

## Research Article

# Food, exercise and life style changes among overweight or obese children in urban population

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## ABSTRACT

**Background:** Obesity is an important public health problem associated with risk of complications in childhood and increased mortality and morbidity in adulthood. Obesity, which was once considered as a symbol of status and wealth in some cultures is now seen as a public health crisis. In India, the available studies suggest that overweight and obesity is 8.5-29.5% and 15-7.4% respectively among school children between 6-18 years from middle and higher socio economic group. Studies have clearly demonstrated that diet and exercise improve glycemic control and some patients with diabetes treated with diet and exercise alone enter a sustained remission state lasting up to 5 years.

**Methods:** Descriptive study was done at tertiary care center, Bangalore involving two urban schools during the period of 1 year between the age group of 10-18 years. The subjects were selected by using purposive sampling procedure keeping in view the operational feasibility.

**Results:** 187 subjects were enrolled for study after informed consent taken. In the study population 88 were overweight and 99 were obese. The mean BMI of overweight was  $24.6 \pm 1.5$  and obese were  $28.8 \pm 1.9$ . In the study population questions regarding adequate fiber intake none consumed green leafy or vegetable soup/stew at least once in a week, which is rich in fiber content. Only 12% consumed fresh fruit juices 4-6 times a week and 26% consumed fruits frequently. Fat intake, 50% consumed fried food items at least 2-3 times/month. 59% of them consumed Pizza, soft drinks and tinned foods at least 2-3 times/month. 38% of them consumed butter on bread or potatoes 2-3 times/month. Level of physical activity 52.9% did mild physical activity, 28.8 % did moderate and 18.1% did severe physical activity.

**Conclusions:** Overweight/obese subjects should be educated regarding their dietary habits. Food items containing rich fiber source intake should be increased and fat intake should be reduced. Regular physical activity should be incorporated.

**Keywords:** Body mass index, International obesity task force, Metabolic syndrome, Coronary artery disease, CDC, IPAQ

## INTRODUCTION

Obesity is an important public health problem associated with risk of complications in childhood and increased mortality and morbidity in adulthood.<sup>1</sup> Obesity, which was once considered as a symbol of status and wealth in some cultures is now seen as a public health crisis. The

World Health Organization (WHO) refers to it as a 'Global Epidemic'.<sup>2</sup>

Obesity is a genetic disease (heritability range from 60-80%) as well as environmentally caused disorder which is proven by the fact that though genetic endowments haven't changed much, there is tremendous increase in

obesity related disorders that can only be explained by changes in the external factors. There are more than 300 genetic loci that are potentially involved in human body weight regulation but vast majority genetic factors are presumed to affect body weight enough to cause obesity only when specific environmental conditions prevail.<sup>3</sup>

In South America, a recent study of children and adolescents in the age group of 10 to 15 years in Brazil indicates an increase in the body mass index. This increase was observed in a multiracial population that demonstrates a propensity to develop obesity despite ethnic differences.<sup>4</sup> Prevalence of obesity in European countries ranges between 10-20%. The global prevalence of overweight children between 5 to 17 years is estimated by International obesity task force (IOTF) is approximately 10%, among them 2-3% were obese in 2000. Since the last 20 years the childhood obesity is accelerated and tripled in countries like USA, UK, France, Germany and China. In the Bogalusa Heart Study of a biracial (black/white) population representing the southeastern United States, white boys showed a greater increase in obesity rate, especially in adolescence and young adulthood, whereas black girls showed the greatest overall increase. Obesity in black girls begins at puberty around 8 years of age and notoriously accelerates into adulthood.<sup>5</sup>

In India, the available studies suggest that overweight and obesity is 8.5-29.5% and 15-17.4% respectively among school children between 6-18 years from middle and higher socio economic group.<sup>6</sup> A study conducted by Ramachandran et al in urban Indian adolescent children (13-18 years) prevalence of overweight was 17.8% for boys and 15.8% for girls. Similarly 3.6% and 2.9% were obese.<sup>7</sup>

The worldwide epidemic of childhood obesity in the last decades is responsible for the occurrence in pediatrics of disorders once mainly found in adults, such as the metabolic syndrome (MS).<sup>8</sup>

