

Abdominal obesity status among Arora preschool children (2-5 years) of Amritsar

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ABSTRACT: *Abdominal obesity is a state of excessive accumulation of central subcutaneous and visceral fat, has emerged as an important predictor for cardiovascular and metabolic risks in children and adolescents. Waist circumference is a highly sensitive and specific measure of abdominal obesity. Very few studies are available to the prevalence of abdominal obesity. Therefore in the present study an attempt has been made to report the prevalence of abdominal obesity among preschool children of Amritsar (Punjab). This study was undertaken among 1879 (949 boys and 930 girls) Arora preschool children aged 2-5 years of Amritsar. Waist circumference was taken on each subjects using standard technique. Abdominal obesity was assessed by using waist circumference criterion of National Health and Nutrition Examination Survey. Present study revealed that abdominal obese were 10.4% and 6.3% among boys and girls, respectively. The percentage prevalence of abdominal obesity was lower in the Amritsar children than other populations.*

Keywords:- *Waist circumference, abdominal obesity, Arora, preschool children.*

INTRODUCTION

Waist circumference is gaining increasing acceptance as the best anthropometric measurement for assessing abdominal obesity. The increase in the mean WC and the prevalence of abdominal obesity occurred consistently across different gender, racial/ethnicity, and age subgroups. Obtaining information on waist circumference in children could be useful as a means of identifying not only the overweight in children, but also the abdominal fat deposition that is found to be related to chronic diseases in later life (Janssen *et al.*, 2005). It is simple, yet effective, surrogate measures of abdominal obesity. Studies continue to show that the measurement of WC enhances diagnostic sensitivity for risk factors related to cardiovascular diseases (CVD), but most of the studies have focused on adults (Kahn and Valdez, 2003, Wang, 2006). Very few studies are available to report the prevalence of abdominal obesity among preschool children in India as well worldwide. Therefore in the present study an attempt has been made to generate a baseline data about the current prevalence of abdominal obesity among preschool children of Amritsar.

MATERIALS AND METHODS

In the present cross-sectional study, the data were collected from 1879 (949 boys and 930 girls) affluent preschool children (2-5 years of age). During data collection, the exact date of birth was noted from the crèches or play-pen and school records. Informed written consent was obtained from children's parents and the in-charge or principals of the respective institutes before the subjects entered into the study. Approval for this study was obtained from the Guru Nanak Dev University Ethical Review Committee. Affluent children means the socio-economic status of the parents of these children was high, which was assessed as per the scale devised by Aggarwal *et al.* (2005). Waist circumference was taken on each subject using standard methodology (Weiner and Lourie, 1981). Abdominal obesity was assessed by using waist circumference criterion of National Health And Nutrition Examination Survey (NHANES) III (1988-1994) devised by Cook *et al.* (2003). The $\geq 90^{\text{th}}$ percentile values of waist circumference for gender and age were used as cut-off values to identify subjects with abdominal obesity. Statistical analysis was performed using SPSS statistical package. Statistical significance was set at $p < .05$.

RESULTS

Waist circumference (WC) provides a measure of abdominal obesity. Table 1 shows the mean value of WC amongst boys was 48.6 cm in age group 2+ which increased to 51.2 cm up to age group 4+. Thus, a total gain of 2.6 cm in WC has been observed up to age group 4+. In age group 5+, the mean value of WC marginally decreases (-0.4 cm). On the other hand, amongst girls the mean value of waist circumference was 48.0 cm in age group 2+ that increased to 51.4 cm up to age group 5+, showing a total gain of 3.4 cm during four year period. In the pooled sample (from age group 2+ to 5+), the mean value of waist circumference was 50.3 cm and 50.1 cm among boys and girls, respectively. This shows that mean value of waist circumference was 0.2 cm higher in boys as compared to the girls. Boys and girls showed maximum annual increment of 1.8 cm and 1.7 cm between age group 2+ and 3+ in waist circumference, respectively. The difference between boys and girls, in the mean values of waist circumference was statistically insignificant in all the age groups and in the pooled sample except age group 2+ ($p < 0.05$). Standard deviation values point towards maximum variability in boys ($SD \pm 3.6$) and girls ($SD \pm 4.7$) in age group 4+ and 3+, respectively.

