

ORIGINAL ARTICLE

Assessment of cardiometabolic risk factors based on waist-to-height ratio in affluent school going children

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ABSTRACT:

Background: Obesity in childhood is associated with adverse levels of cardiometabolic risk factors, including higher blood pressure (BP), triglycerides, total and low-density lipoprotein cholesterol and insulin, and lower high density lipoprotein cholesterol. The present study was conducted to assess cardiometabolic risk factors based on waist-to-height ratio in affluent school going children. **Materials & Methods:** 94 school going children of both genders were included. BMI, WHtR was calculated and waist circumference was measured at the approximate midpoint between the lower margin of the last palpable rib and the top of the iliac crest with non-stretchable measuring tape. **Results:** There were 20 males and 18 females without CMR and 24 males and 32 females with CMR. Waist circumference in children without CMR was 32.4 and with CMR was 52.8. The mean waist-height ratio in children without CMR was 0.24 and with CMR was 0.52. The difference was significant ($P < 0.05$). **Conclusion:** Waist to height ratio is a simple and effective method that identifies the child with high cardiometabolic risk.

Key words: Cardiometabolic risk, Obesity, blood pressure

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INTRODUCTION

Obesity in childhood is associated with adverse levels of cardiometabolic risk factors, including higher blood pressure (BP), triglycerides, total and low-density lipoprotein cholesterol (LDLc) and insulin, and lower high density lipoprotein cholesterol (HDLc).¹ Furthermore, childhood obesity is positively and linearly associated with obesity and related cardiovascular disease in adulthood. It is important to identify children who are at increased risk of developing comorbidities associated with obesity, to potentially intervene and prevent the development of chronic disease including type 2 diabetes.²

Cardiovascular disease (CVD) in comparison to the European ancestry, CVD affects Indians at least a decade earlier and in their most productive midlife years.^{3,4} WHO has estimated that, with the current burden of CVD, India would lose 237 billion dollars of productivity and spending on healthcare over a 10-years period hence India being a developing country with minimal allotment of GDP share towards healthcare system, which will require an effective

management and preventive strategies to limit the cost by modification of lifestyle and early detection of the in India, while type 2 diabetes among Indian adults increased from 5.9% to 9.1% and hypertension prevalence increased from 17.2% to 29.2%, with significant urban-rural differences.⁵ The present study was conducted to assess cardiometabolic risk factors based on waist-to-height ratio in affluent school going children.

MATERIALS & METHODS

The present study comprised of 94 school going children of both genders. The consent was obtained from all parents.

Data such as name, age, gender etc. was recorded. Anthropometry and blood pressure was recorded. Based on anthropometry, BMI, WHtR was calculated and waist circumference was measured at the approximate midpoint between the lower margin of the last palpable rib and the top of the iliac crest with non-stretchable measuring tape. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I Cardiometabolic risk in affluent school going children

Cardiometabolic risk	Male	Female	P value
Without CMR	20	18	0.17
With CMR	24	32	

Table I, graph I shows that there were 20 males and 18 females without CMR and 24 males and 32 females with CMR. The difference was non-significant ($P > 0.05$).

