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TO ASSESS NECK CIRCUMFERENCE, A SCREENING TOOL FOR OBESITY IN PONDICHERRY SCHOOL CHILDRENS

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ABSTRACT
"Child Obesity and its co-morbidities is considered as a prime health hitch that lay up consideration among the public health society. Obesity and overweight has bagged the fifth position in the global risk for mortality. The main objective is to evaluate the association between neck circumference and obesity among the children. This is a cross sectional study conducted between the period of February 2018- March 2018, among 150 male + 129 female students , aged 11 to 18 years. Anthropometric markers of obesity- body mass index (BMI), waist circumference(WC), Hip circumference (HC), waist hip ratio (WHR),neck circumference (NC) were collected. Pearson's correlation coefficient was used to compute the neck circumference with other obesity indices. The mean BMI was 27.70±1.27 kg/m² and 27.72±2.12kg/m²,mean neck circumference was 35.42±2.26cm and 32.85±1.92 in overweight /obese boys + girls respectively.The hip circumference in boys was found to be greater than girls ,which is higher in overweight /obese students with P<0.001.Neck circumference shows a strong positive correlation with other anthropometric measures BMI,WC,HC in boys and girls (P<0.001). Neck circumference has shown significance correlation with other indices of obesity in children with greater reliability.

Key words: : BMI, NC, Over Weight, Obesity , WC, HC, Children.

INTRODUCTION

Overweight is defined as body mass index between 25 and 29.9 kilogram per meter square and obesity is defined as BMI of 30 kilogram per meter square or higher. Obesity is a pathological condition in which excess body fat accumulated, leading adverse effects on health and life expectancy. [1] It is a chronic disorder with complex interaction between genetic and environmental factors. It characterized by high cholesterol, fatty acid levels; imbalance in metabolic energy; insulin desensitization; lethargy, gallstones; high blood pressure; shortness of breath; emotional and social problems; and excessive adipose mass accumulation with hyperplasia and hypertrophy. [2] Pathological obesity is associated with several secondary commodities like heart disease, type 2 diabetes, breathing difficulties during sleep, cancer and osteoarthritis.

It is most commonly caused by a combination of excessive dietary calories, lack of physical activity, and genetic susceptibility. Evidence to support this view is that some obese people eat little yet gain weight due to slow metabolic rate. The primary treatment for obesity are dieting and physical exercise. To addition to this, or in case of failure, anti-obesity drugs may be taken to reduce appetite or impede fat absorption. In serious cases, surgery is carryout or an intragastric balloon is placed to lower stomach volume and/or bowel length, precede to earlier satiation and make less ability to absorb nutrients from food.

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Obesity can be associated with several risk factors such as cardiovascular and metabolic disturbances. There are numerous methods for assessing overweight and obesity. Some techniques are applicable at primary care facilities, such as measurements of weight, height, hip circumference, calculations of waist-hip ratio and BMI. It is important to develop a quick method of for the assessment of obesity in primary care clinic. The purpose of the study to determine whether neck circumference is useful alone for assessing obesity [3]

The restraint of BMI as a risk evaluation tool are also conceded, and there is continuing interest in spotting alternative or complementary indices linking body adiposity and disease risk. For example, some studies suggest that abdominal circumference is better correlated than BMI with the risk of type 2 diabetes (13). Although it is well established that visceral adiposity plays a central role in the metabolic disorders associated with obesity, the dearth of a pragmatic method to assess visceral fat in routine examinations precludes its use as a screening tool for the public. Developing simple and authentic methods to assess body fat compartments should be an important prime concern of obesity research. [4]

OBJECTIVE

Overweight in children is described by using body mass index along with BMI, waist-hip ratio, mid-upper arm circumference, waist thigh ratio indices of body fatness is needed to determine obesity.

The aim of the study to determine whether neck circumference is useful alone for assessing obesity, Children who were to 11 to 18 yrs and undergoing schooling where the subject of the study, trained CRRI collected the anthropometric data from school-going children. We calculated and correlated the neck circumference and other indexes of obesity and we analyzed the optimal neck circumference cutoff for identifying children with high BMI.

METHODOLOGY

A cross-sectional study was conducted Sri Lakshmi Narayana Institute of Medical Sciences, Pondicherry, during the period of February 2018- March 2018 in the private schools, of Pondicherry. Participants were of age 11-18 years comprising both males and females. Considering approximately 50 private schools in Pondicherry , 9 schools were chosen by systematic random sampling method. 35 samples from each school were selected using simple random sampling method using the lottery method with the help of attendance registry maintained in the schools to arrive at the sampling frame. A total of 280 children, among which 150 were males and 129 were females. A pretested questionnaire was used as a study stool for the data collection. [5] The validity of the tool was assessed by consultation with expert opinion.Anthropometry measurements were taken by Doctors through proper modes.

Neck circumference was measured using a plastic tape it was measured in a standing position while the child's head was held erect with eyes looking forward, shoulders in a relaxed position, Waist circumference measurements were measured using tape. Measured at the top of the hip bone, then brought the tape and measured all the way around the body, level with the belly button. Made sure it wasn't too tight and that it's straight, even at the back. asked the children not to hold their breath while measuring,measured the number on the tape right after they exhale. Hip circumference was measured at the maximum circumference of the Gluteal region.

