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Original Research Article

A study of obesity and its associated factors among school Children

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Background: Childhood obesity is an important indicator to predict adulthood obesity and its complications. Obesity and overweight in children can lead to complications like hypertension, dyslipidaemia, hypercholesterolemia, diabetes mellitus and coronary artery disease in their adulthood and an increased risk of early morbidity and mortality.

Material and Methods

Study Design: This was a school-based, cross-sectional, questionnaire based study carried out over a period of six months at Department of Physiology, Alluri sitarama Raju academy of sciences Eluru, Andhra Pradesh. We adopted a multistage stratified random sampling procedure. Six schools were selected by a simple random technique. The subjects were children, 6 to 15 years of age. Children with history of chronic diseases like Tuberculosis, asthma, diabetes were not included. Anthropometric measurements: Trained investigators weighed all of children without shoes and heavy clothing, using an electronic weighing scale with an error of ±100 g.

Result: A total of 90 children in the age group of 6 to 15 years were analyzed. Out of these 59 (65%) subjects were males and 31 (35%) subjects were females. Body Mass Index, we have categorized Male and Female as Underweight (UW), Healthy weight (HW) and Overweight + Obese (OW). The average Body Mass Index (BMI) for boys was 17.9 and that of girls was 18.32.

In male category, 67 (38%) were underweight, 71 (40.3%) were healthy weight and 38 (21.5%) were Overweight + Obese. In female category, 36 (29%) were underweight, 57 (45.9%) were healthy weight and 31 (25%) were Overweight + Obese. It has been found that, more no. of subjects and more than 2 hours watching T.V are from overweight+obese group whereas less than 1 hours watching T.V belonged to underweight and healthy weight were less numbers.

Conclusion: We found a high prevalence of overweight and obese children in our study. Since obesity in adulthood has its onset in childhood, it is important to have effective implementation of school health activities to reduce and curb the burden of childhood obesity.

Keyword: Obesity, overweight children, physical activity

Introduction

The overweight and obesity among children has widely increased worldwide, making it one of the most common chronic disorders in this age group [1]. The use of body mass index (BMI) for age to define being overweight and obese in children is well established for both clinical and public health applications, because of their feasibility under clinical settings and in epidemiological studies [2]. In children, the natural increases in BMI that occur with age necessitate the use of age-sex-specific thresholds. The most widely used growth charts are the Centers for Disease Control and Prevention (CDC-2000) [3], the International Task Force (IOTF) [4], and the 2007 growth references for 5 to 19 year olds produced by the World Health Organization (WHO-2007) [5].

India being a developing country, is also facing problem of the double burden of disease, in

which one end includes childhood and adolescent obesity and other end consists of infectious disease, malnutrition and underweight [6]. The prevalence of obesity among adolescent in India is increasing significantly in recent years from 9.8% in 2006 to 11.7% in 2009 [7].

Although valuable information has been appearing in the literature or online, such as works from the Health Behaviour of School-aged Children study which is mainly related to social determinants of health and well-being among young people [8], no systematic review has been conducted to understand the worldwide magnitude of the overweight and obesity problem among the adolescent population. Thus, the objective of this study was to systematically review the literature regarding the prevalence of overweight and obesity in adolescents (10–19 years old) of both sexes published in the past 12 academic years (1999–2011) [9].

A sedentary lifestyle with low energy expenditure and consumption of high-calorie foods with low nutritional value are assumed to be the two most important factors responsible for the increasing rate of childhood obesity [10]. Overweight children have greater chances of becoming overweight or obese as they enter adulthood and are at a greater risk for chronic disease conditions in adulthood [11-12].

Materials and Methods

This is a prospective, observational study, cross-sectional, questionnaire based study conducted over a period of 6 months at Department of Physiology, Alluri sitarama Raju academy of sciences, Eluru, Andhra Pradesh.

The subjects were children, 6 to 15 years of age. After reaching the concerned school, the classes were selected randomly from each grade. Students were selected from each class by the simple random technique, using the students register, till the desired sample from each class was met. Children with history of chronic diseases like Tuberculosis, asthma, diabetes were not included.

Anthropometric measurements: Trained investigators weighed all of children without shoes and heavy clothing, using an electronic weighing scale with an error of ±100 g. The weighing scale was regularly checked with known standard weights. A portable anthropometric rod was used for measuring the height, with an error to the nearest of 0.1 cm, using standard procedures.

Questionnaire: A predesigned and pretested interviewer administered questionnaire was used to collect information. Information was collected on physical activity, such as participation in sports and games, aerobic physical exercises. Diet preferences such as vegetarian, Non-vegetarian or mixed were taken into consideration.

