ORIGINAL RESEARCH

Assessment of waist-to-height ratio in assessing cardiometabolic risk factors in school-going children

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ABSTRACT

Background: Over the past several decades, the prevalence of obesity has been rising globally, and in low- and middle-income nations, it has alarmingly reached alarming numbers.The present study was conducted to assess waist-to-height ratio in assessing cardiometabolic risk factors in affluent school-going children. **Materials & Methods:**180 children of both genders were enrolled. BMI and anthropometry, waist circumference, the systolic blood pressure (SBP), and diastolic blood pressure (DBP)was measured. **Results:** Out of 180 subjects, males were 100 and females were 80.CMR was present in 35 males and 32 females. The difference was significant (P< 0.05).FBS alone has no statistical significance (p- 0.82) in identifying cardiometabolic risk.HbA1c as an individual parameter can be used in identifying cardiometabolic risk (p- 0.05). Cholesterol alone can indicate the risk of future cardiometabolic risk (p- 0.03). VLDL alone can indicate the risk of future cardiometabolic risk (p- 0.01). **Conclusion:** The child with a high cardiometabolic risk can be identified by the waist to height ratio, which is an age/sex independent cut-off value that is straightforward and easy to use.Therefore, the waist-to-height ratio can be utilized in clinical settings to screen for obesity, provide parental guidance, modify lifestyles, and ensure that everyone gets frequent checkups.

Keywords: Cardiovascular disease, obesity,pandemic

INTRODUCTION

Over the past several decades, the prevalence of obesity has been rising globally, and in low- and middle-income nations, it has alarmingly reached alarming numbers.[1] This pandemic has harmed childhood, resulting in early and severe health issues in younger age groups.

By 2030, cardiovascular disease will be the top cause of mortality worldwide and the leading cause of death for children from wealthy, sedentary homes.[2]The relationship between waist circumference and height in evaluating the degree of abdominal obesity and the associated cardiometabolic risk profile in children who are overweight or obese has been categorized based on the established BMI threshold values.Cardiovascular disease (CVD) strikes Indians at least ten years earlier and during their most productive midlife years than it does people of European descent.[3]

According to WHO estimates, India would lose 237 billion dollars in healthcare spending and productivity over a ten-year period due to the present CVD load.[4] Because of this, India is a developing nation with a low GDP share allocated to the healthcare system. As such, it will need efficient management and preventive measures to cut costs through lifestyle changes and early disease diagnosis. Over the last twenty to thirty years, India's prevalence of overweight and obesity has increased nearly four times, from 4% to 15%.[5] Type 2 diabetes prevalence among adults in India has increased from 5.9% to 9.1%, and the prevalence of hypertension has increased from 17.2% to 29.2%, with notable differences between urban and rural areas.According to several studies, the waist-to-height ratio is a more accurate and promising long-term indicator inin diagnosing cardiometabolic diseases in children and it willhalt the usage of unnecessary investigations and early diagnosis withminimal investigations.[6,7]The present study was conducted to assess waist-to-heightratio in assessing cardiometabolic risk factors in affluent school-goingchildren.

MATERIALS & METHODS

The present study consisted of 180 children of both genders. All parents gave their written consent to participate in the study.

Data such as name, age, gender, etc. was recorded. A pretested, pre-structured proforma was used to gather the demographic profile and clinical data, and standard protocol was followed to record the blood pressure and perform anthropometry. BMI and anthropometry were used to compute WHtR and as per WHO guidelines, barefoot standing in an upright position with relaxed shoulders and arms and head in the Frankfort horizontal plane was advised for measuring height. Waist circumference was measured at the approximate midpoint between the lower margin of the last palpable rib and the top of the iliac crest using a nonstretchable measuring tape and minimal clothing without affecting child privacy. A female doctor measured the waist circumference of a female patient. When the youngster was sitting and at rest, the right arm's blood pressure was taken using theSphygmomanometer made of mercury. The systolic blood pressure (SBP) was measured using the first Korotkoff phase, and the diastolic blood pressure (DBP) was measured using the fifth Korotkoff phase.Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I Distribution of patients

Total-		
Gender	**Male**	**Female**
Number	100	80

Table I shows that out of 180 subjects, males were 100 and females were 80.

Table II Assessment of cardiometabolic risk

Gender	With CMR	Without CMR	P value
Male	35	65	0.01
Female	32	48	0.04

Table II shows that CMR was present in 35 males and 32 females. The difference was significant (P< 0.05).

Table III Comparison of clinical parameters with cardiometabolic risk

Parameters	Variables	Mean	P value
FBS	Male	83.5	0.82
	Female	83.2	
HbA1	Male	6.2	0.05
	Female	6.1	
Cholesterol	Male	158.4	0.03
	Female	150.8	
HDL	Male	65.3	0.75
	Female	66.0	
LDL	Male	145.2	0.61
	Female	146.3	
VLDL	Male	34.2	0.01
	Female	33.9	

Table III show that FBS alone has no statistical significance (p- 0.82) in identifying cardiometabolic risk.HbA1c as an individual parameter can be used in identifying cardiometabolic risk (p- 0.05). Cholesterol alone can indicate the risk of future cardiometabolic risk (p- 0.03). VLDL alone can indicate the risk of future cardiometabolic risk (p- 0.01).

