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ASSESSMENT OF PREVALENCE OF OVERWEIGHT AND OBESITY AMONG ADOLESCENT GIRLS IN RURAL AREAS OF BAGEPALLI TALUK OF CHIKKABALLAPURA DISTRICT, KARNATAKA, SOUTH INDIA

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ABSTRACT

Background: Childhood overweight and obesity has become a major public health concern globally because of its adverse health consequences and escalating prevalence. The factors underlying the disease conditions manifested during adulthood commonly originate in childhood. Overweight and obese children are more likely to grow to become overweight and obese adults with higher chances of developing non-communicable diseases like diabetes and CVDs. **Objectives:** 1. To assess the prevalence of overweight and obesity among the adolescent girls in rural areas Bagepalli taluk. 2. To study the risk factors associated with overweight and obesity. **Materials and Methods:** A Cross-Sectional study was conducted to assess the prevalence on overweight and obesity among government and private high school going adolescent girls in rural area of Bagepalli taluk in Chikkaballapura district. Necessary permission from the concerned authority including the education department block education officer (BEO) in Bagepalli taluk and school principle was been obtained from respective schools. A proportionate sampling technique was used in this study and sampling size 100 was calculated by using prevalence-based formula 4pq/L2, with the prevalence – 6.86%, Q = (100-P), L= Error (5%). n =4(6) (100-6)/(5)2. n = 2,256/25 = 90.26 n =100. And then a semi – structured interview schedule was been used to get the information of family characteristics and individual characteristics. Physical examination was be conducted anthropometric measurements of height, weight, waist – hip ratio was be taken using standard equipment's to calculate body mass index (BMI) and central obesity (waist-hip ratio). **Results:** The overall prevalence of overweight and obesity among adolescent girls according to the body mass index cut off overweight were 30.0%, obesity 5.55%, normal 31.11%, and underweight were 33.33% (30). The overall prevalence of overweight and obesity among adolescent girls were 35.5% from private and government school. The associate risk factors among overweight and obesity among physical activities like walk regularly, weight increased during covid-19 online classes, and transportation. Dietary habits like fruits consumed, junk food consumption. Sleep characteristics like sleep duration weekdays, insomnia, type of sleep habits I had got significant p value among these factors by chi-square test in my study. **Conclusion:** The present study shows that overweight and obesity among school going adolescent girls aged 12–16 years. Prevalence is more the over nutrition problem (overweight/obesity) was reported higher among female students. Health education to students regarding the ill effects of overweight and obesity is the most important step in the prevention of over nutrition. A Well-designed, well-implemented school program can effectively promote physical activity and healthy eating behavior among children.

KEYWORDS: BMI; Prevalence, Overweight, Obesity, Adolescent girls, South India, Karnataka.

INTRODUCTION

According to WHO obesity is defined as a chronic condition characterized by an excess of body fat, and overweight is defined as a body weight that exceeds the acceptable weight for a particular person, based on the individual's age, height and/or frame size. It both represents the most frequent public health problem globally. The prevalence of obesity in children and adolescent has increased steeply among worldwide.[1]

World Health Organization (WHO) recommends anthropometry as the single most portable, universally applicable, inexpensive and noninvasive technique for assessing the size, proportions and composition of the human body fat. Anthropometry reflects both health and

nutritional status and predicts performance, health and survival. Body mass index (BMI) has been conventionally used to define and classify overweight and obesity. Furthermore, in both developed and developing countries girls are proportionately more overweight than boys. During adolescence, BMI is the preferred method of expressing body fat percentile of groups. A high prevalence of adolescent overweight and obesity cases reported high in developing countries. These are emerging as a major public health problem in India.[2]

Many studies have shown that the prevalence of overweight among adolescents is more in urban than in rural areas, which varies between 10 and 30%. the prevalence varies between countries because of difference in the lifestyle, mainly in the dietary patterns, and physical activities. In addition to this urbanization and industrialization are main culprits for the increase in the prevalence of childhood obesity in urban than in rural areas Obesity in children and adolescent is a serious issue not only because of health consequences but also greater risk of obesity in adulthood.[3]

