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# Assessment of Overweight and Underweight among School Going Children in Chitradurga, Karnataka

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**Abstract : Background:** Obesity is defined as the abnormal growth of adipose tissue due to enlargement of fat cells size or increase in their number or a combination of both. The goal of the study is to assess the prevalence of overweight, underweight, normal weight and obese children in chitradurga and also include assessment of overweight and its risk factors.

**Methods:** This is a prospective multi-centric study carried out on two government and two private schools of chitradurga for a period of six months. 355 students effectively interviewed by predesigned questionnaire regarding Socio-demographic profile ie , age, diet, life style practices like the physical activity questions designed to asses typical time spent per day on games and outdoor activity, on sedentary activities, including television viewing, study time, transportation to school etc.

**Result:** Total 355 students enrolled for the study, among them 196 (55.2%) were females and 159 (44.8) were males. In this prevalence of overweight is 19(5.4%), underweight 170 (47.8%), normal weight 161 (45.6%) and obese is 5 (1.5%) respectively.

**Conclusion:** Underweight, overweight, and obesity are prevalent in several regions of Chitradurga, indicating a village level dual burden. A variety of variables are associated with overweight, including physical inactivity, sedentary life changes, television use, and diet etc.

**Keywords:** Overweight, Obese, Risk factors, BMI.

## Introduction

Obesity in children is a complex disorder<sup>1</sup>, defined as the abnormal growth of adipose tissue due to enlargement of fat cells size or increase in their number or a combination of both<sup>2</sup>.

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 and rising prevalence of overweight and underweight. Overweight and obesity are major risk factors for a number of

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chronic diseases, including diabetes, cardiovascular diseases<sup>3</sup>, and psychological dysfunction, besides impairing posture and causing musculoskeletal abnormalities etc. Obesity in children and adolescents is gradually becoming a major public health problem in many developing countries, including India<sup>4</sup>.

Current evidence indicates that overweight is a multi-factorial condition influenced by many variables, including genetic, demographic and lifestyle factors. Genetic and demographic variables such as family history, age, ethnicity and sex are cannot modifiable. However, obesity-associated lifestyle factors such as physical inactivity, excessive sedentary behaviour, and short sleep duration often modifiable<sup>4,5</sup>.

The mechanism of obesity development is not fully understood and it is confirmed that obesity occurs when energy intake exceeds energy expenditure. There are multiple etiologies for this imbalance; hence, the rising prevalence of obesity cannot be addressed by a single etiology. Genetic factors influence the susceptibility of a given child to an obesity conducive environment. However, environmental factors, lifestyle preferences, and cultural environment seem to play major roles in the rising prevalence of obesity worldwide. In a small number of cases, childhood obesity is due to genes such as leptin deficiency or medical causes such as hypothyroidism and growth hormone deficiency or side effects due to drugs (e.g. steroids) etc<sup>6</sup>.

Obesity and overweight amongst children have received attention from policy makers and health ministries, researchers, academics, parents and the World Health Organization (WHO). Also the prevalence of underweight in children has received attention from international health agencies, but seems to be overshadowed by the epidemic status afforded to overweight and obesity. Both over- and underweight are linked to morbidity and mortality in children worldwide<sup>7</sup> Childhood under nutrition and obesity are simultaneous occurrence in many developing countries. Research and investment in health has been mainly focused on infectious diseases and under nutrition. In the meantime, obesity is a well recognized risk factor for various chronic health problems, and also predictor of future adulthood health status<sup>8</sup>.

Overweight and Obesity are associated with sedentary behavior, and over-nutrition while underweight is partly related to under nutrition. Neither of them (underweight, overweight or obesity) is a desirable health status and constitutes the extremes of malnutrition. Specific factors such as food insecurity, fast food and soft drink consumption, decreased level of parental involvement as well as less fruit and vegetable consumption have previously been associated with unhealthy weight status in youth. Although there is no consensus definition, at its core, malnutrition is primarily (but not exclusively) a function of the imbalance between caloric intake and expenditure but other factors can independently influence either the intake or expenditure of calories<sup>9</sup>.

Obesity based on the BMI charts developed by Indian academy of pediatrics (IAP). BMI was calculated by using the below formula.

$$\text{BMI} = \text{weight in kilograms} / (\text{height in meter})^2$$

## Materials and Method

- The data will be collected from the students using suitably designed data collection form and questionnaires.
  - This is a prospective Multicentric study. The study was conducted at selected schools of chitradurga (two government and two private schools). The study was conduct for a period of six months. Children 13-15 years of age group from selected schools from both genders were included in this study. Children who had chronic illness, physical and mental defects were excluded by history. Children hailing from outside Chitradurga
  - Student's body mass index will be calculated using body weight and height, the body mass index can be calculated using the formula
  - **BMI = weight in kilograms / (height in meter)<sup>2</sup>**
  - Questionnaires will be answered by the students based on that risk factors will be assessed

- Questionnaires will be open ended as well as closed ended type
- Data will be entered in **Microsoft Excel** and the results will be analyzed using latest version of statistical factors for social service.
- Descriptive statics was used p value less than 0.05 was considered as significant.

