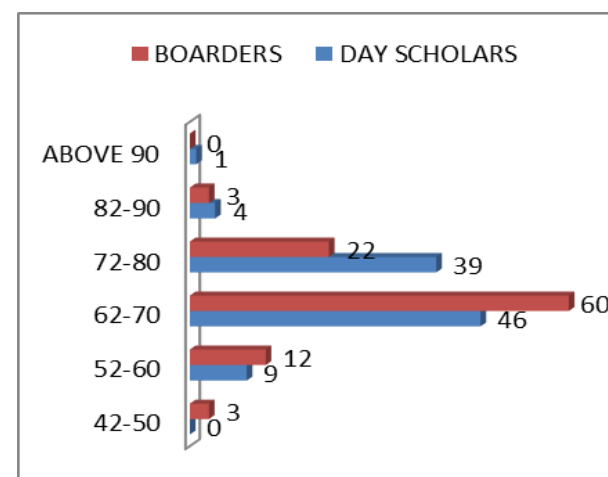


Fig 2: Comparison of Average Diastolic Blood Pressures (mm/Hg) among Day Scholars and Boarders.

On comparison of average systolic blood pressure amongst the total population of day scholars and boarder's majority of them i.e. 43% day scholars and 33% boarders are in the range of 112-120 mm Hg i.e. in the normal range.

The comparison of average diastolic blood pressures shows the same observations as the average systolic

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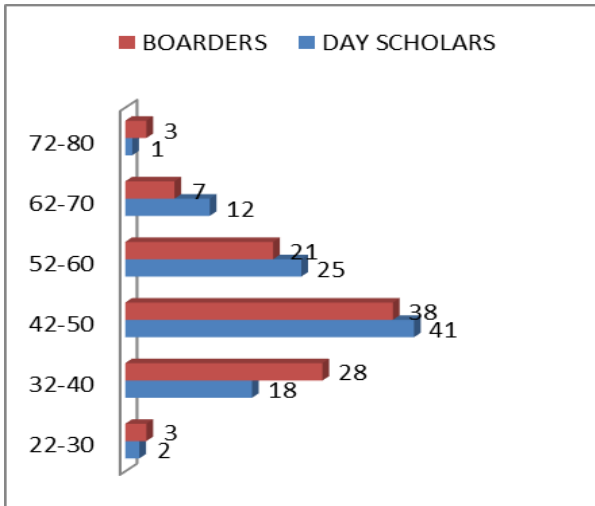


Fig 3: Comparison of Mean Blood Pressures among Day Scholars and Boarders.

The mean blood pressure is calculated by adding diastolic pressure and 1/3rd of pulse pressure (pulse pressure = systolic BP – diastolic BP). The mean blood pressure was found to be within normal range for 61% day scholars and 69% boarders.

*(PRE HT= prehypertensive, HT Stage I= hypertension stage I, HT Stage II= hypertension stage II)

In the age group of 13 years 25% day scholars are hypertensive whereas only 13.3% boarders are hypertensive.

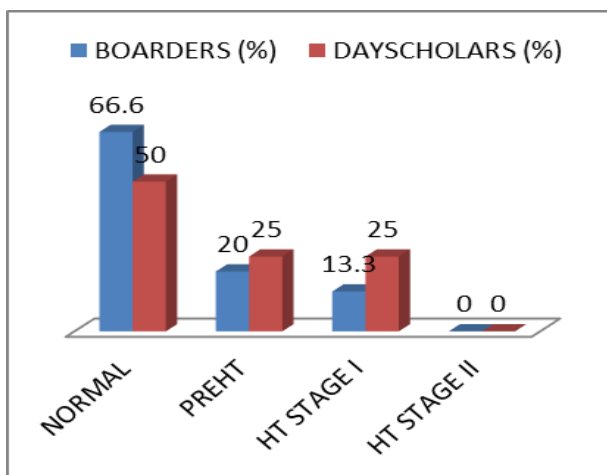


Fig 4: Comparison of Systolic Blood Pressures (mm/Hg) of Boarders and Day Scholars of Age 13 years

In day scholars 8.4% are hypertensive and 6.7% boarders being hypertensives.

