

Prevalence of Obesity and Body Fat Composition Characteristics of Obese Children in Dharwad Taluk

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Abstract

A total of 235 children belonging to 3—12 years were covered for prediction of obesity based on anthropometric measurements in urban area of Dharwad. The prevalence of abdominal obesity was high in both 3—6 (11.11 vs 4.27%) and 7—12 years (17.09 vs 10.68%) compared to general obesity. Abdominal obesity was also found in the absence of general obesity. All the computed body fat components using body mass index in obese children were higher compared to normal children. However, waist circumference could not accurately determine the body fat components in children.

Key words : Abdominal obesity, Body fat components, General obesity.

Obesity is a condition in which there is excess of body fat. Its prevalence in developing countries is generally believed to be low but documented information in this regard is scanty. Hence, an attempt was made to study the prevalence of obesity in urban children of Dharwad and to compute the body fat components of obese and normal children also to study the relationship between body fat components and anthropometric measurements.

Methods

A total of 235 children belonging to 3—12 years were covered for the study. The parameters viz., height, weight, waist and hip circumference were studied for the investigation. Later the Z-scores (1) and waist to hip ratio were computed to screen children for general and abdominal obesity respectively. Further, body mass index and waist circumference were

considered to compute body fat components using the prediction formulae as given by Vanltallie FB et al. (2) and Lean MEJ et al. (3) only for general obese and for equal number of normal children in each age group. The correlation coefficients were calculated to find out the degree of relationship between body mass index and body fat components viz., per cent body fat, fat mass (kg), fat mass index and fat free mass (kg). They were also calculated between waist circumference and body fat components to know the degree of relationship between them.

Results and Discussion

Prevalence of general obesity was more than two fold (10.68%) in higher age group i.e. 7—12 years compared to 3—6 year group (4.27%). However, the prevalence of abdominal obesity was still high in the same age groups i.e. 11.11% in 3—6 years and 17.09%

Table 1. Prevalence of general and abdominal obesity in children. Figures in parentheses indicate per cent age.

| Criteria | Age groups (years) | | | | | |
|---|--------------------|--------------|-----------------|--------------|---------------|-----------------|
| | 3—6 | | | 7—12 | | |
| | Male | Female | Gender combined | Male | Female | Gender combined |
| General obesity (‘Z’ score) | 6 (2.56) | 4 (1.71) | 10 (4.27) | 19 (8.12) | 6 (2.56) | 25 (10.68) |
| Abdominal obesity (Waist to hip ratio) | 5 (2.14) | 21 (8.97) | 26 (11.11) | 4 (1.71) | 36 (15.38) | 40 (17.09) |

Table 2. Number of children with high WHR (abdominal adiposity) by Z-scores criterion. WHR : Waist to hip ratio, Figures in parentheses indicate per cent age.

| Details | Z-scores | Number of children | | | | | | | | | | | |
|-------------|------------|--------------------|-----------|--------|-----------|-----------------|-----------|--------|-----------|---------|-----------------|---------|-----------|
| | | 3—6 years | | | | | | 7—12 | | | | | |
| | | Male | Female | Male | Female | Gender combined | Male | Female | Male | Female | Gender combined | Male | Female |
| Obese | Non-Obese | Obese | Non-Obese | Obese | Non-Obese | Obese | Non-Obese | Obese | Non-Obese | Obese | Non-Obese | Obese | Non-Obese |
| Underweight | -2Z | - | 2 | 2 | 1 | 2 | 3 | 1 | 7 | 4 | 1 | 5 | 8 |
| | | | (0.85) | (0.85) | (0.43) | (0.85) | (1.28) | (0.43) | (2.99) | (1.71) | (0.43) | (2.14) | (3.42) |
| Normal | -2Z to +2Z | 5 | 17 | 15 | 8 | 20 | 25 | 3 | 62 | 29 | 42 | 32 | 102 |
| | | (2.14) | (7.26) | (6.41) | (3.42) | (8.55) | (10.68) | (1.28) | (26.50) | (12.39) | (17.95) | (13.68) | (43.59) |
| Obese | >+2Z | - | 6 | 4 | - | 6 | 4 | - | 19 | 3 | 3 | 3 | 22 |
| | | | (2.56) | (1.71) | | (2.56) | (1.71) | | (8.12) | (1.28) | (1.28) | (1.28) | (9.40) |
| Total | | 5 | 25 | 21 | 9 | 28 | 32 | 4 | 88 | 36 | 46 | 40 | 132 |
| | | (2.14) | (10.68) | (8.97) | (3.85) | (11.96) | (13.68) | (1.71) | (37.38) | (15.38) | (19.66) | (17.09) | (56.41) |

