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Centralized Fat Status of Adolescent Girls in Saudi Arabia in Comparison to the United Kingdom Reference Data

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ABSTRACT

To measure the anthropometric profile of Jeddah adolescent girls based on their waist circumference (WC) status. To identify the centralized fat status of participants in comparison to the United Kingdom's reference data. Measurement of WC for 1519 female adolescents (13 to 18 years) was taken. Construction of Z-scores and percentile and smoothing for the all taken WC measurements using the LMS methodology that summarizes the changing distribution by three curves representing the median, coefficient of variation and skewness, The UK reference data was used for comparisons. The percentage of girls with waist-circumference scores of ≥ 90th percentile was the highest (9.7%) among 13-years old girls, compared to other age groups. Girls who aged 17 years had the highest proportion (36.7%; 98 out of 370) of WC scores ≤ 10th percentile. The mean WC for Saudi girls in all ages (13 to 17 years) was above the 75th percentile. In comparison with the waist circumference 'percentile curves' for British girls aged 5.0 ± 16.9 years, the mean WC for Saudi girls in the all studied ages was above the 75th percentile. In comparison to the UK female population, Jeddah adolescent girls had a higher WC among all compared ages, and 20% of girls in Saudi Arabia were centrally obese. The study has generated imperative data on values for the percentile WC of adolescent girls in Saudi Arabia, which could help to establish national criteria for determining central obesity based on this simple anthropometric measurement.

Keywords: Fat Status, Adolescent Girls, Waist Circumference (WC), Saudi Arabia.

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INTRODUCTION

Waist circumference (WC) is a commonly accepted measure of central obesity, which is an important risk factor for a number of diseases such as cardiovascular disease (CVD). The majority of Saudi researchers generally use the body mass index to classify overweight and obesity in adolescents [1, 2]. However, some researchers considered BMI as just a proxy measurement of body fatness[3]. Centralized excess body fat, which might carry an increased risk for obesity, is associated with metabolic complications in children and adolescents[4]. Visceral fat measurements using tools such as WC can be used in the assessment of centralized deposition of excess body fat[5]. A national or regional assessment of adolescents' WC reference values was suggested by previous research to be used because these values may differ from one country to another[6]. These types of assessments could help to avoid the variations in the WC phenotype that is likely to be explained by genetic and environmental factors. The study aimed to measure the anthropometric profile of Jeddah adolescent girls based on their waist circumference (WC) status, and to identify the centralized fat status of participants in comparison to the United Kingdom's reference data.

MARTIALS AND METHOD

The study included 1519 female adolescents aged 13 to 18 years in Jeddah city who were randomly selected from 18 public and private schools (Figure 1). An ethical clearance from the Ethics and Research Committee at King Abdulaziz University, Saudi Arabia was obtained before conducting the study. Information letters and consent forms were provided to participants and their parents before collecting data. Measurements for waist circumference were taken. Z-scores and percentile construction and smoothing for all WC measurements were performed for the all taken WC measurements using the LMS methodology that summarizes the changing distribution by three curves representing the median (M), coefficient of variation (S) and skewness (L). The skewness expressed as a Box-Cox power (the LMS growth is a Microsoft Excel Add-in designed to manipulate growth data using growth references based on the LMS method). Then, the LMS method was followed by transformation of all individual measurements into standard deviation scores (SDS) and the reference used for comparisons was the UKSDS[7]. The mean values for waist circumference for Jeddah adolescent girls at each age was compared with the United Kingdom reference data that was developed for waist circumference percentile curves for British girls aged 5.0 ± 16.9 years[8]. The UK reference data was used because no enough national or regional references were available at the time of comparison. In addition, a recent review on adults' anthropometry concluded insufficient evidence to suggest that those of Middle Eastern background have different WC than those in the European countries[9]. For describing the

actual WC findings among Jeddah adolescent girls, age and gender-specific WC were divided into percentiles according to Fernandez *et al.* 2004[10]. ≤ 10th percentile;≥ 10th and ≤75th percentile; ≥ 75th and ≤ 90th percentile and ≥ 90th percentile. This method of description was used because it was previously used to describe the WC status of similar Saudi population[11]. Means and standard deviations were calculated and used to describe WC of Jeddah girls. Fat status of participants was categorized and described using frequencies and percentages.

