Original Research Article

DOI: http://dx.doi.org/10.18203/2349-3291.ijcp20181477

BMI and WHtR in assessing the nutritional status of adolescent girls

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Received: 27 March 2018 Accepted: 07 April 2018

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ABSTRACT

Background: In spite of the fact, that, Body mass index being a most commonly used epidemiological tool for the assessment of nutritional status, it does not measure the visceral adiposity, which is the indicator for future cardiometabolic risk. Hence the study was planned to determine whether Waist height ratio, which is an effective tool in measuring the visceral adiposity, has any relationship with the BMI, in assessing the nutritional status.

Methods: The cross sectional study was carried out among 980 school going adolescent girls, studying in class VI-XII standard, in the schools present in urban field practice area of Tagore Medical College and Hospital. Anthropometric assessment was done. BMI and WHtR was calculated, to assess the nutritional status. Relationship between BMI and WHtR was found.

Results: The mean age of the participants was 14±2.9 years. Number of participants, who were normal, underweight, overweight, obese based on BMI values were 227, 5, 301, 447 respectively According to the WHtR, 560 (57%) of them were obese, while 420 (43%) were non-obese. Moderate correlation exists between BMI and WHtR, with r = 0.68.

Conclusions: Waist height ratio having a positive correlation with the BMI in the assessment of nutritional status, preference of WHtR over BMI should be encouraged, as it also helps in measuring the visceral adiposity, which, is a potent risk factor for various metabolic and cardiovascular diseases.

Keywords: Body mass index, Nutritional status, Waist to height ratio

INTRODUCTION

Adolescents contribute to nearly, one-fifth of the total global population. During the adolescent age group, the rate of growth is very rapid, hence proper nutrition during adolescence is critical to meet the demands of physical and cognitive growth and development. It provides adequate stores of energy for illnesses and pregnancy, and prevent adult onset of nutrition-related diseases.1 Adolescent period is considered to be a second chance of growth, for those children who have experienced a nutritional deficit during their early life.^{2,3} In spite of the presence of various epidemiological tools, for the assessment of malnutrition, calculation of Body Mass

Index (BMI) still remains as the most common tool. However, there is a limitation in relying the BMI to interpret overweight and obesity, particularly younger individuals.

Body fat distribution, especially the visceral depot, which is a potent health risk is not explained by BMI. Waist circumference acts as a better indicator of visceral adiposity. 4,5 Recent studies have reported a relationship between waist circumference and BMI.6 Another anthropometric parameter, which has gained attention recently, is waist-to-height ratio (WHtR). It is obtained by dividing the waist circumference (WC) by height, acting as an anthropometric index for central adiposity.

The advantages such as simplicity, less age dependent, acting as an indicator of future cardio metabolic risk, have enhanced its usage significantly. A universal cut-off value of 0.5 is considered for all except children <6 years, those who have fallen above the cut-off value are considered to be obese.⁷

Having the above background, the study was planned with the following objectives:

- To assess the nutritional status of the adolescent girls, using Body Mass Index (BMI) and Waist to Height ratio (WHtR)
- To determine the correlation between BMI and WHtR in assessing the nutritional status.

METHODS

It was a cross-sectional study. Simple Random sampling method (4 out of 8 schools having VI-XII standards, present in urban field practice area, Tagore medical College and Hospital, Chennai). Sample size was 980. Study duration was of 6 months.

Inclusion criteria

Girls studying in VI-XII standard, studying in the selected schools, willing to participate in the study.

Exclusion criteria

Those girls, fulfilling the inclusion criteria, not present on the day of data collection, will be excluded.

After the approval form, Institutional Ethical Committee and consent from the participants the study was carried out among the eligible participants. Anthropometric assessment was done. BMI and WHtR was determined to assess the nutritional status of the study participants. Relationship between BMI and WHtR was found.