in 7—12 years. Males registered a higher prevalence for general obesity compared to their gender counterparts. Similar trend was not evident for abdominal obesity (Table 1).

The data on number of children with high waist to hip ratio by Z-scores criterion is depicted in Table 2. Higher per cent prevalence of abdominal obesity was found among normal children (22.22%). However, the per cent prevalence was same among under weight (2.99%) and obese children (2.99%). A higher per cent prevalence of abdominal obesity was found in females in all the three Z-scores criteria compared to males. The prevalence of abdominal obesity was higher in 7—12 year group compared to 3—6 year group both in underweight and normal children. Similar trend was not noticed in obese children. Body fat components computed based on waist circumference

exhibited little difference among normal and obese children of both the age groups.

A significant positive correlation was evident between body mass index and body fat components i.e. per cent body fat, fat mass and fat mass index except for per cent body fat in female normal children (7—12 years), for fat mass index in female obese children (3—6 years) and female normal children (7—12 years). However, a significant positive correlation was noted for fat free mass in obese male children of 7—12 years.

Nevertheless, a significant positive correlation was also noticed between waist circumference and body fat components except for fat mass in female children, for fat mass index in obese female children and for fat free mass in both normal and obese children of both the genders (Table 4).

Table 3. Body fat composition characteristics of children based on body mass index. Values are mean \pm SD. *r* values were calculated between body mass index and body fat components. **Significant 1% level. NS—Non significant.

| Study area | Body fat composition | | | | | | | |
|----------------|----------------------|------------------|-----------------|-----------------|-----------------|-----------------|------------------|------------------|
| | Per cent body fat | | Fat mass (kg) | | Fat mass index | | Fat free mass | |
| | Male | Female | Male | Female | Male | Female | Male | Female |
| 3—6 years | | | | | | | | |
| Normal | 17.70 \pm 2.56 | 20.62 \pm 0.84 | 2.55 \pm 0.54 | 2.94 \pm 0.39 | 2.69 \pm 0.67 | 3.06 \pm 0.26 | 11.78 \pm 1.46 | 11.31 \pm 1.12 |
| <i>r</i> value | 0.99** | 0.93** | 0.90** | 0.57NS | 0.99** | 0.98** | 0.26** | 0.31** |
| Obese | 22.87 \pm 1.24 | 24.93 \pm 2.12 | 3.51 \pm 0.60 | 4.36 \pm 0.76 | 4.21 \pm 0.43 | 4.43 \pm 0.78 | 11.91 \pm 2.37 | 13.14 \pm 2.10 |
| <i>r</i> value | 0.93** | 0.99** | -0.06NS | 0.59* | 0.98** | 1.00NS | -0.39NS | -0.13NS |
| 7—12 years | | | | | | | | |
| Normal | 12.35 \pm 1.73 | 16.80 \pm 1.22 | 2.44 \pm 0.57 | 3.11 \pm 0.38 | 1.78 \pm 0.37 | 2.42 \pm 0.21 | 17.40 \pm 3.60 | 15.56 \pm 2.97 |
| <i>r</i> value | 0.78** | 0.34NS | 0.47** | -0.25NS | 0.91** | 0.62NS | 0.01NS | -0.30NS |
| Obese | 14.76 \pm 3.54 | 25.06 \pm 6.47 | 3.45 \pm 1.16 | 6.33 \pm 2.48 | 2.42 \pm 0.83 | 5.19 \pm 2.63 | 19.45 \pm 3.70 | 18.51 \pm 3.81 |
| <i>r</i> value | 0.95** | 0.98** | 0.92** | 0.91** | 0.98** | 0.99** | 0.46** | 0.01NS |

