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Original Research Article

To Study Hypertension relationship with Body Mass Index and Waist Circumference in Paediatric Cases

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Abstract

Background & Methods: The aim of the study is to Study Hypertension relationship with Body Mass Index and Waist Circumference in Paediatric Cases. Weight was measured to the nearest 0.5 kg using electronic weighing scale, with the subjects wearing lightweight gown or underwear. Height was measured to the nearest 0.1 cm using wall mounted height board.

Results: Age in year (mean ± SD) 12.98± 2.37. Weight and WC was higher in female whereas height and BMI was higher in male. Age in year (mean ± SD) 12.98± 2.37. Weight and WC was higher in female whereas height and BMI was higher in male.

Conclusion: There was a strong correlation noted between increased WC and BMI with high BP among adolescents. Prediction for hypertension by WC was found to be higher compared to BMI in this study. A significant association was found pre-hypertension/hypertension among adolescent cases. The BMI correlated better with the BP and hypertension levels than the WC. As a result of this study, it is recommended that weight control be promoted.

Keywords: Hypertension, BMI, Waist & Paediatric.

Study Design: Observational Study.

Introduction

According to many studies performed world-wide the prevalence of hypertension in children and adolescents appear to be increasing.[1] The growing prevalence of hypertension is coupled with increase body weight and many reports have shown an association between blood pressure (BP) and body mass index (BMI).[2] In Bogalusa Heart Study, it was reported that overweight children were 4.5 and 2.4 times likely to have elevated systolic blood pressure (SBP) and diastolic blood pressure (DBP) respectively.[3]

There is alarming rise in obesity among children and adolescents worldwide. WHO has called obesity a “Global Epidemic”. Hypertension in children is increasing along with the childhood obesity epidemic. Childhood obesity may persist into adulthood and hence this may increase the

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risk of cardiovascular disease (CVD) later in life including hypertension and metabolic syndrome[4]. In addition, childhood obesity is associated with high risk of adult hypertension.Blood pressure measurement is not a part of regular health check -ups in children and this leads to under diagnosis of hypertension in children. Thus, the prevention of obesity in childhood may be important in reducing the risk of CVD later in life.

Evidences suggest the importance of measuring abdominal obesity besides general obesity for the evaluation of health risks in the first decades of life. However, whether WC measured in childhood correlates better with high BP than BMI is still unresolved[5].This cross sectional study was undertaken to study relationship of BMI and WC with blood pressure.

The World Health Organization (WHO) defines adolescents as those people between 10 and 18 years of age. It is a unique phase of human development and a significant time for laying the foundations of good health. Despite being thought of as a healthy phase of life, there is significant injury, illness and death in the adolescent years. Much of this is treatable or preventable[6]. During this stage, adolescents establish patterns of behaviour – for example, related to sexual activity, substance use, physical activity and diet – that can preserve their health and the health of others around them, or put their health at risk now and in the future. The stages of adolescence are separated into three: early (10–13 years of age), middle (14–16), and late (17–18). Behaviorally, early adolescents begin to experiment with new ways of behaving, while middle adolescence is considered a time of risk-taking, ending in late stage adolescence, during which assessment of one's own risk taking occurs[7].

Material and Methods

This study was conducted at on 100 cases for 01 Year who completed both anthropometric and BP measurements were studied. Informed consent from parents of children was taken. Weight, height, waist circumference and BP measurements were recorded.

Child stood straight with no shoes; heels, buttocks, shoulder blades and back of head touching the vertical wall surface and looking directly forwards with Frankfurt plane (the line joining floor of external auditory meatus to the lower margin of orbit) and the being horizontal. BMI was calculated using standard formula: weight (kilograms)/height (meters2). According to BMI, children were categorized into 3 groups: normal weight, overweight and obese as per (WHO) child growth standards (BMI greater than 95th percentile obese; BMI between 85th and 95th percentile - overweight). Waist circumference was measured to the nearest 0.1 cm with nonelastic flexible tape with child standing without clothes. The smallest circumference between the hip and chest was measured at the end of gentle expiration.