Study by Meiss and colleagues shows that those children who do not show metabolic syndrome early in childhood are less prone to develop later.<sup>3</sup>

Studies have clearly demonstrated that diet and exercise improve glycemic control and some patients with diabetes treated with diet and exercise alone enter a sustained remission state lasting up to 5 years. Data from two NHANES (National Health and Nutrition Examination Survey) surveys show that among adults aged 20-74 years, the prevalence of obesity increased from 15.0% (in the 1976-1980 survey) to 32.9% (in the 2003-2004 survey). Thirty-four percent of adults aged 20-70 are overweight. This can be partly attributed to a significant increase in total calories and carbohydrate consumption in the past 30 years.<sup>9</sup>

In 1921 Eliot P. Joslin wrote:

*"It is proper at the present time to devote not alone to treatment but still more to prevention of diabetes. The results may not be as striking or immediate, but they are sure to come and to be important".*

Parental obesity correlates with higher risk for obesity. Parental factors including weight gain during pregnancy, gestational diabetes, large for gestational babies have associated with increased risk of obesity in the later life. Simultaneously intrauterine growth restriction with early infant catch up growth is associated with the development of central adiposity and cardiovascular risk.<sup>1</sup>

The relative risk of developing obesity in young adulthood is higher for young children if they have obese parents and higher for older children if they themselves are obese. Among children 8-16 years of age, the prevalence of obesity was positively associated with hours of television viewing, even when controlling for age, race, income, caloric intake, and physical activity. During childhood levels of body fat change with highest adiposity during infancy and decrease over next 5 to 5.5 years and then again increase until adulthood.

Use of body mass index (BMI) to predict coronary artery disease (CAD) has been endorsed by Center for disease control and prevention (CDC) and IOTF. But obesity per se is not a sufficient marker to identify at risk MS and consequent CAD but fat distribution plays an important role. Visceral fat accumulation is more strongly associated with MS and its consequent complaints and waist circumference is recognized as the best predictor of visceral fat accumulation. The association between clustering of cardio vascular risk factors and waist circumference is not reflection of degree of obesity, but has a psychopathological background, given that visceral obesity is one of the main risk factors for the development of insulin resistance, DM, Hypertension and CAD.<sup>10</sup>

There is clear evidence that early detection of people with high risks, when followed by interventions like life style changes like dietary modification and increased physical activity, to delay or prevent T2DM can result reduction in incidence of diabetes and its associated complications, thereby related morbidity and mortality. This also has huge implication in reducing the cost diabetes care including the treatment of its complications.<sup>11</sup>

Hence we did prepare a standard questionnaire for adolescent children with overweight/ obesity of urban Bangalore population about their dietary habits, physical activity and sedentary life style to bring about awareness about its associated morbidity and mortality.

## METHODS

Descriptive study was done at tertiary care center, Bangalore involving two urban schools during the period of 1 year between the age group of 10-18 years. The

subjects were selected by using purposive sampling procedure keeping in view the operational feasibility.

### ***Inclusion criteria***

- Children who are overweight (BMI >85<sup>th</sup> percentile for age and sex, weight for height >85<sup>th</sup> percentile, between the age group of 10 to 18 years.

### ***Exclusion criteria***

- Known diabetic children.
- Children on steroid/drug therapy that enhance glycemic status.
- Children with syndromic features.

### ***Method of collection of data***

This descriptive study was conducted after informed consent is obtained. Ethical clearance was obtained from institutional ethical committee. All adolescent children who meet the inclusion and exclusion criteria mentioned above were recruited for the study.

### ***Sampling***

The participants were explained about the need for study, procedures involved (anthropometry, demographic data, proforma) and benefits from the study to subjects and to the population in general. Those children after effective counseling willing to participate in the study, informed consent/assent was taken.

Following the informed consent/assent all children were asked to come to the outpatient department, a pretested proforma was filled. The proforma consisted of demographic data, family history, past history, clinical history (vitals, systemic examination, head to toe examination) were recorded.

Standard questionnaire with modified International physical activity questionnaire (IPAQ) consisting of 4 parts were asked to the participants and filled.