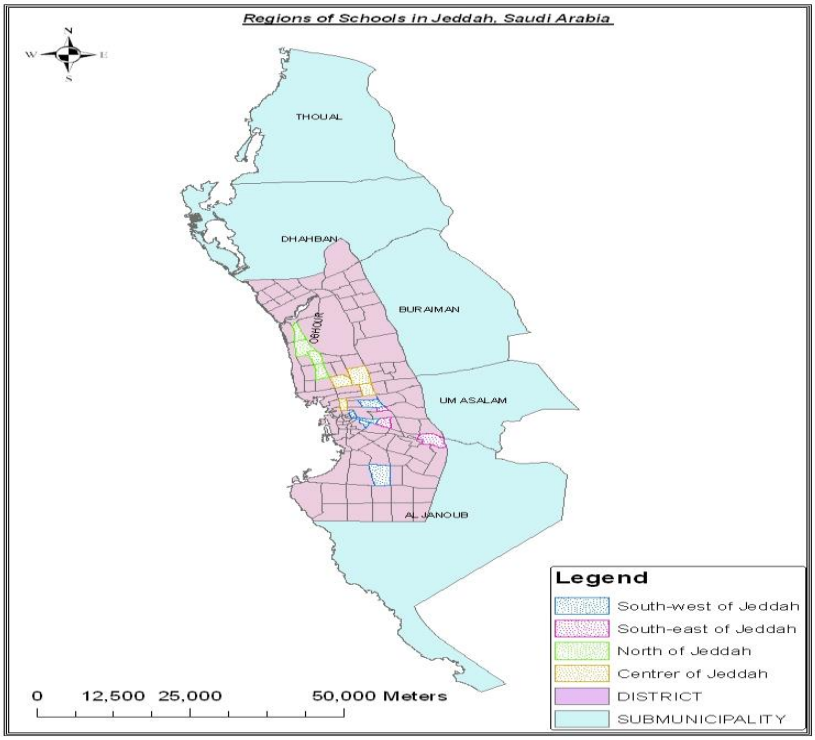

Figure 1: Map for distribution of schools regions

RESULTS AND DISCUSSION

The mean baseline WC per age group is 72.7±11.33 (Table 2). Based on the cut-off point of 75th percentile as high WC [9], the mean WC for girls in Saudi Arabia in all ages (13 to 17 years) was above the 75th percentile. In addition, 20% of Jeddah girls had a WC greater than or equal to the 75th percentile and 80% of participants were below the 75th (n=1215). The percentage of girls with waist-circumference (raw data) scores ≥90th percentile was the highest (9.7%) among 13-years old girls, compared to other age groups. Girls who aged 17 years had the highest proportion (36.7%; 98 out of 370) of WC scores ≤10th percentile (Table1). The mean WC by age (excluding girls aged 18 years old), was compared with waist circumference percentile curves for British girls aged 5.0 ± 16.9 years. The comparison pointed out that the mean WC for Saudi girls in all ages (13 to 17 years), were above the 75th percentile (Figure 2). In comparison to the UK female population (12-17 years old), Jeddah

adolescents had a higher WC among all compared ages. This could be due to genetics and environmental differences between UK population and Middle East[6]. In comparison to a national data from Riyadh, 12% (527 out of 4400 girls) had a high WC (≥ 75th percentile)[11]. The same study, has demonstrated mean WC among three age groups of 4400 girls as follows: 66.30 cm for girls aged 10-13, 70.77cm for girls in the age group of 14-16 and 70.89cm for those who aged 17-19 years old. Another national study assessed WC for 126 girls aged 14-18 years from Riyadh city, found that the mean WC was 66.6±10.5[12]. Thus, the present study demonstrated that Jeddah girls have a higher WC measure (72.7±11.33), compared to their counterparts in Riyadh city (the capital) from both studies. The difference between the results in both Riyadh studies and the current study might be due to the inclusion of different age groups in one study and the small sample size for the other study.