Statistical Analysis: Body mass index (BMI, kg/m2) was calculated on measured height and weight and was used to identify underweight, overweight and obese conditions using age and sex appropriate normative cut points. For classification, WHO reference charts for BMI, 2007 different for boys and girls, was used. Children were categorized into three groups namely underweight (≤ 5th percentile), normal (5th to 85th percentile) and overweight (≥ eighty-fifth percentile) + obese (≥ ninety-fifth percentile). We examined the prevalence of overweight, healthy weight and underweight in each gender by age group and sex. Group comparisons were performed using tables gender wise (Male and female)

Result

A total of 90 children in the age group of 6 to 15 years were analyzed. Out of these 59 (65%) subjects were males and 31 (35%) subjects were females in table 1.

Table 1: Gender wise distribution of subjects

Subjects	Frequency	Percentage
Male	59	65
Female	31	35
Total	90	100

Table 2: BMI category for male and female

Subjects	Male Frequency (%)	Female Frequency (%)
Underweight (UW)	21 (35.5)	36 ()
Healthy weight (HW)	27 (45.7)	57 (19)
Overweight + Obese (OW)	11 (18.6)	31 (10.3)
Total	59 (100)	31 (41.3)

In table 2, Body Mass Index, we have categorized Male and Female as Underweight (UW), Healthy weight (HW) and Overweight + Obese (OW). The average Body Mass Index (BMI) for boys was 17.9 and that of girls was 18.32.
In male category, 67 (38%) were underweight, 71 (40.3%) were healthy weight and 38 (21.5%) were Overweight + Obese. In female category, 36 (29%) were underweight, 57 (45.9%) were healthy weight and 31 (25%) were Overweight + Obese.

Table 3: Distribution of BMI (Category) according the dietary pattern.

Subjects	Vegetarian n (%)	Non-Vegetarian n (%)	Mixed N (%)	Total
Underweight (UW)	23 (7.6)	37 (12.3)	43 (14.3)	103 (34.3)
Healthy weight (HW)	29 (9.6)	41 (13.6)	58 (19.3)	128 (42.6)
Overweight + Obese (OW)	18 (6)	22 (7.3)	29 (9.66)	69 (23)

In table 3 shows the distribution of BMI (Category) according the dietary pattern.

Table 4: BMI distribution according to the duration of T.V/phone/Tab/Computer viewing per day.

Subjects	Less than 1 hour N (%)	1 to 2 hours N (%)	More than 2 hours n (%)	Total
Underweight (UW)	47 (15.6)	33 (11)	23 (7.6)	103 (34.3)
Healthy weight (HW)	61 (20.3)	39 (13)	28 (9.3)	128 (42.6)
Overweight + Obese (OW)	9 (3)	22 (7.3)	38 (12.6)	69 (23)

In table 4, From the above figures it has been found that, more no. of subjects and more than 2 hours watching T.V are from overweight+obese group whereas less than 1 hours watching T.V belonged to underweight and healthy weight were less numbers.

Table 5: BMI distribution according to the physical activity per day.

Subjects	Always (7 days) n (%)	Often (3–5 days) n (%)	Sometimes (1–2 days) n (%)	Rare (0–1 day) n (%)	Total
Underweight (UW)	53 (17.6)	39 (13)	11 (3.6)	3 (1)	103 (34.3)
Healthy weight (HW)	43 (14.3)	40 (13.3)	35 (11.6)	11 (3.6)	128 (42.6)
Overweight + Obese (OW)	5 (1.66)	9 (3)	21 (7)	34 (11.3)	69 (23)

In table 5, it has been found that, more no. of subjects doing physical exercise are from healthy weight group whereas less no. of subjects doing physical exercise belonged to underweight and overweight + obese. Thus physical exercise helps in maintaining healthy weight and prevents obesity and underweight.

Discussion

This study employed an analytical approach that provides insight into two types of commonly recognised risk factors for adult obesity-demographic and dietary factors. In recent decades, the double burden of malnutrition-the coexistence of under-nutrition and over-nutrition in the same population-has become a prominent public health concern in transitional countries. Traditional diet has been replaced by the 'Western diet' and major declines in all phases of activity and increased sedentary activity as the

main reasons explaining the rapid increase in overweight and obesity, bring major economic and health costs [13].