- First part, questions regarding fruit, vegetables and fiber consumption 2-3 times a week (grade 1) to >5 times a week (grade 6). Children who consumed less than 2-3 times a week were considered nil.
- Second part consisted of dietary fat intake, like fried food stuffs (veg and non-veg) to junk foods (soft drinks pizza etc.) graded from I to V, where grade I is once a month and grade V is 5 times a week.
- Third part of the questionnaire consisted of 7 day recall physical activity graded as mild, moderate and severe.

Mild - walking slowly, stationary activity, light stretching, home care

Moderate - brisk walking, cycling, swimming, racket sports

Severe - brisk uphill, swim fast, vigorous stretching, athletics.

### ***Criteria***

Mild activity - are those participated who did not fulfill moderate or

Severe physical activity,

Moderate activity - 3 days of vigorous activity 20 min/day or

5 or more days of moderate activities for 30 min/day or

5 or more days of any combination achieving a minimum total physical activity of at least 600 min/week.

Severe/vigorous physical activity: 7 or more days achieving 1500 min/week or

Vigorous activity achieving total of 3000 min/week.

- Fourth part consisted of questions regarding their daily activities with reference eating habits and physical activities were recorded.

### ***Anthropometric measurements were recorded***

a) *Height & weight:* Measurements were recorded using calibrated stadiometer and digital weighing machine. Height to nearest (mm) & weight (to nearest 100 g) were rewarded using standard techniques with minimal clothing

b) *BMI was calculated using the formula:*

$$BMI = \frac{\text{Weight (Kg)}}{\text{Height (m}^2\text{)}}$$

Obese: BMI for age and sex >95<sup>th</sup> centile

Over weight: BMI for age and sex >85<sup>th</sup> centile

WHO charts of BMI for age & sex were used as standard reference & plotted. Children with BMI >95<sup>th</sup> percentile were considered obese. BMI percentile between >85 & <95<sup>th</sup> percentile were overweight and >95<sup>th</sup> centile were obese as per WHO standard.

### c) Waist circumference

The waist circumference was taken in standing posture after asking the subjects to raise their shirts and the midpoint between the lowest rib and the anterior superior iliac spine was marked and non-stretchable measuring tape was placed snugly around this point and the reading was made to the nearest of 0.1 cm at inspiration. Centile charts were used to classify the study population into overweight and obese. Age and sex specific centile charts were applied.<sup>15</sup>

### d) Hip circumference

With the child standing erect with arms at the sides and feet together, the measurer sitting at the side of the subject so that the level of the maximum extensions of the buttocks can be seen, the measuring tape is placed around the buttocks in the horizontal plane. The tape is snug and the reading is made to the nearest 0.1 cm.

### d) Waist-Hip ratio:

$$\text{Waist - Hip ratio} = \frac{\text{Waist circumference (cm)}}{\text{Hip (cm)}}$$

Waist circumference and hip ratio were calculated and were grouped into overweight and obese group using the centile charts derived from Urban Bangalore population.<sup>15</sup>

All subjects underwent general and physical examination. Blood Pressure was recorded thrice in each subject using manual sphygmomanometer at an interval of 10 minutes and mean Blood Pressure was recorded.

Clinical features such as acanthosis nigricans, skin tag, buffalo hump, striae and PCOD in females were recorded.

### Statistical methods

Descriptive statistics were reported using mean and SD for the continuous variables, number and percentages for categorical variables. Independent t test was used to

compare the anthropometric measures. All the analysis were done using SPSS version 18.0 software.

## RESULTS

A total of 924 children were screened according to age and sex specific WHO charts for >85<sup>th</sup> centile to classify them into overweight and >95<sup>th</sup> centile as obese.

Out of this population 187 were enrolled for study after informed consent taken. In the study population 88 were overweight and 99 were obese. The mean BMI of overweight was  $24.6 \pm 1.5$  and obese were  $28.8 \pm 1.9$ .