Adolescent life phase is a critical fortuity phase for inculcating healthy life style and behavioral changes because during this time there cognitive as well behavioral domain is best to adopt healthy habits in long term is necessary. A major concern is the increased trends of obesity and overweight in younger age groups. However, it has recently been estimated that the prevalence of obesity in adolescent girls is increased. Overweight and obesity among early adolescent school girls is a growing health concern in west Bengal. Statistics also shows that the prevalence of overweight continues to increase during the school age and adolescent stages. The prevalence of adolescent overweight was in the age group of 13-17 years, higher among girls than among boys in Guntur District, Andhra Pradesh, India the prevalence of overweight and obesity among affluent girls aged 10-15 years in Chennai was 9.6% and 6.2% respectively in 1998.[4]

Obesity is associated with significant co-morbidities and health problems such as mainly type 2 diabetes mellitus, hypertension, cardiovascular diseases, musculoskeletal disorders, cancers, obstructive sleep apnea and orthopedic problems. The adolescent phase of human life is one of the vital times when most of the body growth development and hormonal changes occur. Preparation of adulthood takes place in this period in the form of physical, sexual, and psychological growth and development is seen. There is paucity of nationwide data on prevalence of overweight and obesity in early adolescent girls, several methods have been created in order to measure body fat and obesity during childhood and adolescence. BMI is the preferred method of expressing body fat percentile. This data taken from three reference charts, these are the center for disease control (CDC), WHO references, and the international obesity task force references. South Asia is found to have highest prevalence of obesity it increases every year. It is essential to know the prevalence of overweight and obesity among adolescents so that appropriate preventive measure can be taken.[5]

Globally the prevalence of childhood obesity varies from over 30% in USA to less than 2% in sub-Saharan Africa. The increased prevalence of pediatric obesity demonstrates the need for a simple anthropometric tool that can used to assess and identify children's who are at risk of becoming obese. Many countries in south East Asia including India are going through an economic and nutrition transition. The nutrition transition is associated with a change in dietary habits, decreasing physical activity thus rising prevalence of obesity. An increase in the prevalence of childhood obesity is associated with medical complications of obesity in adolescence and especially in adulthood.[6]

The large range in the prevalence of overweight and obesity could be due to regional differences and non-uniformity in the criteria used to classify socio economic status. A school-based data on obesity in India shows a prevalence of 5.6 - 24% among children and adolescent. Early stage of adolescent is characterized by an exceptionally rapid rate of growth and is often variable in individuals due to its dependence on genetic hormonal and nutritional factors. Epidemiological literature shows that about 1/3rd of obese preschool children and about one-half of obese are school age children are become overweight/obese adults.[7]

During past two decades, the prevalence of overweight and obesity in children has increased worldwide, obesity in childhood and adolescence has adverse consequences on premature mortality and physical morbidity in adulthood, childhood obesity is associated with the higher chance of obesity, premature death and disability in adulthood.[8]

Adolescence is defined as the period of physical, social, psychological, behavioral, and sexual maturity, development of adult's mental process and adult's identity. Adolescence is nutritionally vulnerable age groups where there is a increased nutritional needs, eating pattern, lifestyle, and susceptible to environmental needs, The health problems and unhealthy habits acquired during adolescence phase prove a lifelong hindrance and wellbeing. Overweight and obesity is one of the today neglected public health problem which is emerging global epidemic. Obesity is a multifactorial condition influenced by various variables including the genetic, demographic, and lifestyle factors. Adolescent obesity is associated with increased morbidity and mortality related to a variety of chronic related disease later in life is seen.[9]

In low- and middle-income countries, obesity is traditionally been disease of affluent. as given that Indian

and western fast foods are available, accessible, affordable, in India, and the marketing of processed, high sugar, high fat foods, (junk foods), through mass media targeted specifically younger population.[10]

MATERIALS AND METHODS

Study Design and Setting

A Community-based Cross-Sectional study was conducted in the rural areas of Bagepalli Taluk, situated in Chikkaballapura District, Karnataka. This taluk predominantly comprises rural and semi-urban areas with limited access to comprehensive adolescent health services. The study was carried out over a period of three months from July to September 2023.

Study Population

The study population included adolescent girls aged 12–16 years, studying in classes 8 to 10 in selected government and private schools located within the rural regions of Bagepalli Taluk. This age group corresponds to the early-to-mid adolescent stage, where physiological changes such as increased body fat and hormonal shifts can contribute significantly to weight status.