According to a study carried out among Chinese urban children and adolescents (aged 7–18 years) in 2000, the prevalence of obesity in boys was 6.5% in Beijing, 4.9% in Shanghai, 4.5% in coastal big cities, and 2.0% in coastal medium/small-sized cities, respectively, while the prevalence of obesity and overweight in girls of the same age group was 3.7% in Beijing, 2.6% in Shanghai, 2.8% in coastal big cities, and 1.7% in coastal medium/small-sized cities, respectively [14]. The China Health and Nutrition Surveys reported that the prevalence of obesity in children aged 7–17 increased from 5.2% in 1991 to 13.2% in 2006, and the most noticeable increase was in children from urban areas and those from higher income backgrounds [15]. In our study, the prevalence of obesity reached 10.1%, 7.3% and 6.5% among city, township and rural area adults in Zhejiang province. The prevalence of obesity in the coastal big cities, followed by that in the township cities, had reached the average level of the developed countries, and the result was consistent with Ji CY's study [16].

Ji CY also reported that the prevalence of obesity was low in most of the inland cities at an early stage of epidemic overweight. The epidemic manifested a gradient distribution in groups, which was closely related to the socioeconomic status of the populations [17]. This was also consistent with the previous report that a higher prevalence of obesity was observed in the more educated, urban, high income and high social status segments of society [18]. Recently, in Drewnowski A's study, census tract level home values and college education were more strongly associated with obesity than household incomes. For each additional $100 000 in median home values, the census tract obesity prevalence was 2.3% lower. The three socioeconomic status factors together explained 70% of the variance in census tract obesity prevalence [18].

There was a pattern that the risk of obesity was greater among city residents with higher education. It seems possible that the education level may be complicating the relationship between dietary behaviour and obesity. On the one hand, residents with a higher education level are more likely to endorse health ideals such as a more healthy diet or physical activities to preserve a good body image [19], and linked to a lower prevalence of obesity among city residents, and the result was consistent with previous studies [20, 21]. On the other hand, a higher education level may be associated with clerical work or increased sitting time among township residents and rural residents, which one might expect would increase the risk of obesity; thus, we could not find the effect of education level on the risk of obesity in a township and rural area. In addition, this inconsistency between city and township residents and rural area residents was similar to the opinion that an initial increase from low social economic status to mid-level social economic status was associated with worse health outcomes and behaviours; however, the continued increase from mid-social economic status to high social economic status saw returns to healthy outcomes and behaviours [22].

The major finding of dietary factors among city residents was that residents with obesity have a higher daily intake of rice and its products and pickled vegetables. BMI increased with the daily intake of rice and its products, wheat flour and its products, light coloured vegetables, pickled vegetables, nut, pork and sauce and decreased with the daily intake of tubers, dried beans, milk and dairy products. In a township, residents with obesity have a higher daily intake of vegetable oil, salt, chicken essence, monosodium glutamate and sauce. The major finding among rural area residents was that BMI increased with the daily intake of pork, fish and shrimp, vegetable oil and salt, but decreased with the daily intake of dark coloured vegetables. The differences in relationship between dietary factors and BMI among city, township and rural area residents may be due to the different dietary patterns, as reported in the literature [23], but a daily intake of salt and foods high in salt and sugar such as sauce, chicken essence and pickled vegetables was associated with high BMI.

This was consistent with the ecological study of the UK and other previous studies [24, 26]. Also, a

Swiss study found a positive association between obesity and salt intake [27]. This was also consistent with the policy and action on nutrition and health promotion in many countries. In the UK, a wide range of policies are in place, including support for breastfeeding and healthy weaning practices, nutritional standards in schools, restrictions on marketing foods high in fat, sugar and salt to children, schemes to boost participation in sport, active travel plans, and weight management services [28, 29]. In recent years, there has been increased interest in the public health benefit of small changes to behaviours. The developing world needs to give far greater emphasis to addressing the prevention of the adverse health consequences of this shift to the nutrition transition stage.

Among city residents, the daily intake of milk and dairy products was associated with low BMI; this result was similar to the results of a random-sample population-based study in Córdoba, Argentina [30]. Among rural residents, the daily intake of dark coloured vegetables was associated with low BMI, while the daily intake of vegetable oil was associated with high BMI. The obesity problem needs to be tackled differently in the city, township and rural area as their correlated dietary factors are not the same.

Conclusion

In conclusion, the present study indicates that the prevalence of overweight and obesity among children has been very high during the past years. Furthermore, the main influencing factors for overweight and obesity are sex, age, diet, physical activity and leisure time (watching T.V/Phone/Tab/Computer). These data suggest that efforts related to the prevention and control of overweight and obesity should be a public health priority in the India. These findings will be submitted to relevant departments as a reference for efforts to reverse these trends.

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