Table 1. Mean, Standard Deviation (SD), Velocity/year and 't'-value with significance level of Waist Circumference of Amritsar pre-school children according to age and sex

Age group (years)	Waist Circumference (cm)								't' value	P
	Boys				Girls					
	Number of subjects	Mean	SD	Velocity/year	Number of subjects	Mean	SD	Velocity/year		
2+	204	48.6	3.0	-	198	48.0	3.3	-	2.1*	0.036
3+	220	50.4	2.9	1.8	253	49.7	4.7	1.7	1.9	0.050
4+	254	51.2	3.6	0.8	240	51.3	3.8	1.6	0.1	0.920
5+	271	50.8	3.1	-0.4	239	51.4	3.8	0.1	0.9	0.360
2+-5+	949	50.3	3.3	2.2	930	50.1	4.1	3.4	1.3	0.195

WC has been suggested as the most useful simple measure of fat distribution and, in children, it has been found to be a better indicator of high trunk fat mass than WHR (Taylor *et al.*, 2000). An

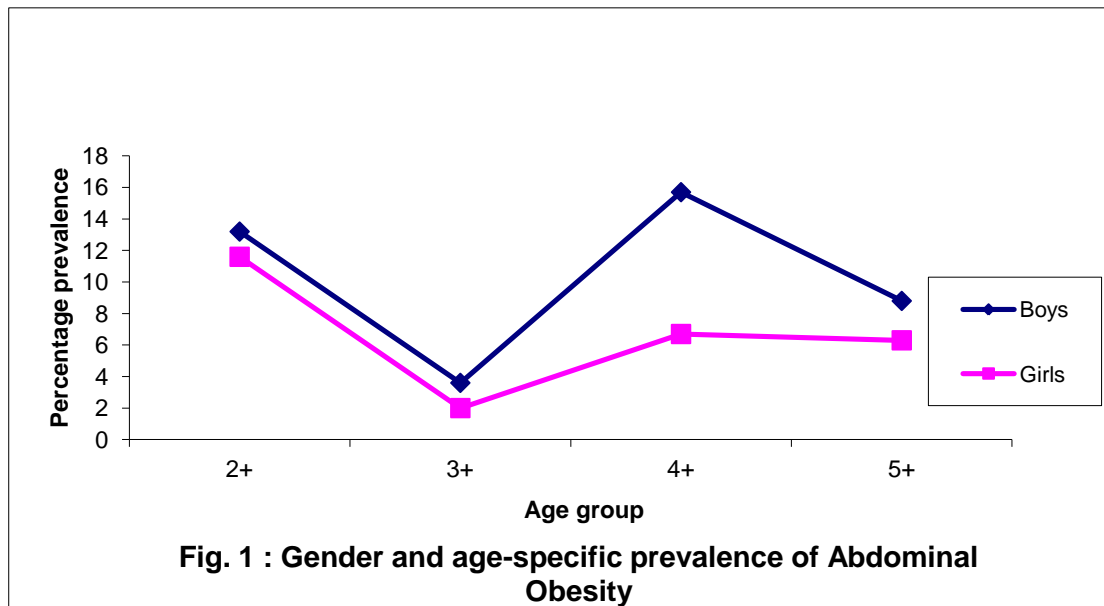
extensive research of online database revealed that there are no published studies on the prevalence of abdominal obesity because there are no Asian or Indian standards for the assessment of abdominal obesity in children. Therefore, the age- and sex-wise prevalence of abdominal obesity in sampled children was derived using the cut-offs suggested for children of developed country like USA. According to these cut-offs more than or equal to 90th percentile values of waist circumference for gender and age (that were generated in National Health And Nutrition Examination Survey (NHANES) III) were used as cut-offs to identify subjects (aged 2 to 19 years) with abdominal obesity (Cook *et al.*, 2003). It is evident from Table 2 that in the pooled sample of Arora children 10.4% and 6.3% boys and girls were abdominally obese, respectively. Amongst boys, the maximum prevalence of abdominal obesity was observed in age group 4+ (15.7%) and minimum in age group 3+ (3.6%), while the highest value of abdominal obesity was found in age group 2+ (11.6%) and the lowest in age group 3+ (2.0%) amongst girls. It has been observed from the results of the present study that the percentage prevalence of abdominal obesity was more in case of boys than girls in all age groups and in the pooled sample.

Table 2 Age and sex-wise percentage prevalence of Abdominal Obesity according to Waist Circumference percentiles (NHANES III, 1988-1994) among pre-school children

Age group (years)	Number of subjects	Normal	Abdominal Obese	Number of subjects	Normal	Abdominal Obese	Chi-square (χ^2)	P
2+	204	86.8 (177)	13.2 (27)	198	88.4 (175)	11.6 (23)	0.2	0.67
3+	220	96.4 (212)	3.6 (8)	253	98.0 (248)	2.0 (5)	0.3	0.57
4+	254	84.2 (214)	15.7 (40)	240	93.3 (224)	6.7 (16)	9.4*	0.00
5+	271	91.1 (247)	8.8 (24)	239	93.7 (224)	6.3 (15)	1.6	0.20
Total	949	89.6 (850)	10.4 (99)	930	93.6 (871)	6.3 (59)	9.6*	0.00

