



ASSESSMENT OF CAROTID INTIMA MEDIA THICKNESS AMONG HYPERTENSIVE ADOLESCENTS- A CROSS-SECTIONAL STUDY

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ABSTRACT This study aimed to evaluate the effectiveness of Carotid Intima Media Thickness (CIMT) assessment using B-mode ultrasound (USG) as an early detection method for arterial injury (presence of atherosclerosis) in hypertensive adolescents. A total of 168 adolescents, aged 18-20 years, from two associated colleges were included in the study. They were divided into two groups, C1 & C2, each consisting of 84 individuals doing second professional Yr. Within each group, participants were further classified as hypertensive (BP > 140/90mmHg) or normotensive (BP < 140/90mmHg). The study found a modest correlation between CIMT measurements in normotensive adolescents (IQR: 0.03 - 0.40) & hypertensive adolescents (IQR: 0.05 - 0.50). This suggests that CIMT could serve as an early warning sign for arterial injury in hypertensive adolescents, potentially helping to reduce the risk of cardiovascular complications.

KEYWORDS : Carotid intima thickness hypertension

INTRODUCTION

India is experiencing an epidemiological transition with rising prevalence of non communicable diseases (NCDs), including hypertension, which contributes significantly to cardiovascular disease (CVD) burden (1). Compared to adults, children & adolescents are more likely to have secondary causes of hypertension, such as renal parenchymal disease & renovascular disease (2). Diagnosing hypertension in children & adolescents is challenging due to variations in normal blood pressure values (3). Factors such as obesity, renal disease, & diabetes contribute to hypertension in this age group. Regular screenings, lifestyle changes, & early detection are crucial for managing hypertension in adolescents (4). Detecting hypertension during childhood helps identify those at risk of developing primary hypertension as adults (5). Studies in India have reported a prevalence of hypertension ranging from 0.46% to 11.7% among adolescents (1). Carotid intima-media thickness (CIMT) measurement is a valuable tool for early detection of arterial injury & predicting cardiovascular risk. CIMT serves as a non-invasive method to assess atherosclerotic risk factors & visualize arterial walls (6). Increased CIMT is correlated with the presence of atherosclerosis in adults & describes vascular abnormalities in hypertensive adolescents (7). CIMT serves as a simple, inexpensive, & non-invasive method to assess the cumulative effect of atherosclerotic risk factors & predict future cardiovascular risk (8). B-mode ultrasound measurement of CIMT in common carotid artery (CCA) is a reliable technique to monitor early stages of atherosclerosis (9). Overall, early detection, regular screening, & lifestyle modifications are vital in managing hypertension in adolescents & reducing the burden of CVDs in the long run.

Figure 1: Correlation between SBP and CIMT

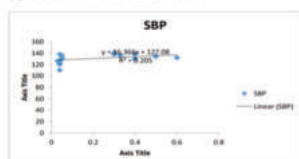


Figure 1 represents the correlation between the systolic blood pressure and the carotid intima-media thickness of the study participants

Figure 2: Correlation between DBP and CIMT

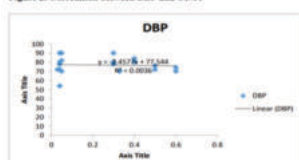


Figure 2 represents the correlation between the diastolic blood pressure and the carotid intima-media thickness of the study participants

Table 1: Sociodemographic Details Of Study Participants (n= 176).