Graph I Cardiometabolic risk in affluent school going children

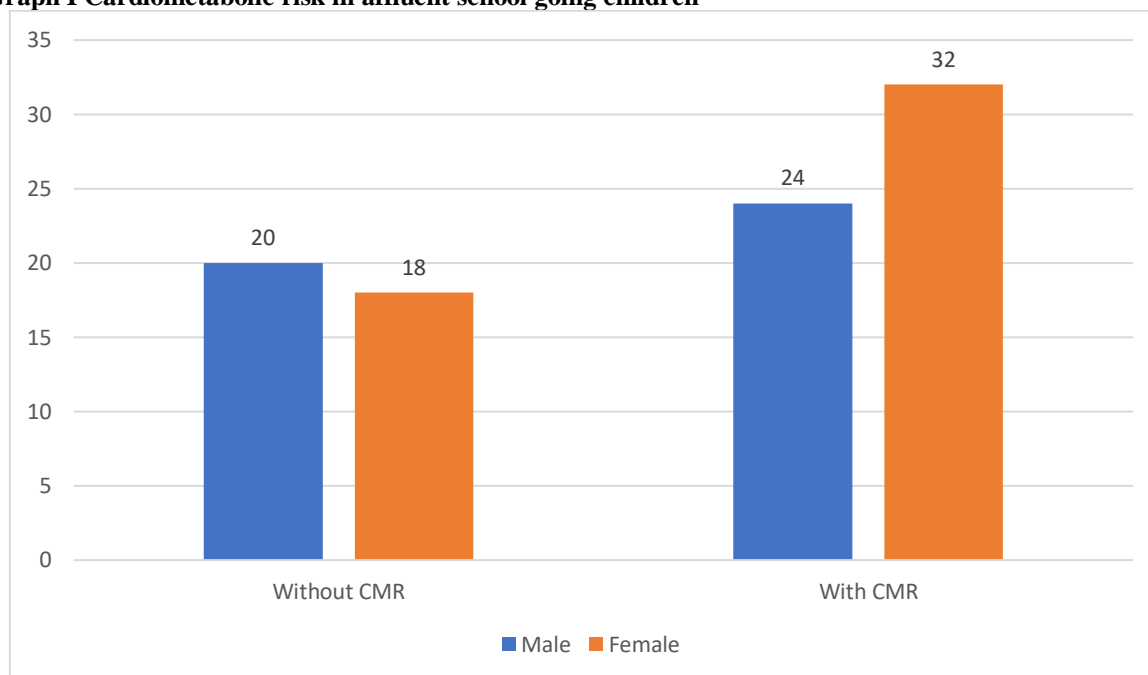
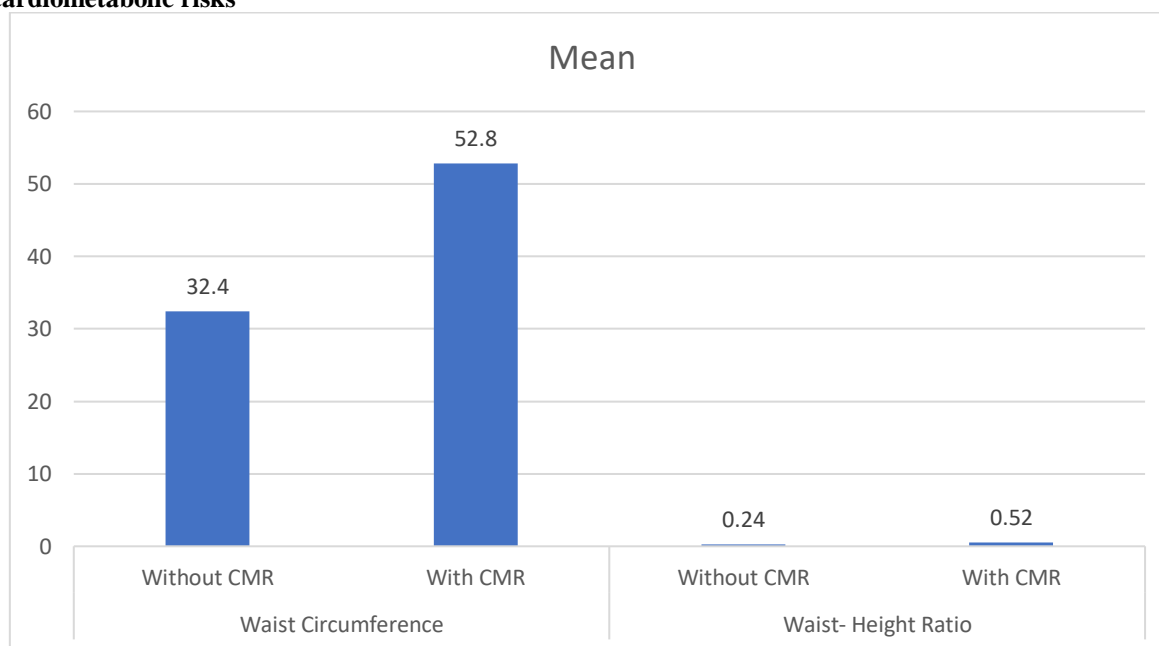


Table II Comparison of waist circumference and waist to height ratio in children with and without cardiometabolic risks

Parameters	Cardiometabolic risk	Mean	P value
Waist Circumference	Without CMR	32.4	0.05
	With CMR	52.8	
Waist- Height Ratio	Without CMR	0.24	0.03
	With CMR	0.52	

Table II, graph II shows that waist circumference in children without CMR was 32.4 and with CMR was 52.8. The mean waist- height ratio in children without CMR was 0.24 and with CMR was 0.52. The difference was significant ($P < 0.05$).