## Result

Total 355 students enrolled for the study, among them 196 (55.2%) were females and 159 (44.8) were males. Children were divided into three groups based on age classification. Out of 355, 98 (28.6%) from 13 years followed by 142 (40%) from 14 years and 155 (32.4%) were from 15 years age group as respectively. In this prevalence of overweight is 19(5.4%), underweight 170 (47.8%), normal weight 161 (45.6%) and obese is 5 (1.5%) respectively. Prevalence of overweight was higher in private school (78.26%) children than in Government school children (21.73%) prevalence of underweight is more in government schools (64.7%).

A variety of variables are associated with these conditions including physical inactivity, sedentary life changes, television use, and diet etc. Dietary behaviors, physical activity and sedentary lifestyle should be considered when planning prevention and intervention programs for underweight or overweight children.

## FIGURES AND TABLES

### TABLES

#### Age wise distribution of study population

In the current study, children were divided into three groups based on age classification. Out of 355, children 98 (28.6%) were from 13 years followed by 142 (40%) were from 14 years and 155 (32.4%) were from 15 years as respectively. The results are shown in Table No.1.

**Table 1: Distribution according to age (n=355)**

Age-groups	Frequency	Percentage
13-year	98	27.6
14-year	142	40
15-year	115	32.4
Mean age (SD)=14.05 (0.774)		

#### Prevalence of overweight, underweight, normal weight and obese children

A total of 355 school students were found during the study period. Among them 170 (47.8%) of were underweight, 161 (45.6%) were normal, 19 (5.4%) were overweight and 5 (1.5%) students were obese. The results are shown in Table No.2.

**Table 2: Prevalence of overweight, underweight, normal weight and obese children**

Variables	BMI range	Frequency	PREVALENCE
Under weight	<18.5	170	47.8
Normal	18.5-24.9	161	45.3
Over weight	25.0-29.9	19	5.4
Obese	>30	5	1.5

#### Comparison of mean body weight, height and BMI of the school going children

According to the data collected the mean body weight of male children is 43.40±9.21 kg , Height is 157.6±10.2 cm and BMI is 17.6±3.16 ,comes to the case of female children the mean body weight is 43.03±9.32 kg, Height is 151.5±14.5 cm and the BMI is 18.77±4.1. The result is shown in the table no.3.

**Table 3: Comparison of mean body weight, height and BMI of the school going children**

Genders	Body Weight (kg) mean±SD	Height (cm) mean±SD	BMI mean±SD
Male	43.48±9.21	157.6±10.2	17.6±3.16
Female	43.03±9.32	151.5±14.5	18.77±4.1

**Comparison of Mean Body Weight, Height and BMI of Underweight, Overweight, Obese and Normal Children**

Table no.4 shows that the mean body weight, height, and BMI of underweight, overweight, obese and normal children. The mean body weight of underweight children is 37.53±5.87 kg, height is 155.5±14.30 cm and the mean BMI is 15.2±1.4, mean body weight of overweight children is 58.01±11.55 kg, height is 150.8±11.86 cm and the mean BMI is 26.58±1.40, mean values of obese children is 55.60±60 kg, 132.20±13.51 cm, 31.50±0.75 respectively and the Normal children were 47.20±7.46 kg, 153.95±11.24 cm, 20.13±1.49.

**Table 4: Comparison of mean body weight, height and BMI of underweight, overweight, obese and normal children**

Variables	Body Weight (kg) mean±SD	Height (cm) mean±SD	BMI mean±SD
Underweight	37.53±5.87	155.5±14.30	15.2±1.4
Overweight	58.01±11.55	150.8±11.86	26.58±1.40
Obese	55.60±11.69	132.20±13.51	31.50±0.75
Normal	47.20±7.46	153.95±11.24	20.13±1.49

**Relationship between Overweight and It's Risk Factors**

**Table 5: Relationship Between Overweight and It's Risk Factors**

Characteristics	Response	Total No of children (N=355)	Over weight (N=19)	P-value
Being a single child	Yes	73	16	0.001
	No	283	3	
Diet	Vegetarian	171	2	0.03
	Non-vegetarian	184	17	
Outing for Dinner or Lunch	Weekly	74	4	0.000
	Monthly	147	2	
	More than among	48	12	
	Never	86	1	
Habit of Skipping Breakfast	Yes	208	5	0.05
	No	147	14	
Consumption of Soft Drinks	More than in a week	166	17	0.001
	Once in a week	189	2	
Consumption of sweets and chocolates	More than three times in a week	246	13	0.000
	Less than three times in a week	109	6	
Consumption of Dairy Products	Daily	183	15	0.004
	Not daily	172	4	