Variables	Normal N (%)	Hypertensive N (%)	p Value (Chi square test)
Age			
18- 19 years	94, (53.41)	13, (7.39)	0.408
20- 21 years	59, (33.52)	10, (5.68)	
Gender			
Male	49, (27.84)	19, (10.8)	0.001*
Female	104, (59.09)	4, (2.27)	
SES			
Upper class	45, (25.57)	10, (5.68)	0.606
Middle class	28, (15.91)	3, (1.7)	
Lower	3, (1.7)	0, (0)	
Family H/O NCDs			
Yes	82, (46.59)	12, (6.82)	0.537
No	71, (40.34)	11, (6.25)	

*p<0.05 is significant

Table 2: BMI Classification (n=176)

Variables	Normal N (%)	Hypertensive N (%)	X2	p Value
BMI:				
Underweight	41, (97.6)	1, (2.4)	18.154	0.001*
Normal weight	79, (89.8)	9, (10.2)		
Overweight	23, (79.3)	6, (20.7)		
Obese	10, (58.8)	7, (41.2)		

*P<0.05 is significant

Table 3: CIMT Using B-mode USG

B-mode USG CIMT	Median (IQR)
Normotensive	0.04 (0.03- 0.40)
Hypertensive	0.31 (0.05- 0.50)

DISCUSSION

This cross-sectional study conducted in a tertiary care hospital in Pondicherry aimed to determine the prevalence of hypertension among the adolescent population. The study found a prevalence rate of 13.1% for adolescent hypertension (Table 1). Among the hypertensive subjects, 52.6% exhibited increased carotid intima-media thickness (CIMT) (Table 3). The study population showed a significant gender difference, with 10.8% being male & 2.27% being female (Table 1). The age distribution revealed that 7.39% were between 18-19 years, while 5.68% were between 20-21 years (Table 1). Additionally, the BMI classification indicated that 20.7% were overweight & 41.2% were obese, with these differences being statistically significant (Table 2).

The median CIMT measured using B-mode ultrasound was 0.31 (IQR 0.05-0.50). Furthermore, a linear correlation was observed between systolic & diastolic blood pressure & CIMT (Table 3). These findings are consistent with a previous study by Jinzy Mariam George et al in 2013, which highlighted a significant association between carotid atherosclerosis measured by B-mode ultrasound & the presence & extent of coronary atherosclerosis documented by coronary angiography(11).

Another case-control study by Ghodratollah Naseh et al in 2016 compared CIMT in hypertensive patients & a control group, concluding that the mean CIMT of all carotid arteries was higher in hypertensive patients than in the controls(10). A systematic review & meta-analysis on the prevalence of hypertension among Indian adolescents demonstrated a pooled prevalence rate of 7.6%, indicating significant heterogeneity between the studies(12).

Given the rapid emergence of hypertension as a major health issue among adolescents, regular screening of students becomes crucial in preventing complications later in life. This aligns with the growing interest in measuring blood pressure in adolescents(1). Tanu Anand et al conducted a cross-sectional study in 2014 among school adolescents in Delhi, which recommended regular blood pressure check-ups to take timely remedial action for hypertension & pre-hypertension(13).

Another study conducted in 2010 by M. Iqbal Khan et al on adolescent schoolboys in Ahmedabad City highlighted the high prevalence of undiagnosed & untreated hypertension. The study found the highest prevalence among the 19-year-old age group & identified a significant association with strong family history, overweight, & obesity(14).

Furthermore, a study by Frida L. Plavnik emphasized the influence of age & blood pressure on intima-media thickness & the association of echocardiographic changes with CIMT(15).

In conclusion, this study provides valuable insights into the prevalence of hypertension among adolescents & its association with increased carotid intima-media thickness. Regular blood pressure screening & early intervention are recommended to address this emerging health issue. The findings align with previous research highlighting the significance of CIMT measurement using B-mode ultrasound in assessing cardiovascular health & the correlation between blood pressure & CIMT.

CONCLUSION

- The prevalence of adolescent hypertension was found to be 13.1% in the study population
- Among the diagnosed adolescent hypertensive subjects, 52.6% of them were having increased carotid intima media thickness.
- Also there is a linear correlation between systolic & Diastolic blood pressure with the Carotid intima-media thickness.
- Using CIMT as a marker to identify the long standing Hypertension & thereby decrease the complications like cardiovascular diseases.

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