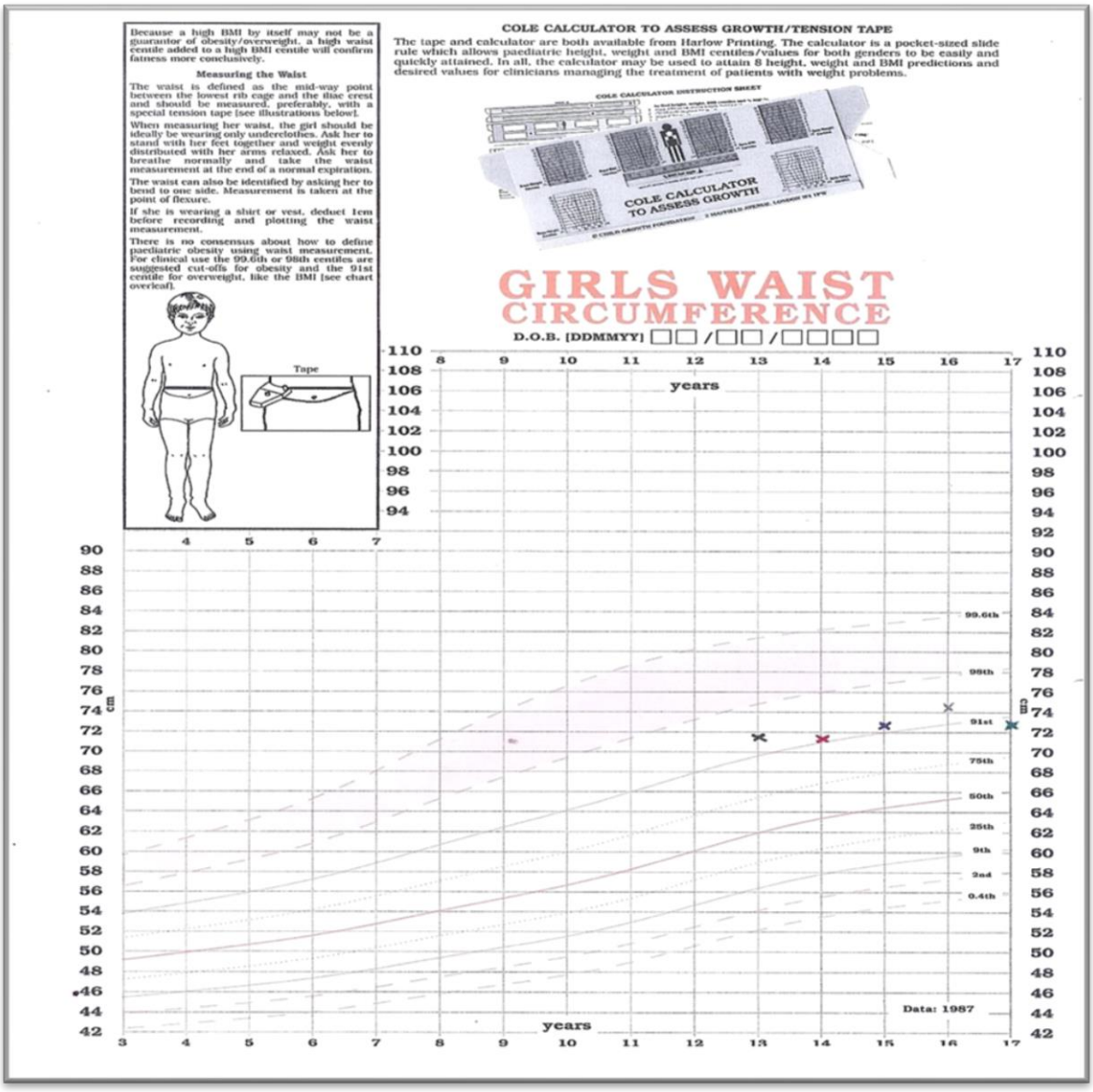

Figure 2: Comparisons of participants' mean WC stratum vs. UK 1990 population (girls 5-16.9 years) Charts

Table 1: Comparison of mean WC for each age stratum with WC percentile curves for British girls aged 5.0 ± 16.9 years

Waist circumference group	Age for each stratum (%)*						Total = 1519(%)
	13	**14**	**15**	**16**	**17**	**18**	
≤10th percentile	27(11.4)	55 (20.9)	53 (20.4)	49 (20.5)	98 (36.7)	88 (34.2)	370 (24.4)
>10thto≤75thpercentile	131(55.3)	140(53.2)	154(60.2)	139(58.2)	132(49.4)	149 (57)	845 (55.6)
≥75thto≤90th Percentile	56(23.6)	51 (19.4)	32 (12.5)	36(15.1)	28 (10.5)	15 (5.8)	218 (14.4)
≥90thPercentile	23(9.7)	17 (6.5)	17 (6.6)	15 (6.3)	9 (3.4)	5(1.9)	86 (5.7)

*Age indicates the whole age groups, e.g. 13.0-13.99 years

Table 2: WC for participants for each age stratum (raw data)*

Age	N	WC (Mean ± SD)
13	237	71.66±11.41
14	263	71.59±11.09
15	256	72.65±11.01
16	239	74.48±11.89
17	267	72.80±12.23
18	257	73.09±10.13

*****Raw data: the originally measured WC for participants

CONCLUSION

Compared to the UK girls (13 to 17 years), 20% of girls in Saudi Arabia were centrally obese. There is a dearth of information regarding the use of WC in evaluating body fatness of young girls in Saudi Arabia and this study has generated imperative data on values for the percentile WC of adolescent girls in Saudi Arabia, which could help to establish national criteria for determining central obesity based on this simple anthropometric measurement. The present prevalent health problem (centralized fats) imply immediate interventions by individuals themselves, their families, schools and health professionals. This calls for focused targeted programmes that aim to identify such a growth-related problems as early as possible. From the research point of view**,** national-base studies on centralized obesity status among pre-scholars, schoolchildren, and adolescents should be carried out in different parts of Saudi Arabia. Several factors should be considered when planning for such studies concerning sensitive indicators such as waist circumference to measure obesity. In addition, the use of standardized cut-offs for measuring central fats should be considered.

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