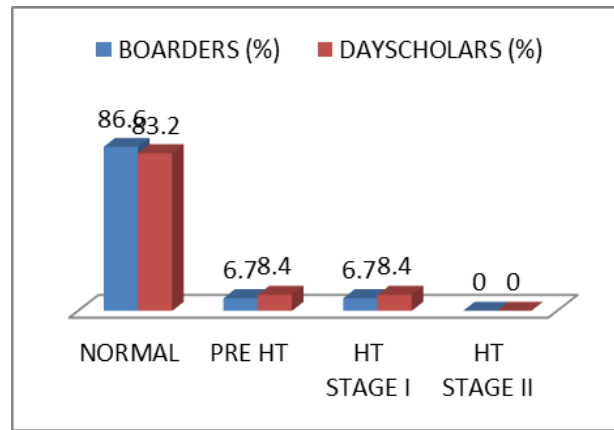


Fig 5: Comparison of Diastolic Blood Pressures among Boarders and Day Scholars of Age 13 years.

In this case there is a wide variation in the blood pressures of day scholars and boarders. The percentage of hypertensive day scholars [28.6% (HT stage I) +4.7% (HT stage II) = 33.3%] is much higher than that of boarders (7.6% +2.5% =10.1%).

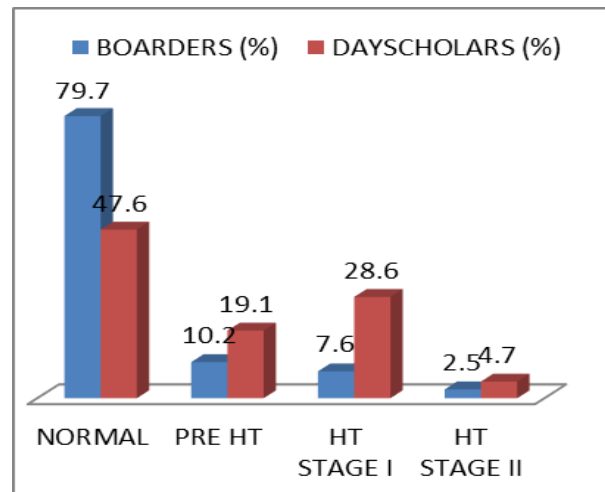


Fig 6: Comparison of Systolic Blood Pressures of Boarders and Day Scholars of Age 14 years.

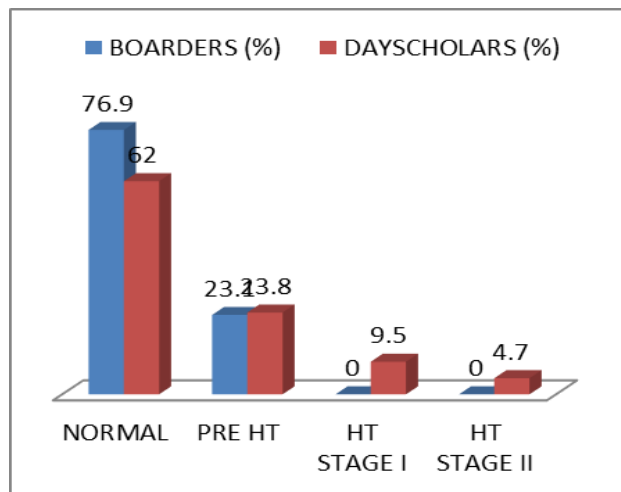


Fig 7: Comparison of Diastolic Blood Pressures (mm/Hg) of Boarders and Day Scholars of Age 14 years

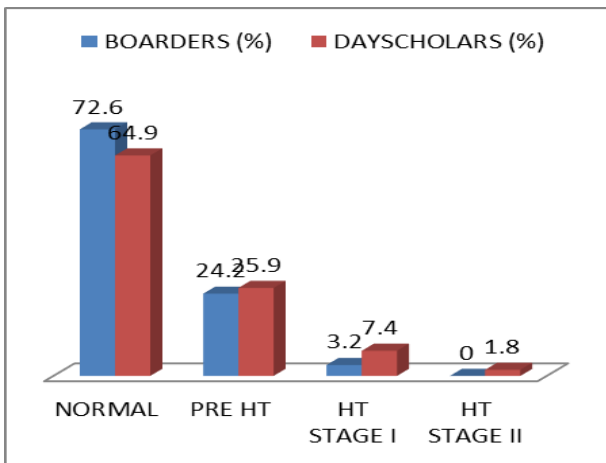


Fig 8: Comparison of Systolic Blood Pressures of Boarders and Day Scholars of Age 15 years.