Sample Size and Sampling Technique

The sample size was determined based on the prevalence rate of overweight and obesity among adolescent girls from similar regional studies (approximately 6.86%), using the formula:

n=Z2×P×(1−P) d2n = \frac{{Z^2 \times P \times (1-P)}}{{d^2}}n=d2Z2×P×(1−P)

Where:

- Z=1.96Z = 1.96Z=1.96 at 95% confidence interval,
- P=0.0686P = 0.0686P=0.0686,
- d=0.05d = 0.05d=0.05.

This resulted in a minimum required sample size of 90 participants. A three-stage sampling approach was employed:

1. Stage 1 – Selection of Schools: Two government and two private high schools were selected using simple random sampling.
2. Stage 2 – Selection of Classes: From each school, classes 8 to 10 were included.
3. Stage 3 – Selection of Participants: From each selected class, adolescent girls were enrolled using convenience sampling, based on availability and willingness to participate on the day of data collection.

Data Collection Tools and Procedure

A semi-structured questionnaire was used to collect data on socio-demographic details (age, class, religion, parental education, occupation, and income), lifestyle factors (physical activity, dietary habits, sleep duration), and school type (government/private). The tool was pre-tested in a nearby school not included in the study, and necessary modifications were made for clarity and cultural appropriateness.

Anthropometric Measurements were conducted as follows:

- Height was measured using a portable stadiometer to the nearest 0.1 cm.
- Weight was measured using a calibrated digital weighing scale to the nearest 0.1 kg.
- Body Mass Index (BMI) was calculated using the formula

BMI=Weight(kg)Height(m)2BMI = \frac {Weight (kg)} {Height (m)^2} BMI=Height(m)2Weight(kg)

The BMI classification was based on WHO growth reference for 5–19 years, which categorizes BMI-for-age Z-scores into: underweight (< -2 SD), normal (≥ -2 to +1 SD), overweight (> +1 SD), and obese (> +2 SD).

- Waist-to-Hip Ratio (WHR) was also recorded for additional analysis of central obesity.

Data Analysis

Data were entered into Microsoft Excel and analyzed using IBM SPSS version 20. Descriptive statistics such as frequency, percentage, mean, and standard deviation were calculated for all variables. Associations between BMI categories and independent variables were tested using the Chi-square test. A p-value of <0.05 was considered statistically significant.

Ethical Considerations

Ethical clearance for the study was obtained from the **Institutional Ethical Committee of Karnataka State Rural Development and Panchayat Raj University (KSRDPRU), Gadag**. Permission was also obtained from school authorities prior to data collection. Written informed consent was obtained from the parents or guardians, and assent was taken from each adolescent participant. Privacy and confidentiality were strictly maintained throughout the study.

RESULTS

Table No. 1: Distribution of Socio-demographic characteristics among study participants (n=90).

Sociodemographic Variable	Category	Frequency (n)	Percentage (%)
Age (in years)	12–13	26	28.9
	14–15	46	51.1
	16	18	20.0
Class	8th	28	31.1
	9th	31	34.4
	10th	31	34.4
Religion	Hindu	77	85.6

	Muslim	13	14.4
Type of Family	Nuclear	66	73.3
	Joint	24	26.7
Father's Education	Illiterate	8	8.9
	Primary	15	16.7
	High School	29	32.2
	PUC	23	25.6
	Graduate and above	15	16.7
Mother's Education	Illiterate	18	20.0
	Primary	28	31.1
	High School	30	33.3
	PUC and above	14	15.6
Father's Occupation	Farmer	42	46.7
	Daily wage laborer	24	26.7
	Private/Service	14	15.6
	Other	10	11.1
Socioeconomic Status	Lower Class	35	38.9
	Upper-Lower Class	33	36.7
	Lower-Middle and above	22	24.4
Type of School	Government	55	61.1
	Private	35	38.9

Among 90 study participants, private participants are higher than government participants. The age of adolescent taken in the study maximum were 13y- 14y age group, then 15y-16y, then 17y-18y.among 9th & 10th were same percentage and the higher compare to 8th class. maximum overweight and obese were Hindu's minimum were Muslim. Nuclear families were more than half percentage, joint was less than half percentage. Many fathers were educated secondary level while compare to higher secondary level, then followed by primary and illiterate. Maximum mothers were educated at primary level, then followed by secondary, lliterate and higher secondary level. Maximum from middle class family. Occupation of father maximum are from business and agriculture least were employed and remaining were labour. Maximum percentage of the mothers were house-wife's then followed by agriculture, labour than others Maximum adolescent girls are from obese were have No history of family obesity. Most of the girls got the menarche at the age of 10-12y, then 13y-14y. maximum number of adolescents well get regular periods.

