

LIFESTYLE FACTORS AND OBESITY AMONG ADOLESCENTS IN RURAL SOUTH INDIA

PRASANNA MITHRA P^{1*}, PAWAN KUMAR², VEENA G KAMATH², ASHA KAMATH², UNNIKRISHNAN B¹, REKHA T^{1,3}, NITHIN KUMAR¹

¹Department of Community Medicine, Kasturba Medical College (Manipal University), Mangalore, Karnataka, India. ²Department of Community Medicine, Kasturba Medical College (Manipal University), Manipal, Karnataka, India. ³Deputy Director Student Affairs (Mangalore Campus), Kasturba Medical College (Manipal University), Mangalore, Karnataka, India.
Email: prasanna.mithra@manipal.edu

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ABSTRACT

Objectives: To estimate the prevalence of obesity among adolescents of the study area and to study the association of physical activity, dietary habits with obesity.

Methods: This was a school based cross sectional study conducted among 2963 adolescents in Udupi. They were interviewed using pre-tested questionnaire, followed by body mass index measurement and classification using World Health Organization criteria. Statistical analysis was done using Mann-Whitney U-test, Kruskal-Wallis test, and Chi-square tests.

Results: The prevalence of overweight was 2.4% and obesity 1.4% and they were higher among the adolescents belonging to higher socio-economic status, among those using motorized transport. Furthermore, 93.2% of the subjects consumed readymade food items apart from homemade ones, 28.8% of them had the habit of eating in between the regular meals, and 59.6% of the subjects had the habit of consuming carbonated beverages regularly.

Conclusions: Current levels of obesity and lifestyle factors among the adolescents in the study area can significantly predispose them to the risk of non-communicable diseases, which needs to be considered while making policies for non-communicable diseases.

Keywords: Adolescents, Obesity, Overweight, Lifestyle, Diet, World Health Organization.

INTRODUCTION

Non Communicable Diseases (NCD) currently represent nearly half of the worldwide disease burden and by the year 2020, they are expected to reach 60% level & 73% of all deaths globally. [1] About 79% of the deaths attributed to the NCD are occurring in the developing countries. Several factors, such as demographic, dietary transition, and the globalization of economic processes, are believed to be the contributing factors to this scenario [1]. According to the available literature, India and other developing countries are having double problem of under and over-nutrition. Thus obesity and its consequences have renewed the interest in adolescent anthropometry. [2].

Metabolic and cardiovascular risk factors continue to adult life from childhood leading to higher morbidity and premature mortality. There is an urgent and increased need for study on lifestyle-related diseases and conditions in adolescents. [3] World Health Organization (WHO) defines adolescents as young people aged 10-19 years. Currently, nearly one fifth of the global population consists of adolescents, i.e. 1.2 billion. Also, their numbers are found to be on the rise. Adolescents are usually open to new ideas; they show curiosity and interest. Many habits acquired during adolescence will last a lifetime [1].

The current eating environment of adolescents is characterized by easily accessible, economical and large portions of highly palatable food items. [4] These patterns are combined with sedentary lifestyle, motorized transport, and labor-saving devices in the home [5]. There is a paucity of studies on adolescent overweight and obesity, along with their related lifestyle factors in developing rural areas. The current study was done in rural areas of Udupi Taluk; an administrative division of Udupi district in Southern Indian state of Karnataka. It is a rapidly developing region economically and educationally [6].

METHODS

This was a school based cross-sectional study done in the rural areas of Udupi Taluk, among the adolescents aged 10-18 years for a period of 2-year following September 2009. The sample size was estimated to be 2963 by using the anticipated prevalence as 5.7% [7], precision rate of 15%, 95% confidence interval (CI), and 10% non-response error. Stratified cluster random sampling was used in this study to select the required clusters. The schools and pre-university colleges of Udupi Taluk were taken as the clusters in this study. They were further divided into aided (Private institutions salaried by the government with minimum fees), government (totally under the government management), and unaided (totally under private management; mainly catering to the affluent part of the society). The Institutional Ethics Committee approval was obtained and necessary permissions were taken from the educational officers and school authorities of the study area. They were visited on a pre-informed date for data collection. The subjects were explained about the study and their assent was obtained and through them their parents' consents were taken. Then face to face interviews were conducted using a pre-tested semi structured questionnaire which included their diet patterns and physical activity profiles. This was followed by the measurement of their heights and weights using the WHO specified methods. Then the body mass index (BMI) was calculated using the formula:

$$\text{BMI} = \text{weight in kg} / (\text{height in m}^2)$$

However, the subjects below 14 years were excluded from the interviews for reliability issues.