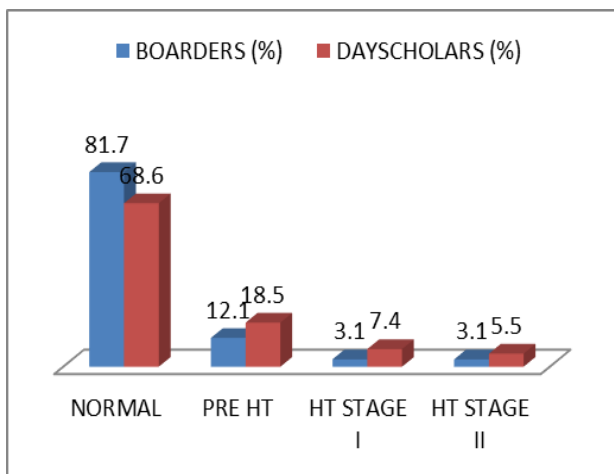


Fig 9: Comparison of Diastolic Blood Pressures (mm/Hg) of Boarders and Day Scholars of Age 15 years.

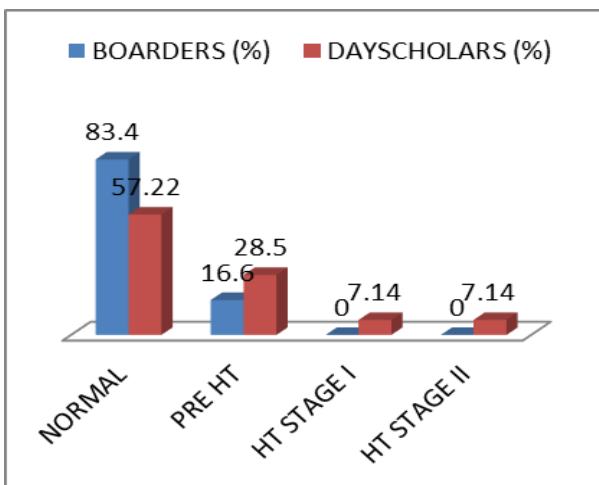


Fig 10: Comparison of Systolic Blood Pressures of Boarders and Day Scholars of Age 16 years.

The Fig 7 depicts that the prehypertensive cases are almost equal (23.1% boarders and 23.8% day scholars) but the hypertensive cases being significant in day scholars (14.2%).

In the age group of 15 years, considering systolic blood pressure as criteria 7.4%-day scholars fall in hypertension stage I criteria whereas 1.8% fall in hypertension stage II, both being higher than boarders.

3.1% boarders fall under hypertension stage I and II respectively whereas 12.1% boarders are prehypertensive with all the three values being lower than that of day scholars.

None of boarders in this age group are hypertensive with 14.28% hypertensive day scholars.

With 83.4% boarders and 64.4%-day scholars in the normal range, there are 21.4% day scholars and 16.6% boarders in the pre hypertensive stage. Whereas 14.2%-day scholars are hypertensive and none from the boarders.

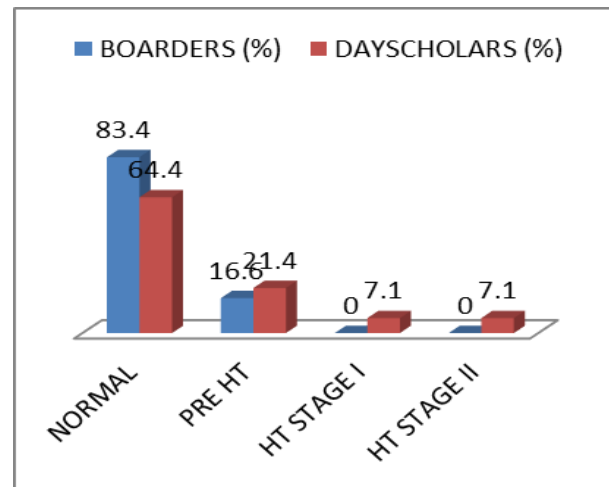


Fig 11 : Comparison of Diastolic blood pressures of Boarders and Day scholars of 16 years of age.