**Table 1: Baseline characteristics among overweight and obese children.**

| N=187               | Over weight      | Obese            |
|---------------------|------------------|------------------|
| Age (years.)        | $14.5 \pm 3.53$  | $14.9 \pm 3.60$  |
| Sex (Male)          | 48 (55.81%)      | 37 (43.02%)      |
| Weight (kg)         | $51.5 \pm 12.2$  | $73.2 \pm 15.55$ |
| Height (meters)     | $1.59 \pm 0.18$  | $1.52 \pm 0.70$  |
| BMI                 | $24.6 \pm 1.5$   | $28.8 \pm 1.9$   |
| Waist circumference | $84.2 \pm 9.1$   | $89.1 \pm 6.9$   |
| Waist/Hip ratio     | $0.80 \pm 0.06$  | $0.99 \pm 0.18$  |
| Systolic BP         | $110.9 \pm 16.4$ | $124.6 \pm 15.7$ |
| Diastolic BP        | $74.4 \pm 8.2$   | $84.3 \pm 7.8$   |

**Table 2: Clinical findings in the study population.**

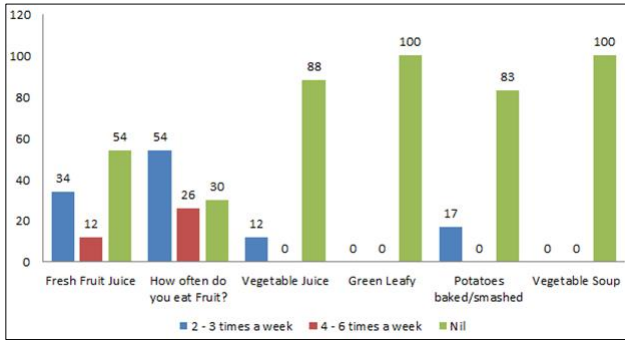
| Clinical findings    | Number | Percentage |
|----------------------|--------|------------|
| Acanthosis nigricans | 10     | 5.3        |
| Buffalo hump         | 7      | 3.7        |
| PCOD                 | 7      | 6.9        |
| Striae               | 15     | 8          |
| Skin tag             | 4      | 2.1        |

In the study population 8% had clinical finding of striae, followed by 5.3% of acanthosis nigricans, as marker of insulin resistance. Among females 6.9% had polycystic ovarian disease.

Questionnaire category:

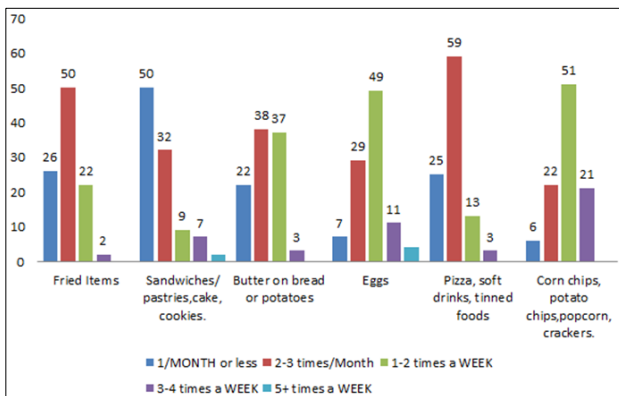
**Table 3: Questions regarding fiber intake.**

| Duration         | Fresh fruit juice (%) | Fruits (%) | Vegetable juice (%) | Green leafy (%) | Potatoes baked / smashed (%) | Vegetable soup (%) |
|------------------|-----------------------|------------|---------------------|-----------------|------------------------------|--------------------|
| 2-3 times a week | 34                    | 54         | 12                  | 0               | 17                           | 0                  |
| 4-6 times a week | 12                    | 26         | 0                   | 0               | 0                            | 0                  |
| Nil              | 54                    | 30         | 88                  | 100             | 83                           | 100                |



**Figure 1: Questions regarding fiber intake.**

In the study population questions regarding adequate fiber intake none consumed green leafy or vegetable soup/stew at least once in a week, which is rich in fiber content. Only 12% consumed fresh fruit juices 4-6 times a week and 26% consumed fruits frequently.



**Figure 2: Questions regarding dietary fat intake.**

In the study population questions regarding fat intake, 50% consumed fried food items at least 2-3 times/month. 59% of them consumed Pizza, soft drinks and tinned foods at least 2-3 times/month. 38% of them consumed butter on bread or potatoes 2-3 times/month.