Inclusion Criteria:

1. Absence of any severe medical disorder or chronic illness,

2. No history of hospitalization of any duration during the last year and no history of any longterm medication.

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Exclusion Criteria:

1. Children aged <10 or >18 year.

2. Children already diagnosed to have secondary hypertension.

3. Children on chronic drugs such as steroids.

Result

Table No. 1: Demographic Profile

S. No.	Gender	No.	Percentage
1	Male	61	61
	Female	39	39
2	Socio-demographic status	No.	Percentage
	Lower class	39	39
	Middle class	35	35
	Upper class	26	26
3	BMI category	No.	Percentage
	Normal	75	75
	Overweight	18	18
	Obese	07	07
4	Waist circumference	No.	Percentage
	<70 percentile	77	77
	70–90 percentile	18	18
	>90 percentile	05	05

Age in year (mean ± SD) 12.98± 2.37. Weight and WC was higher in female whereas height and BMI was higher in male.

Table No. 2: Anthropometry & BP Distribution

Anthropometry	Mean	SD
Weight	41.57	3.10
Height	151.65	2.49
Waist Circumference	66.47	9.56
BMI	20.74	4.33
BP Distribution	No.	Percentage
Normal<90		08
Pre-hypertension 90–95		11
Hypertension>95		81

Incidence of pre hypertension and hypertension was 11% and 08% respectively.

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Table No. 3: Association between blood pressure and BMI

BMI	Normal BP	Pre-hypertension	Hypertension	P Value
Normal	71	02	00	0.039
Overweight	09	07	01	
Obese	04	05	01	

Blood pressure and BMI is significantly associated (p<0.05).

Table No. 4: Association between blood pressure and WC

WC	Normal BP	Pre-hypertension	Hypertension	P Value
<70 percentile	75	03	01	0.046
70–90 percentile	07	05	02	
>90 percentile	02	03	02	

Blood pressure and WC is significantly associated (p<0.05).

Discussion

Kumar et al. (2017) reported prevalence rates of pre-hypertension and hypertension of 10.9% and 4.6%, respectively, in Indian male and female adolescents aged 13 to 15 years. In a study conducted on male and female adolescent students 13–17 years of age, 12.3% of the subjects were pre-hypertensive and 21.2% hypertensive[8]. A report from Lithuania showed that the pre-hypertension prevalence in adolescents aged 12–15 years was 12.8%, while the hypertension prevalence was 22.2%. The same hypertension criteria were used for a nationwide survey that included 2166 children aged 6–15, in which the prevalence of hypertension was found to be higher, at 15.1%, than our results. However, comparisons of varying prevalence rates among countries can be problematic[9]. To begin with, the criteria for hypertension and the measurement systems used in blood pressure readings may differ from country to country and may be responsible for differing study results. Secondly, the total prevalence may be affected by the age range and the proportion of different ages included in these studies. Moreover, a trend toward increasing childhood prehypertension and/or hypertension has been observed worldwide[10-12].

In research involving adults, a close association was found between centrally distributed body fat and an increase in negative cardiovascular outcomes, and thus, as an indicator of total and abdominal fatmass, WC was considered better than BMI. Because BMI indicates both fat and lean body mass, WC can theoretically be more closely linked to cardiovascular risks like hypertension[13]. The correlation between childhood/adolescent hypertension and abdominal obesity has been determined by a number of studies; however, the findings of these studies are inconsistent. Studies in the United States, Lithuania and China, for example, found the link between hypertension and WC ≥ the 90th percentile (defined reference group = WC < the 90th percentile) to be significant. In contrast, Guo et al. (2013) [14] compared WC < the 90th percentile and WC ≥ the 90th percentile in males and females separately and observed no significant

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correlation between them and pre-hypertension. Furthermore, in another study, WC was reported to be no better than BMI at predicting hypertension in adolescents aged.

Conclusion

There was a strong correlation noted between increased WC and BMI with high BP among adolescents. Prediction for hypertension by WC was found to be higher compared to BMI in this study. A significant association was found pre-hypertension/hypertension among adolescent cases. The BMI correlated better with the BP and hypertension levels than the WC. As a result of this study, it is recommended that weight control be promoted.

In addition to BMI, increased waist circumference is an indicator of high blood pressure in children. WC is much easier to measure than blood pressure in terms of training and access to equipment, especially in low income settings.

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