Participants were also examined regarding height, weight, and BMI

Height (cm): standing height was measured using a stadiometer and height road. It was measured in cm, The participants were made to stand in an erect position

Weight (kg): standard weight monitoring device was used that was placed on a hard flat surface and checked for zero balance

BMI: BMI was calculated by dividing weight in kg with the square of height in the meter as per the formula kg/M2

The Data was entered in excel sheets and analysed using SPSS software version 21

RESULT

In a total of 279 children, Table 1 shows mean anthropometric measurement values in boys. The mean weight , height, BMI ,WC,HC,WHR were 71.54±9.83kg**,** 161.92±7.53 cm, 27.70±1.27kg/m^2, 91.07±5.29 cm,104.28±4.63 cm,0.87±0.07 cm respectively in obese / overweight boys. table 2 shows mean anthropometric measurement values in Girls. The mean weight , height, BMI ,WC,HC,WHR were 57.54±14.77 kg ,150.87±5.6cm, 27.72±2.12kg/m^2, 87.75±4.57 cm, 97.58±4.75cm, 0.89±0.054 cm respectively in obese / overweight girls. All the anthropometric measures are significantly found to be higher in overweight/obese children compare to their normal peers and higher in boys compared to girls.

The above table 1 shows mean anthropometric measurement values in boys. The mean weight , height, BMI ,WC,HC,WHR were 71.54±9.83kg**,** 161.92±7.53 cm, 27.70±1.27kg/m^2, 91.07±5.29 cm,104.28±4.63 cm,0.87±0.07 cm respectively in obese / overweight boys.

The above table 2 shows mean anthropometric measurement values in girls. The mean weight, height,BMI, WC, HC, WHR were 57.54±14.77 kg, 150.87±5.6 cm, 27.72±2.12kg/m^2, 87.75±4.57 cm, 97.58±4.75cm, 0.89±0.054 cm respectively in obese / overweight girls.

Table 1: Comparison of anthropometric measurements between controls and overweight / obese in boys.

Boys (Mean)	Controls (Normal /Underweight)	Overweight-Obese	P-Value
Age (Years)	13.839±2.05	14.28±1.88	0.563
Weight in KG	39.23±9.97	71.54±9.83	<0.001
Height in CM	154.07±10.66	161.92±7.53	0.033
BMI (kg/m²)	15.62±4.36	27.70±1.27	<0.001
HIP Circumference in CM	79.86±11.12	104.28±4.63	<0.001
Waist Circumference in CM	65.95±8.62	91.07±5.29	<0.001
Waist HIP Ratio	1.26±2.61	0.87±0.07	0.081
Neck Circumference in CM	29.84±3.62	35.42±2.26	<0.001

Table 2: Comparison of anthropometric measurements between controls and overweight / obese in girls.

Girl (Mean)	Controls (Normal /Underweight)	Overweight-Obese	P-Value
Age (Years)	13.96±2.08	15.16±2.08	0.079
Weight in KG	42.75±9.59	57.54±14.77	0.005
Height in CM	152.91±8.87	150.87±5.6	0.275
BMI (kg/m²)	18.10±3.15	27.72±2.12	<0.001
HIP Circumference in CM	80.98±9.29	97.58±4.75	<0.001
Waist Circumference in CM	70±10.61	87.75±4.57	<0.001
Waist HIP Ratio	0.85±0.075	0.89±0.054	0.028
Neck Circumference in CM	29.79±2.31	32.85±1.927	<0.001

Table 3: Pearsons correlation (r) between the neck circumference and other anthropometric measurements

	NC-BMI (r)	NC-WC (r)	BMI – WHR (r)	P value
Boys	0.491	0.453	0.496	<0.01
Girls	0.708	0.694	0.300	<0.01

DISCUSSION

The present study conducted on children aged 11-17 years had shown a notable relation between neck circumference and anthropometric measurement of obesity in both boys and girls. [6]

Childhood obesity has become a paramount worry. Many studies had manifest expand unfavorable health issue of childhood obesity both short term besides long term consequences. Controlling the epidemic of childhood obesity, awareness prior precaution and treatment of childhood obesity are important priorities that need adequate diagnostic measures. Both patients and health practitioner must have tools with low cost, quick and easy to use for screening and monitoring. There are many methods available for assessing obesity in children which includes weight, waist circumference, waist hip ratio, BMI and weight height ratio. BMI also has its own disadvantage which doesn't reflect the body fat distribution and waist circumference measurement and time consuming though it reflects central obesity. [7] Direct measurement of body fat USG, DEXA, CT etc are not feasible due to their cost. Hence, anthropometric measures are reliable and comparatively easy to perform. The obesity shows a very early onset in life which has laid the utmost importance in the prevention of itamong the children. Neck circumference is being considered as the marker of upper body subcutaneous tissue distribution. [8]

Studies which conducted in adults had shown some results with neck circumference can be used as a screening tool for identifying high BMI individuals and there are various studies which has association between neck circumferences with other obesity indices but there are very less number of studies on neck circumference relevant to obesity in paediatric age group. [9] The first person to suggest that different body morphology and type of fat distribution which is associated with health risk of obesity is Vague J. Hatipoglu et al also suggested neck circumference can be used for screening children with overweight and obesity and correlated positively between neck circumference and BMI, waist circumference. Nafiu et al conducted a study on 1102 children aged between 6-18yrs had shown that neck circumference correlated with age, BMI and waist circumference in both boys and girls and neck circumference cut off value were given according to age, optimal neck circumference cutoff indicative of high BMI in boys ranged from 28.5-39 cm, in girls 327-34.6 cm respectively. Similar results were also found in other studies. [10]

The present study results which conducted on 279 students aged between 11 to 17 years has shown that neck circumference correlated with BMI, weight, hip circumference, waist circumference in both boys and girls. Optimal NC cutoff values indicative of high BMI in boys ranged from 33.16-37.68 cm, in girls 30.92-34.77 cm

respectively. Neck circumference is reliable and easy to measure compare to other indiexes of adiposity.

CONCLUSION

The present study findings in children are consistent with other studies, therefore we conclude that overweight/obese children could be screened through neck circumference, through which we could identify the pre obese children and carry out the needed management since there in increased level of obesity related health conditions among the children and the adolescents.

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