**Table 4: Questions regarding physical activity in overweight/obese category.**

| Physical activity | No. | %    |
|-------------------|-----|------|
| Mild              | 99  | 52.9 |
| Moderate          | 54  | 28.8 |
| Severe            | 34  | 18.1 |

Table 4 shows questions regarding physical activity in overweight/obese category.

In the study population categorized according to the level of physical activity 52.9 % did mild physical activity, 28.8 % did moderate and 18.1% did severe physical activity.

**Table 5: Dietary habits in relation leisure time.**

|   | Yes (%)     | No (%)      |
|---|-------------|-------------|
| Do you seek food in absence of hunger?  | 84 (44.91)  | 103 (55.08) |
| Do you have a sense of control over eating?   | 70 (37.43)  | 117 (62.56) |
| Do you seek food in response to sadness, boredom, and restlessness?                             | 65 (34.75)  | 122 (65.24) |
| Do you seek food as a reward?   | 113 (60.42) | 74 (39.57)  |
| Do you sneak or hide food?  | 101 (54.01) | 86 (45.98)  |
| Do you after bingeing use inappropriate behaviours like purging, fasting or excessive exercise? | 48 (25.66)  | 139 (74.33) |
| Do you skip or delay breakfast?   | 67 (51.87)  | 120 (64.17) |
| Do you eat more than half of the daily food after evening (5.00pm)?                             | 72 (38.50)  | 115 (61.49) |
| Do you wake up frequently at night (after 11.00pm and before 5.00am) and eat?                   | 26 (13.90)  | 161 (86.09) |
| Do you visit fast foods restaurants very often (5 or more times/week)?                          | 44 (23.52)  | 143 (76.47) |
| Do you consume lunch/dinner in groups? (group must have atleast nine children)                  | 62 (33.15)  | 125 (66.84) |

## DISCUSSION

Our study population constituted more between 13-15 years and had stage II (34%) and stage III (31%) prevalence. BMI increases with increasing SMR staging.

Study done by S. Shaitil<sup>12</sup> et al. had higher incidence of stage V (49.6%) and stage I (57%). This is because in their study population was between 5-22 years. Our study population age category was 10-18 years.

### Lifestyle changes

We applied a standard questionnaire to know the life style habits in study population.

Question regarding dietary fiber intake was asked which include consumption of food items rich in fiber content. In our study, none of the participants consumed green leafy, vegetables soup at least once in 2-3/weeks and fruits intake was moderate.

Questions regarding dietary fat intake, food terms rich in fat like fried veg/N. veg, sandwiches, butter, eggs, pizza s were consumed maximum in the study population at least 1-2 times/week to 2-3 times/month.

Most of the study population had mild physical activity in 7 day recall method.

According to age and sex specific WHO BMI charts, all 924 children were screened for  $>85^{\text{th}}$  centile charts. 187 children were included in the study, 47.05% were overweight and 52.95% were obese by BMI centile charts. The mean BMI of the study population, overweight  $24.6 \pm 1.5$  and obese  $28.8 \pm 1.9$ .

Study conducted by Ranjana Sinha<sup>13</sup> et al. to determine IGI among children and adolescent had a mean BMI of  $30 \pm 1$ . In this study the subjects were morbid obesity. Study done by Mehmet Keskin<sup>14</sup> et al. had mean BMI of  $31.29 \pm 5.89$ . Most of studies in children and adolescent age group, obese children were considered. In our study, subjects consisted of both overweight and obese.

From the population of age and sex specific BMI charts, waist/height ratio was further classified by age and sex specific centile charts, derived from urban population of Bangalore.<sup>15</sup>

According to age and sex specific waist/height ratio, 62 were overweight, 18 were obese and 20 belonged to normal ratio. Similarly for age and sex specific centile charts for waist circumference 62 were overweight, 18 obese and 20 belonged to normal category.<sup>15</sup>

## CONCLUSIONS

Dietary habits in these study population is to be influenced and lifestyle modifications has to be inculcated. Eating habits in this urban population was more westernized. Overweight/obese subjects should be educated regarding their dietary habits. Food items containing rich fiber source intake should be increased and fat intake should be reduced. Regular physical activity should be incorporated.

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