DISCUSSION

Different obesity indices (i.e. body mass index (BMI) and waist circumference (WC)) are used to define the metabolic syndrome (MSX).[8] The use of BMI was recommended by the WHO, whereas WC was included in the National Cholesterol Education Program (NCEP) definition of MSX.[9,10] This contributes to differences in the prevalence and incidence of MSX reported in several studies.While the choice between the two parameters remains a matter of an ongoing debate, direct assessment of fat mass (FM) may be a better index of obesity-related health risk.[11]The present study was conducted to assess waist-to-height ratio in assessing cardiometabolic risk factors in affluent school-going children.

We found that out of 180 subjects, males were 100 and females were 80.Bosy- Westphal et al[12] found that except CRP and BPsys in men, %FM showed lesser relationships with metabolic risk variables as compared to BMI and WC. Women's BMI was most closely correlated with HDL-C and HOMA-IR. In both sexes, WC or WC/ht were the greatest predictors for all other risk variables. The variations found

across all obesity indices within a single risk factor were not as great as the variations in the correlations between an obesity index and other risk factors. Stepwise multiple regression analysis revealed that the primary predictor of metabolic risk in the combined cases of both sexes was WC/ht. All obesity indicators, however, showed comparable accuracy when the area under receiver operating characteristic curves was analyzed to predict the incidence of >or=2 MSX component features.

We found that CMR was present in 35 males and 32 females. FBS alone has no statistical significance (p-0.82) in identifying cardiometabolic risk.HbA1c as an individual parameter can be used in identifying cardiometabolic risk (p- 0.05). Cholesterol alone can indicate the risk of future cardiometabolic risk (p-0.03). VLDL alone can indicate the risk of future cardiometabolic risk (p- 0.01). Raghavendra et al[13]conducted a study in children aged between 11 to 17 years in affluent schools. Weight, Height, BMI, and waist circumference were measured. A total of 1577 children were included in the study, 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). The area under the ROC curve for waist-to-height ratio among the children who had WHtR>0.5 was 78.4% which was a good predictor of obesity and many of the children had abnormal biochemical parameters.

The limitation of the study is the small sample size.

CONCLUSION

Authors found that the child with a high cardiometabolic risk can be identified by the waist to height ratio, which is an age/sex independent cut-off value that is straightforward and easy to use.Therefore, the waist-to-height ratio can be utilized in clinical settings to screen for obesity, provide parental guidance, modify lifestyles, and ensure that everyone gets frequent checkups.

REFERENCES

1. World Health Organization. Preventing Chronic Diseases: A vital investment. World Global Report. Geneva: World Health Organization, 2005.
2. Kalra. S. Unnikrishnan. A.G. Obesity in India: The weight of the nation. J Med NutrNutraceut. 2012; 1:37-41.
3. Anchala R, Kannuri NK, Pant H, Khan H, Franco OH, Di Angelantonio E, Prabhakaran D. Hypertension in India: a systematic review and meta-analysis of prevalence, awareness, and control of hypertension. Journal of hypertension. 2014; 32(6):1170.
4. Bosy-Westphal A, Geisler C, Onur S, Korth O, Selberg O, Schrezenmeir J, Müller MJ. Value of body fat mass vs anthropometric obesity indices in the assessment of metabolic risk factors. Int J Obes. 2006; 30:475-83.
5. Mishra A, NK Vikram, R Gupta, RM Pandey, JS Wasir, VP Gupta. International journal of obesity. 2006; 30(1):106. 8. Luis B Sardinha, Diana A Santos, Analiza M Silva, Anders Grontved, Lars B Anderson et al. PLoS One. 2016; 11(2):0149351.
6. Must A, Spadano J, Coakley EH, Field AE, Colditz G, Dietz WH. The disease burden associated with overweight and obesity. JAMA. 1999; 282:1523-9.
7. Hsieh SD, Muto T. The superiority of waist-to-height ratio as an anthropometric index to evaluate clustering of coronary risk factors among non-obese men and women. Prev Med. 2005; 40:216-20.
8. Goodman E, Daniels SR, Morrison JA, Huang B, Dolan LM. Contrasting prevalence of and demographic disparities in the World Health Organization and National Cholesterol Education Program Adult Treatment Panel III definitions of metabolic syndrome among adolescents. J Pediatr 2004; 145: 445–451.
9. Laaksonen DE, Niskanen L, Nyyssonen K, Punnonen K, Tuomainen TP, Valkonen VP et al. C-reactive protein and the development of the metabolic syndrome and diabetes in middle-aged men. Diabetologia 2004; 47: 1403–1410; (Epub 2004 July 28).
10. Lorenzo C, Okoloise M, Williams K, Stern MP, Haffner SM, San Antonio Heart Study. The metabolic syndrome as predictor of type 2 diabetes: the San Antonio heart study. Diabetes Care 2003; 26: 3153–3159.
11. Svendsen OL. Should measurement of body composition influence therapy for obesity? Acta Diabetol 2003; 40: S250–S253. 8 Richelsen B, Pedersen SB. Associations between different anthropometric measurements of fatness and metabolic risk parameters in non-obese, healthy, middle-aged men. Int J ObesRelatMetabDisord 1995; 19: 169–174.
12. Bosy-Westphal A, Geisler C, Onur S, Korth O, Selberg O, Schrezenmeir J, Müller MJ. Value of body fat mass vs anthropometric obesity indices in assessing metabolic risk factors. Int J Obes. 2006; 30:475-83.
13. Raghavendra G, Asha Benakappa, Vani H N, Vikas Patil,Shreedhar H S. Waist-To-Height Ratio in Assessing Cardiometabolic Risk Factors in Affluent School Going Children. International Journal of Health and Clinical Research, 2021;4(24):232-240.