Those subjects who were severely ill, with obvious skeletal deformities and those who were not willing to participate were excluded from the study. The criterion used for the diagnosis of overweight and

obesity based on the BMI, for age and sex, was as per the WHO recommendations - >95th percentile for obesity and >85th percentile for overweight [8,9]. The collected data was coded and entered on to Statistical Package for Social Sciences (SPSS) version 11.5. The results were expressed as proportions and to compare across the groups, Mann-Whitney U-test, Kruskal-Wallis test, and Chi-square (χ^2) tests were used and $p < 0.05$ was taken as statistically significant.

RESULTS

The subjects in our study were between the age of 10 years and 18 years. There were 1898 (64%) subjects <14 years of age and 1065 (36%) >14 years. The mean age of the subjects was 12.9 (standard deviation: 2.1) years. The overall prevalence of overweight was 2.4% (95% CI: 2.395, 2.405) and obesity 1.4% (95% CI: 1.396, 1.404) in the study area. The socio-demographic characteristics of the subjects and their nutritional status are shown in Table 1.

The prevalence of overweight and obesity was much higher among the adolescents aged <14 years and those belonging to un-aided schools (9.3% [95% CI: 9.28, 9.32]), which was statistically significant ($p=0.02$ and $p<0.0001$, respectively). Among the 1065 subjects, who were aged 14 years and above, 36.4% walked from between home and the school, 15.3% used bicycles and 48.3% other vehicles. Among the subjects who walked, 1.1% were overweight and obese, 3.0% among those using bicycle, and 3.9% among other vehicles. The difference was statistically significant ($p=0.023$).

Among the subjects involved in the physical activity beyond school hours, 1.6% were obese and overweight as compared to 6.8% of the subjects who were not involved. Furthermore, 42.3% of male subjects involved in >3 hrs of daily physical activity beyond the school hours compared to 7% of females. This difference was statistically significant ($p<0.0001$). In our study, 59.6% of the subjects had the habit of consuming carbonated beverages regularly. Among those consuming the carbonated drinks regularly, 1.9% were overweight and 0.6% were obese. As the Table 2 shows, 93.2% of the 1065 subjects had the habit of consuming readymade food items apart from homemade ones.

Among those subjects with the habit, 51.8% were normal, 2.8% were obese and overweight, as compared to 56.9% normal, and 2.8% were obese and overweight among those without the habit. However, these differences were not statistically significant.

The overall physical activity was computed using the average duration of household work, average duration of regular walking, and time taken in walking to school (among those, whose mode of transport to school was walking). Table 3 describes the medians and inters-quartile ranges for all the categories in nutritional status with respect to the overall average physical activity per week. The overweight and obese subjects,

had lesser duration of activity, who showed statistically significant difference from normal and underweight subjects. Even when this duration of overall physical activity was compared to the mean BMI for age and sex, it correlated significantly ($p<0.0001$).

DISCUSSION

This study included the adolescents in the rural area of Udipi Taluk and district in Southern India. The factors evaluated were the level of overweight and obesity among the subjects and their life style related factors along with the socio-demographic correlates. The study findings are consistent with the observations made by Deshmukh *et al.* [10] in rural Wardha in Gujarat, where 2.2% of males and 1.7% females were overweight, with overall prevalence of obesity being 2.2% and Kapil *et al.* [11] (9.4% of obesity in boys compared to 8.3% in girls). They observed significant gender differences in obesity among adolescents from the affluent classes wherein males had higher levels. Also, those adolescents from low socio economic class did not have gender differences being significant in obesity levels. Similar findings were reported by Singh *et al.* [12] in New Delhi in 2003. As per the study conducted by Fairclough and Boddy [13] in England on young adults and adolescents in 2005, where high number of subjects used motorized transport even for a short distance. Singh *et al.* [14] in their study observed that 18.3% boys and 22.2% girls were physically inactive (activities less than 60 minutes/day for at least 3 days in a week). Also, 54.4% boys and 69.3% girls were not involved in school based or leisure time sports activities.

The Childhood and Adolescence Surveillance and Prevention of Adult NCD study by Kelishadi *et al.* [15] showed that the physical activity level was significantly higher among boys, those from rural areas and studying in intermediate schools v/s high-school. The BMI had a significant inverse association with the physical activity. Laxmaiah *et al.* [16] in Hyderabad studied the contributing factors on urban adolescent obesity. They found that adolescents taking part in outdoor gaming had significantly lower level of overweight and obesity (3.1% v/s 9.7%).