Table 4. Body fat composition characteristics of children based waist circumference. Values are mean \pm SD. *r* values were calculated between waist circumference and body fat components. **Significant at one per cent level. NS—Non significant.

| Study area | Body fat composition | | | | | | | |
|----------------|----------------------|------------------|-----------------|-----------------|-----------------|-----------------|------------------|------------------|
| | Per cent body fat | | Fat mass (kg) | | Fat mass index | | Fat free mass | |
| | Male | Female | Male | Female | Male | Female | Male | Female |
| 3—6 years | | | | | | | | |
| Normal | 1.02 \pm 0.66 | 16.18 \pm 1.19 | 0.46 \pm 0.10 | 2.30 \pm 0.28 | 0.15 \pm 0.10 | 2.39 \pm 0.07 | 14.19 \pm 1.68 | 11.95 \pm 1.30 |
| <i>r</i> value | 0.99** | 0.99** | 0.97** | 0.46NS | 0.99** | 0.93** | -0.08NS | -0.27NS |
| Obese | 0.91 \pm 1.04 | 16.62 \pm 1.70 | 0.14 \pm 0.16 | 2.92 \pm 0.66 | 0.17 \pm 0.19 | 2.92 \pm 0.15 | 15.28 \pm 2.70 | 14.56 \pm 2.07 |
| <i>r</i> value | 0.99** | 0.99** | 0.99** | 0.73NS | 0.99** | 0.60NS | -0.21NS | 0.22NS |
| 7—12 | | | | | | | | |
| Normal | 3.44 \pm 2.32 | 18.42 \pm 1.75 | 0.73 \pm 0.63 | 3.43 \pm 0.70 | 0.50 \pm 0.35 | 2.65 \pm 0.31 | 19.11 \pm 3.62 | 15.23 \pm 2.74 |
| <i>r</i> value | 0.99** | 0.98** | 0.97** | 0.98** | 0.99** | 0.97** | 0.41NS | -0.36NS |
| Obese | 2.67 \pm 1.38 | 17.98 \pm 1.04 | 0.62 \pm 0.43 | 4.46 \pm 0.96 | 0.43 \pm 0.24 | 3.57 \pm 0.80 | 22.27 \pm 4.29 | 20.37 \pm 4.34 |
| <i>r</i> value | 0.99** | 0.94** | 0.90** | 0.07NS | 0.93** | 0.39NS | 0.02NS | -0.25NS |

A prevalence rate of over 4% was evident in 3—6 year group and 10% in 7—12 year group. Similar to our observation, a prevalence of general obesity over 4% has been reported in pre-school children in developing countries such as Barbados, Honduras, Lesotho, Bolivia, Trinidad, Tobago, Iran and Mauritius (4, 5).

Higher prevalence of abdominal obesity compared to general obesity may be because of syndrome 'x' which is explained by "starvation gene theory" (6). It is related to the starvation gene factor in Indians caused by prolonged drought over the years. So Indian genes adapted to survive long periods of drought by consuming fats and carbohydrates slowly to make them last longer. Now, though our bodies get adequate supplies of food, these genes are still in action as they take long time to adapt, so food consumed continues to be metabolized slowly resulting in the dysfunctional biochemical profile that constitutes syndrome x.

Since obese children are in general advanced in both size and development over the average and the more so as compared with the normal children, it is scarcely surprising that the obese and normal children differ in the body fat components (7). Some part of the greater fat free mass of obese children (Table 3), even when fat mass is higher, could possibly be a direct consequence of the greater mass they carry. Fat free mass may simply be a product of the dimensional and developmental advancement associated

with hyper nutrition. Sex effects were less pronounced for body fat composition computed based on body mass index, demonstrating the reason that, in children the differences in body composition between the sexes are small compared to adults (8).

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