Table No. 2: Distribution of Body Mass Index category among study participants (n=90).

BMI Category (Based on WHO BMI-for-Age Growth Reference)	Frequency (n)	Percentage (%)
Underweight (< -2 SD)	17	18.9
Normal (≥ -2 SD to +1 SD)	41	45.6
Overweight (> +1 SD to +2 SD)	27	30.0
Obese (> +2 SD)	5	5.6

Among the study participant the prevalence of overweight and obesity was 35.55% body mass index ranges from underweight students were more then followed by normal, and then overweight and obese were very less.

Table No. 3: Distribution of health risk based on waist to hip ratio on BMI among study participants (n=90).

Health risk	Underweight		Normal		Overweight		Obesity	
	F	%	F	%	F	%	F	%
Lower risk (≤ 0.80m)	20	66.66	13	46.42	05	18.51	02	40.00
Moderate risk (0.81–0.85m)	09	30.00	09	32.14	18	66.66	03	60.00
High risk (> 0.86m)	01	03.33	06	21.42	04	14.81	00	00.00
Total	30	99.99	28	99.98	27	99.98	05	100.0

Among the study participants, the underweight was highest among lower health risk, followed by normal, then obesity, and overweight were less. The moderate health risk is highest among the overweight, followed by obesity, then normal, and underweight were less. The high health risk highest among normal, followed by overweight, then underweight.

Table No. 4: Distribution of each school-wise BMI classification among study participants(n=90).

School names	Underweight		Normal		Overweight		Obesity	
	F	P (%)	F	P (%)	F	P (%)	F	P (%)
Sri Sathya Sai Private School	0	0	2	33.33	4	66.66	0	0
Madhayamma Private School	4	33.33	2	16.66	4	33.33	1	8.3
Arvindya Private School	6	40	4	40	3	20	0	0
Kishore Private School	3	60	0	0	2	40	0	0
Prashanti Vidyalaya Private School	0	0	5	27.77	9	50	4	22.22
Chehur Government School	2	28.57	3	42.85	2	28.57	0	0
Palkerya Government School	2	33.33	2	33.33	2	33.33	0	0
Chakvelu Government School	2	33.33	3	50	1	16.66	0	0
Nallgutalapalli Government School	3	75	1	25	0	0	0	0
Somanatpura Government School	8	66.66	4	33.33	0	0	0	0

Above table shows Sri Sathya Sai private school is more among overweight less normal, Madhayamma school was underweight and overweight are more, then normal, less obese, Arvindya school as more underweight and normal, then overweight is less, Kishore private school more underweight, then less overweight, Prashanti Vidyala were more overweight, then normal, less obese. Chelur School were more normal, then underweight and overweight are less. Palkery School were equal among underweight, normal, and overweight. Chakvelu school were more among normal, then underweight, less overweight. Nallgutalpalli School more underweight, and less normal. Somanatapura School were more seen underweight, and less normal among study participants.

Table No. 5: Distribution of type of school among study participants (n=90).

Characteristics	Categories	Underweight		Normal		Overweight		Obesity	
		F	%	F	%	F	%	F	%
Type of school	Government	17	48.5	13	37.1	5	14.2	0	0
	Private	13	23.6	15	27.2	22	40.0	5	9.0

Table shows the among study participants the governments school students are underweight are more followed by normal, and overweight no obesity students, private school students are more seen was overweight followed by normal, underweight & overweight among study participants.

Table No. 6: Socio demographic details associated with overweight and obesity (n=90) (Chi-square test).