Ekelund *et al.* [17] in their Stockholm Weight Development Study, known as SWEDES which was a follow-up study since 1984, in 2006 reported that the outdoor physical activity was more among males and also the relationship of this physical activity to obesity status was more among males. Furthermore, Laxmaiah *et al.* [16] found that involvement in household activities had significantly lower levels of obesity (4.7% as compared to 18.6% among those not involving in household activities) among the adolescents. Chugh and Puri [18] in New Delhi studied the physical activity and dietary behavior of 150 affluent adolescent girls of ages 16-18 years. More than half of subjects were physically inactive and the proportion was highest among obese subjects.

The observations made by Janssen *et al.* [19] showed that consumption of food items outside home made ones saw three times increase over 2 decades among children. Also, 42% of children in their study area reported fast food consumption. In addition to that they also observed a lack of uniformity in definitions of fast food items across various studies.

Chugh and Puri [18] also observed that nearly all the subjects in their study were indulged in snacking, irrespective of their nutritional status. They concluded that snacking outside food items apart from home food was common among adolescents. Cleland *et al.* [20] observed that, among Australian young adults, the eating habits were increased with the increase in TV watching duration.

Thus, this study adds that the lifestyle factors conducive to adolescent obesity are at high levels even in rural areas. So, far the policy makers and public health scientists have been concentrating on urban areas. However, the strategies need to be formulated to reduce the adolescent obesity and their related lifestyle factors to the rural areas. Furthermore, the current study area is having a high literacy rate and

Table 1: Socio-demographic characteristics of the study population and nutritional status (n=2963)

Characteristics	Nutritional status (n (%))			p value
	Normal and below	Overweight	Obese	
Age group (years)				
<14	1814 (95.6)	52 (2.7)	32 (1.7)	0.02*
≥14	1036 (97.3)	19 (1.8)	10 (0.9)	
Gender				
Male	1483 (96.0)	37 (2.4)	24 (1.6)	0.81
Female	1367 (96.3)	34 (2.4)	18 (1.3)	
Type of school				
Government	0620 (99.0)	05 (0.8)	01 (0.2)	<0.0001*
Aided	1465 (98.1)	22 (1.5)	06 (0.4)	
Private	0765 (90.6)	44 (5.2)	36 (4.1)	
Total	2850 (96.2)	71 (2.4)	42 (1.4)	

*Significant at $p=0.05$ level

Table 2: Diet related lifestyle of the subjects and their nutritional status (n=1065)

Eating habits	Nutritional status (n (%))			
	Underweight	Normal	Overweight	Obese
Eating readymade food items				
Yes (n=993)	452 (45.5)	514 (51.8)	19 (01.9)	8 (00.8)
No (n=72)	029 (40.3)	041 (56.9)	00 (0.00)	2 (02.8)
Eating in between the regular meals				
Yes (n=307)	136 (44.3)	159 (51.8)	08 (02.6)	4 (01.3)
No (n=758)	345 (45.5)	396 (52.2)	11 (01.5)	6 (00.8)

Table 3: Overall average physical activity and nutritional status of the study population (n=1065)

Overall physical activity in a week				
Nutritional status	n (%)	Median (minutes)	Inter quartile range (minutes)	p=0.001*
Underweight	481 (45.2)	270.0	140.0-420.0	
Normal	555 (52.1)	285.0	195.0-420.0	
Overweight	019 (01.8)	105.0	0.0-315.0	
Obese	010 (00.9)	150.0	0.0-270.0	

*Significant at p=0.05 level

the overall health seeking behavior of people is favorable [6]. If this area has such level of modifiable risk factors for young people, the other areas without favorable socio-demographic indicators would face a problem with higher magnitude.

CONCLUSIONS

The prevalence of overweight and obesity are of health problem even in rural areas especially among those from higher socio-economic strata. The overall physical activity duration was significantly lesser among those overweight and obese in addition to the use of motorized transport. There was gender difference in activities of house hold work and outdoor playing (more among males). The adolescents also had the habit of consuming outside readymade snacks and carbonated drinks apart from home-made food items. These factors could lead to excess calorie intake and also decreased calorie expenditure; therefore, could increase the risk of lifestyle-related disorders.

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