Anthropometric assessment

- Weight, Height and BMI assessment: Weight was measured with Tarring weighing scale and was recorded to nearest 0.1 kg. Height was measured with standard inch tape and was recorded to the last completed 0.1 cm. To determine the Body mass index, Weight in kg was divided by height in square metre. Participants are classified as Underweight, Normal, Overweight, Obese based on the WHO cutoff for BMI which are <18.5, 18.5-24.9, 25-29.9, ≥30 respectively.</p>
- Waist circumference and Waist to Height ratio: Measurement was made at the approximate midpoint between the lower margin of the last palpable rib and the top of the iliac crest. Waist to height ratio (WHtR) was determined, those girls falling above the cut-off value of 0.5 are considered to be obese.

Statistical analysis

Data was entered in MS excel and analysed using SPSS 19. Frequency and proportion was used to determine the nutritional status using BMI and WHtR. The relationship between BMI and WHtR was assessed using Pearson correlation, p value of <0.05 was considered to be significant.

RESULTS

The nutritional status was assessed for 980 school-going adolescent girls, using BMI and WHtR. The mean age of the participants was 14±2.9 years. Based on Modified kupuswamy scale classification, it was found that majority (64%) of them belonged to class III socioeconomic status, followed by class II (21%), class I (9%) and class IV (6%) respectively. Most of the study participants were Hindus (79%), followed by Christians (13%) and Muslims (8%). Based on their residential background nearly three-fifth (62%) of them were from urban background, remaining were rural residents (38%) (Table 1).

Table 1: Socio-demographic profile of study participants (n=980).

Parameters	Findings
Mean age±SD	14±2.9 years
Socio-economic status	
Class I	88(9%)
Class II	206(21%)
Class III	627(64%)
Class IV	59(6%)
Religion	
Hindu	774(79%)
Christian	127(13%)
Muslim	79 (8%)
Resident	
Rural	372(38%)
Urban	608(62%)

On determining the menarche status, 598 (61%) of them have attained menarche.

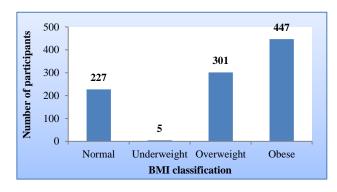


Figure 1: Distribution of study participants based on BMI (n=980).

On assessing the nutritional status of the participants, it was found that number of participants, who were normal, underweight, overweight, obese based on BMI values were 227, 5, 301, 447 respectively (Figure 1), indicating high proportion of obesity.

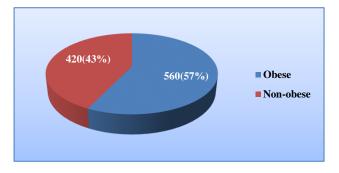


Figure 2: Distribution of participants based on WHtR (n=980).

According to the Waist to Height ratio, it was found that, nearly three-fifth (57%) of the participants were obese. Figure 2, also indicates high proportion of participants being obese.

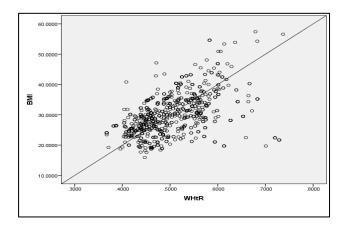


Figure 3: Relationship between Body Mass Index (BMI) and Waist to Height ratio (WHtR).

Using Pearson Correlation, the relationship between the BMI and WHtR was determined. It was found that, there was a positive correlation between the BMI and WHtR in assessing the nutritional status, having a 'r' value of 0.68 (moderate correlation), statistically significant (p value <0.005) (Figure 3).

The positive correlation indicates, whenever the BMI increases, the Waist to Height ratio, also increases. This relationship was statistically significant.

DISCUSSION

Obesity acts as major determining factor of Life expectancy. Any health issue is considered to be a public health problem, when the prevalence is >5%. The present study findings, ensights the silent epidemic of obesity.