Variables	Categories	Underweight		Normal		Overweight		Obesity		P-value
		F	%	F	%	F	%	F	%	
Type of Family	Joint	6	21.42	5	17.85	15	53.57	2	7.14	0.00*
	Nuclear	24	38.70	23	37.09	12	19.35	3	4.83	
Education of Father	Illiterate	1	33.33	0	0.00	2	66.66	0	0.00	
	Primary	7	35.00	9	45.00	4	20.00	0	0.00	
	Secondary	21	42.00	13	26.00	15	30.00	1	2.00	0.00*
	Higher Secondary and above	1	5.88	6	35.29	6	35.29	4	23.52	
Family History of Obesity/Siblings	Yes	3	10.00	1	3.33	23	76.66	3	10.00	0.00*
	No	27	45.00	27	45.00	4	13.33	2	3.33	
Occupation of Father	Agriculture	12	52.17	8	34.78	2	8.69	1	4.34	
	Business	0	0.00	0	0.00	0	0.00	1	100.0	
	Labour	3	60.00	0	0.00	2	40.00	0	0.00	

	Employed	1	33.33	1	33.33	1	33.33	0	0.00	0.004
	Unemployed	0	0.00	0	0.00	0	0.00	0	0.00	
	Housewife	14	24.13	19	32.75	22	37.93	3	5.17	

Above table shows that the socio demographic details of study participants type of family, education of father, family history of obesity/siblings, highly significant. Occupation of father is less significant.

DISCUSSION

The overall prevalence among adolescent girls in my study were overweight 30.0%, and obesity 5.55%, according to the Body Mass Index cut off values, 33.3% were underweight, 31.1% were normal.

In a study the prevalence overweight and obesity among adolescent age 12-17 years in the urban group was found to be 9.9% and 4.8% study conducted in 2010 in city of Mangalore, Karnataka were marginally higher in the pubertal age groups of 13 to 15 years, perhaps because of increased adipose tissue and overall body weight in children during puberty, compare to my study the prevalence is less. This may be variation in the prevalence could be explained due to the difference in baseline characteristic of the study population as the school going students belonged to different states with different culture and dietary pattern. Furthermore, the variation could be explained by the difference in the method and criteria used for assessment of overweight and obesity. Some used the WHO BMI standard while other used International Obesity Task Force.[11]

The prevalence of overweight/obesity was significantly higher in private compared to government schools both by the IOTF criteria Overweight/obesity was higher among girls IOTF- 18% compared to boys and higher among adolescent compare to children's different criteria of IOTF is used in this study done in Chennai. Compare to our study used WHO Criteria the prevalence rate is high in my study when compare to their study.[12]

In a study among adolescent in Surat city observed a prevalence of overweight and obesity as 6.55% and 13.9% respectively. Some of the determinants of overweight and obesity found in previous study were low physical activities, TV/computer/watching games, and junk foods association seen among these factors. Similar association was also seen in study done by Prasad et al. as in my study prevalence is high as compared above study Association seen my study as similar to above study. A similar study is done in Pondicherry the prevalence of overweight and obesity was found to be 14% among adolescent (aged 10-18 year), in this study they observed high prevalence of obesity among urban and private schools, Goyal et al. as compared to present my study prevalence is increased in rural areas.[13]

A similar study is done in Kerala among rural adolescent children's age group of 13-18years that the rates of prevalence of overweight and obesity were 16% and 7% respectively. The results of the studies discussed above are lower prevalence when compared to our study, the most of overnutrtion seen overconsumption of certain nutrients, such as protein, calories or fat, can also lead to malnutrition. This usually results in overweight or obesity.[14]

The prevalence of overweight in early adolescent was found to be 15.83% and obese was 11.18%, obese school going students who watched television for long duration, and eating junk food is on risk. A study sample size of 322 with 30 % prevalence, a study conducted by prajapati k, et in rural early adolescents in central part Maharashtra. As compared to my study the prevalence is high in my study with sample size is 90, the associated risk factors are same among both study mentioned above in this study it's possible to be overweight and obesity from excessive consumption of calorie but not get enough vitamins and minerals at the same time, that's because food contribute to overnutrtion, such as eating junk foods like sugar foods, fast foods, which high in calories and fat but low in other nutrients.[15]

CONCLUSION

The current study assess the prevalence rate of overweight and obesity was 30.0 % and 5.5%, respectively, in our study population. The study results show that overweight and obesity is predominant among adolescent girls belonging to the private schools and government schools in rural areas. Percentage of overweight and obese children studying in private schools was more as compared to government school children's. Associated risk factors in the study significant are walking regularly, consuming junk foods, and transportation etc. In rural children, the prevalence of overweight and obesity was more than under nutrition. There is a need for nutrition education, reinforcement of lifestyle changes, and healthy behaviors for the schools and community.

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