χ^2 is calculated for abdominal obesity in between boys and girls

* Significant at $p < 0.05$ Figures in the parenthesis are the number of subjects



DISCUSSION

Waist circumference (WC) is a convenient and simple measurement which is unrelated to height, correlates closely with BMI and WHR among adults. Indeed, WC has been proposed to be a better correlate of visceral fat and cardiovascular risk than the commonly used WHR because of the postulated role of the visceral fat depot in health risks associated with obesity (Goran and Gower, 1999; Maffeis *et al.*, 2001; Seidell *et al.*, 2001; Teixeira *et al.*, 2001; Katzmarzyk *et al.*, 2004; Kahn *et al.*, 2005; Esmailzadeh *et al.*, 2006).

But WC is not measured in routine among children. It is evident from literature that no reference values exist for assessing abdominal obesity on the basis of waist circumference among Asian or Indian children, but some countries like, Italy (Zannolli and Morgese, 1996), Spain (Moreno *et al.*, 1999), the United Kingdom (McCarthy *et al.*, 2001), Canada (Katzmarzyk *et al.*, 2004), the United States (Fernandez *et al.*, 2004; Kahn *et al.*, 2005), Australia (Eisenmann, 2005), and the Netherlands (Fredriks *et al.*, 2005) have their own reference standards for the assessment of abdominal obesity using WC percentile in children and adolescents. Therefore, in the present study an attempt has been made to evaluate the

percentage prevalence of abdominal obesity using the $>90^{\text{th}}$ percentiles of WC for age and sex according to Cook *et al.* (2003). According to this criterion, clustering of risk factors was significantly higher in subjects with a WC $\geq 90^{\text{th}}$ percentile than in subjects with $<90^{\text{th}}$ percentile.

Unfortunately, there is no report in the current literature regarding the prevalence of abdominal obesity in Indian pre-school children. Therefore, an attempt has been made to compare the present results with only German and US children. Table 2 depicts the percentage prevalence of abdominal obesity among pre-school children of Amritsar. The percentage prevalence of abdominal obesity was 10.4% and 6.3% amongst boys and girls, respectively and the difference between two sexes was statistically insignificant, except in age group 4+ as well as in the pooled sample ($p < 0.05$). The percentage prevalence of abdominal obesity was maximum in age group 2+ and minimum in age group of 3+ (Fig. 1). Age group difference was statistically significant in boys and girls between the age group of 2+ to 3+ (boys: $\chi^2 = 9.2$; $p = 0.00$ and girls: $\chi^2 = 10.3$; $p = 0.00$) and 3+ to 4+ (boys: $\chi^2 = 20.0$; $p < 0.0001$ and girls: $\chi^2 = 4.8$; $p = 0.02$), respectively. Present results also revealed that more boys have abdominal obesity than girls in all age groups. Similar to the present study, Schwandt *et al.* (2008) studied German children (aged 3 to 11 years) and observed a prevalence of abdominal obesity (WC $> 97^{\text{th}}$ percentile) significantly higher in boys than in girls (4.1% vs. 2.8%, $p < 0.05$). The percentage prevalence of abdominal obesity was more in studied population than the children of Germany which could be because of the use of American standards. Li *et al.* (2006) studied US children and adolescents (aged 2 to 19 years) and found that 19.4% boys and 13.4% girls (aged two to five years) were abdominally obese. The percentage prevalence of abdominal obesity was lower in the Amritsar children than US children. On comparison with Turkish children (Hatipoglu *et al.*, 2013) the prevalence of abdominal obesity was calculated as 10.1% for boys and 10.7% for girls which were approximately same in boys but lower in girls of the present study.

As the present study is a cross-sectional study and only the prevalence of abdominal obesity was assessed and the health risks associated with it have not been studied, so the longitudinal studies will be needed to determine the association between WC and various non-communicable diseases. Future research is warranted to determine the appropriate cut-off or

threshold values using standardized WC reference data for identifying children at risk of abdominal obesity in relation to clustering of metabolic and cardio-vascular risk factors or obesity related diseases such as type 2 diabetes.

CONCLUSION:- In boys, the prevalence of abdominal obesity was more than girls in all age groups but this difference was statistically insignificant in all the age groups except in age group 4+ and in the pooled sample. Among children, on this index, there are apparently no standard values for the assessment of abdominal obesity. So it can be concluded from the current study that more research is needed to develop optimal waist circumference and waist-hip ratio threshold values that are related to elevated risk factors of various chronic diseases in children.

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