Obesity, primarily the abdominal obesity has a greater influence on onset of various metabolic diseases, its sequeale and prognosis. WHO defines people as obese when BMI is greater than 30 kg/m². Most of the chronic lifestyle related, non-communicable diseases have a greater link with obesity in determining its incidence and prognosis.^{8,9} In the present study, the proportion of obese participants (46%) are extremely high, which is an alarming situation. This high proportion of obese participants, could be unequal distribution of participants due to rural-urban variation. The previous study results, though showed a high prevalence of obese participants comparing the country profile, its very less compared to our present study finding. This increasing trend could be attributed to the fact that, nowadays, school going adolescents are less engaged in sports, not only because of increased academic burden and competition, but also, due to the developed electronic era, which makes them less involved in outdoor games and physical activity. 10,11

Our present study findings shows a high proportion of obese participants by both the anthropometric assessment methods, namely BMI and WHtR, however, the proportion of participants by both the methods are not same, this is mainly due to the fact that, BMI have been classified into Normal, underweight, Overweight and Obese, whereas, WHtR on the other hand is determined only based on single cut-off value of 0.5, above which the participants are considered to be obese. To overcome this variability and also to determine, whether, WHtR really has any relationship with BMI, in determining the nutritional status, Pearson correlation was carried out, which showed a moderate correlation between the WHtR and BMI, similar to the study finding of a systematic review has also showed the moderate correlation. 12

Having a positive relationship between the BMI and WHtR, the preference for using WHtR as an anthropometric tool has to be encouraged, as the waist circumference, while effectively determines the visceral abdominal fat composition, WHtR with its single cut-off value also makes it easy for interpretation.

ACKNOWLEDGEMENTS

Authors would like to thank the school management and the interns, who helped in successful completion of the project.

Funding: No funding sources Conflict of interest: None declared

Ethical approval: The study was approved by the

Institutional Ethics Committee

REFERENCES

 World Health Organization Physical Status. The use and interpretation of anthropornetry. Technical Report Series 854 Geneva. World Health Organization. 1995:263-308.

- Rao S. Nutritional Status of Indian population. J Biosci. 2001;26:481-9.
- Helene D, Mauli VC, DeBenoist B. Should Adolescents be specifically targeted for nutrition in developing countries? To address which problems and how? Available at http://www.who.int/childadolescent.
- Dasgupta A, Butt A, Saha TK, Basu G, Chattopadhyay A, Mukherjee A. Assessment of malnutrition among adolescents: Can BMI be replaced by MUAC. Indian J Community Med 2010;35:276-9.
- 5. Singh D. Body shape and women's attractiveness: the critical role of waist-to-hip ratio. Human Nature. 1993;4(3):297-321.
- Chinedu SN, Ogunlana OO, Azuh DE, et al. Correlation between body mass index and waist circumference in Nigerian Adults: implication as indicators of health status. J Public Health Res. 2013;2(2):e16.
- 7. Yoo EG. Waist-to-height ratio as a screening tool for obesity and cardiometabolic risk. Korean J Pediatr. 2016;59(11):425-31.

- 8. The world helalth report. 2000 Available at http://www.who.int/whr/2000/en/whr00_en.pdf
- 9. Haslam DW, James WP. "Obesity". Lancet. 2005;366(9492):1197-209.
- Mahajan PB, Purty AJ, Singh Z, et al. Study of childhood obesity among school children aged 6 to 12 years in Union Territory of Puducherry. Indian J Comm Med. 2011;36(1):45-50.
- 11. Vohra R, Bhardwaj P, Srivastava JP, Srivastava S, Vohra A. Overweight and obesity among schoolgoing children of Lucknow city. J Fam Comm Med. 2011;18(2):59-62.
- 12. Jensen NS, Camargo TF, Bergamaschi DP. Comparison of methods to measure body fat in 7-to-10-year-old children: a systematic review. Public Health. 2016;133:3-13.

Cite this article as: Ramamani D, Suganya E. BMI and WHtR in assessing the nutritional status of adolescent girls. Int J Contemp Pediatr 2018;5:829-32