DISCUSSION

On consideration of the average systolic blood pressures it was found that most of the students were under the normal ranges of blood pressures. But hypertension is significantly present both in day scholars and boarders which is in accordance to a study conducted by Anand NK, Tandon L [8]. In their study on Prevalence of Hypertension in School going children they found 0.46% of the population to be hypertensive. The same trend was seen with the average diastolic blood pressures as well. Taking mean blood pressure into consideration:

$$\text{Mean blood pressure} = \text{Diastolic BP} + \frac{1}{3} \text{pulse pressure}$$

$$(\text{Pulse pressure} = \text{Systolic BP} - \text{Diastolic BP})$$

The main aim for comparison of the mean blood pressure is to the tissue perfusion. Mean blood pressure is the criteria to see the tissue perfusion of the body. The mean blood pressures of a large number are normal with 31%-day scholars and 20% boarders below the normal range and a considerable chunk above it as well.

Taking the age into account, the systolic and diastolic blood pressures were compared separately. On considering the systolic BP, higher prevalence was noted in all the 3 categories namely Pre-hypertension, Hypertension

Table 1: Comparison of systolic blood pressure taking Age into account

Blood Pressure	Age wise (years) distribution									
	DAY SCHOLARS (%)					BOARDERS (%)				
	13	14	15	16	Total	13	14	15	16	Total
Normal	6	10	35	8	58	10	31	24	10	76
Prehypertension	3	4	14	4	25	3	4	8	2	17
Hypertension I	3	6	4	1	14	2	3	1	0	6
Hypertension II	0	1	1	1	3	0	1	0	0	1
Total	12	21	54	14	100	15	39	33	12	100

stage I, Hypertension stage II in day scholars. For the age group of 13 there was no student with stage II hypertension but children with hypertension stage I and pre-hypertension was found to be significant. For 14 years of age 1% boarders are in the category of hypertension stage II but for 15 and 16 years there is none in this class. But the numbers of day scholars in stage II have considerably increased with age. With a comparatively higher ratio of day scholars is seen in hypertension stage II, a similar trend follows in prehypertension and stage I as well.

On taking diastolic BP into consideration, almost a similar trend as the systolic blood pressure is followed by the diastolic blood pressure. Here instead of the 14 years there are more boarders of 15 years of age who fall into stage II (3.1%). Even for the diastolic blood pressures the day scholars have a higher take than the boarders with the number increasing with age.

Taksande A [6] in their study on Distribution of blood pressures in school going children in rural area of Wardha have stated that the blood pressures of school going children increase with the age; which falls in accordance with my findings.

Bonita Falkner [7] in his study on Hypertension in children and adolescents' states that 48% of the population had elevated systolic BP whereas 41% had elevated diastolic BP. In my study 17%-day scholars have high systolic BP and 13 % have a higher diastolic BP. In case of boarders 7% of these show an elevation in systolic BP and 3% have elevated diastolic BP.

Also, my study is in accordance to a study conducted by Rohan R Patil [4], in their study the prevalence of hypertension in school children in Wardha was found to be 3%.

Nirav Buch et.al. [9] in their study entitled "Prevalence of hypertension in school going children in Surat city" have concluded that prevalence of hypertension in school children is 6.48% and obesity, family history of diabetes mellitus and ischaemic heart disease was found to be significant association for childhood hypertension. They also conclude that prevalence of hypertension increases with age.

Margaret Riley and Brian Bluhm in their study "High blood pressure in children and adolescents states that apart from the physical aspects, certain diseases may act as the etiological factors namely coarctation of aorta, Cushing's syndrome, drug induced (caffeine, diet pills,

cocaine etc.), hyperthyroidism, mineralocorticoid excess, obstructive sleep apnoea, pheochromocytoma, primary hypertension, renal artery disease, and rheumatologic disorders [11].

In our study the percentage of day scholar children with raised systolic BP were found more. This result can be attributed to their life style and stress levels. Day scholars have peer pressure and parental pressure for their performance which can be a stressor. Moreover, life style of any day scholar child in Pravara Public School is devoid of exercises, sport and physical activity as well as have the stress of travelling to the school daily. Being a rural area this travelling stress, parental stress, peer pressure may be the reasons for these results.

The study recommends the school authorities to conduct proper and regular cardiovascular workouts for the students who have been found to have raised BP as well as take measures to provide stress free environment more for day scholars through periodic parental meetings.

CONCLUSION

The study revealed Percentage of students in hypertension stage I and hypertension stage II were found more in day scholars (14% HT Stage I and 3% HT stage II) than boarders (6% HT Stage I and 1% HT stageII) respectively. Thus, it can be very well concluded that 17% of day school children and 7% boarders were found to be in hypertensive.

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