Graph II Comparison of waist circumference and waist to height ratio in children with and without cardiometabolic risks



DISCUSSION

There has been recent interest in the use of the waist-to-height ratio (WHtR) for identifying excessive central adiposity in children and adolescents.⁶ It has been suggested that a WHtR ≥ 0.5 , irrespective of age, sex or ethnicity, is a valid predictor of higher cardiometabolic risk.⁷ WHtR may be a more straightforward anthropometric index to apply in the clinical setting where BMI centile charts may not be readily available.⁸ Waist circumference correlates well with visceral adipose tissue in adults but not in children.⁹ Waist circumference and WHtR have been used as useful predictors for cardiovascular disease risk factors and coronary heart disease mainly in adults. Body weight, height and waist circumference are all simple measurements that most paediatricians can precisely measure, while the same does not apply to other measurements such as the skin fold measurements.¹⁰ The present study was conducted to assess cardiometabolic risk factors based on waist-to-height ratio in affluent school going children.

We found that there were 20 males and 18 females without CMR and 24 males and 32 females with CMR. Raghvendra et al¹¹ in their study a total of 1577 children were included, out of which 702 (44.5%) were boys and 875(55.5%) were girls. The mean age was 14.4 ± 0.2 years. 280(17.8%) children had abnormal WHtR (>0.5). Area under the ROC curve for waist to height ratio among the children who had WHtR >0.5 was 78.4% which is good predictor of obesity and many of the children had abnormal biochemical parameters.

We observed that waist circumference in children without CMR was 32.4 and with CMR was 52.8. The mean waist- height ratio in children without CMR was 0.24 and with CMR was 0.52. Graves et al¹² in their study data from 2858 adolescents aged 15.5 years and 2710 of these participants as children aged 7–9 years were used. Outcome measures were cardiometabolic risk factors, including triglycerides, low density lipoprotein cholesterol, high density lipoprotein cholesterol, insulin, glucose and blood pressure at 15 years of age. Both BMI and WHtR measured at ages 7–9 years and at age 15 years were associated with cardiometabolic risk factors in adolescents. A WHtR ≥ 0.5 at 7–9 years increased the odds by 4.6 [95% confidence interval 2.6 to 8.1] for males and 1.6 [0.7 to 3.9] for females of having three or more cardiometabolic risk factors in adolescence. Cross-sectional analysis indicated that adolescents who had a WHtR ≥ 0.5 , the odds ratio of having three or more cardiometabolic risk factors was 6.8 [4.4 to 10.6] for males and 3.8 [2.3 to 6.3] for females. The WHtR cut-point was highly specific in identifying cardiometabolic risk co-occurrence in male children and adolescents as well as female children (90 to 95%), but had poor sensitivity (17 to 53%). Similar associations were observed when BMI was used to define excess adiposity.

Morales et al¹³ in their study overall, 125 children aged 6 to 12 years were analyzed. Anthropometric, biochemical, and dietary parameters were assessed. All the three adiposity indicators showed significant areas under the ROC curve (AURC) greater than 0.68 for high low-density lipoprotein cholesterol (LDL-c), triglycerides, and atherogenic index of plasma, and low high-density lipoprotein cholesterol (HDL-c). A significant increased risk of having LDL-c ≥ 3.4 mmol/L was observed among children with WHtR ≥ 0.5 as compared to those with WHtR < 0.5 . Fasting plasma glucose was not associated with any of the adiposity parameters. WHtR performed similarly to WC and z-BMI in predicting lipidic cardio-metabolic risk factors; however, a WHtR ≥ 0.5 was superior in detecting an increased risk of elevated LDL-c.

CONCLUSION

Authors found that waist to height ratio is a simple and effective method that identifies the child with high cardiometabolic risk.

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