Eating Snacks Between Meals	Yes	161	12	0.000
	No	194	7	
Habit of eating food while watching TV	Yes	279	9	0.001
	No	76	10	
No of Hours of Exercise (include playing)	½ hour	134	7	0.002
	1-hour	119	5	
	2-hour	53	5	
	More than 2-hours	49	2	
Participation in cultural activities	Frequently	208	1	0.04
	Not frequently	147	18	
No. of hours watching TV	½ hours	78	2	0.000
	1-hours	160	5	
	More than 1 hours	117	12	
No. of hours spend in sleeping	6 hours	56	2	0.05
	7-hours	86	6	
	8-hours	133	4	
	More than 8 hours	80	7	
No. of hours spend in studying.	½ hours	24	10	0.05
	1-hours	51	6	
	2-hours	112	2	
	More than 2 hours	168	1	
Mode of transport to school.	Walking	94	4	0.002
	Cycling	48	7	
	Motor transport	213	8	

## FIGURES

### Gender wise distribution of study subjects

A total of 355 school students were found during the study period. Among them 196(55.2%) were females and 159(44.8) were males. The results are shown in Figure No 1.

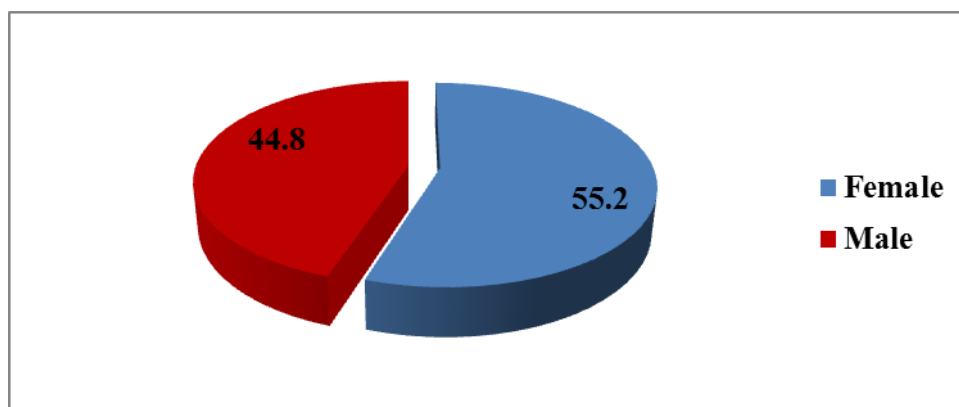
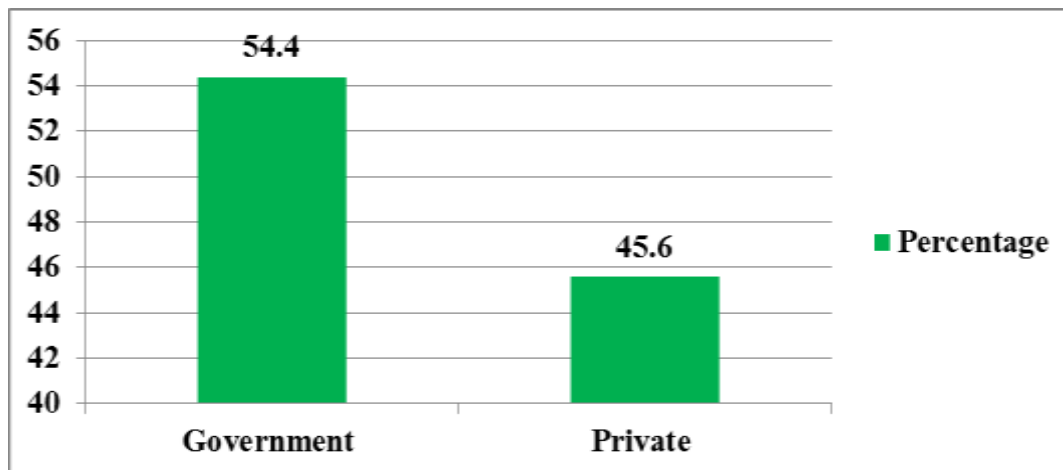


Fig no1: Distribution according to gender (n=355)

**Distribution of subjects as per school**

In the present study patients were classified based on type of schools. Out of 355, 193 (54.4%) patients were obtained from government schools followed by 162 (45.6%) from private schools. The results are shown in figure No.2.

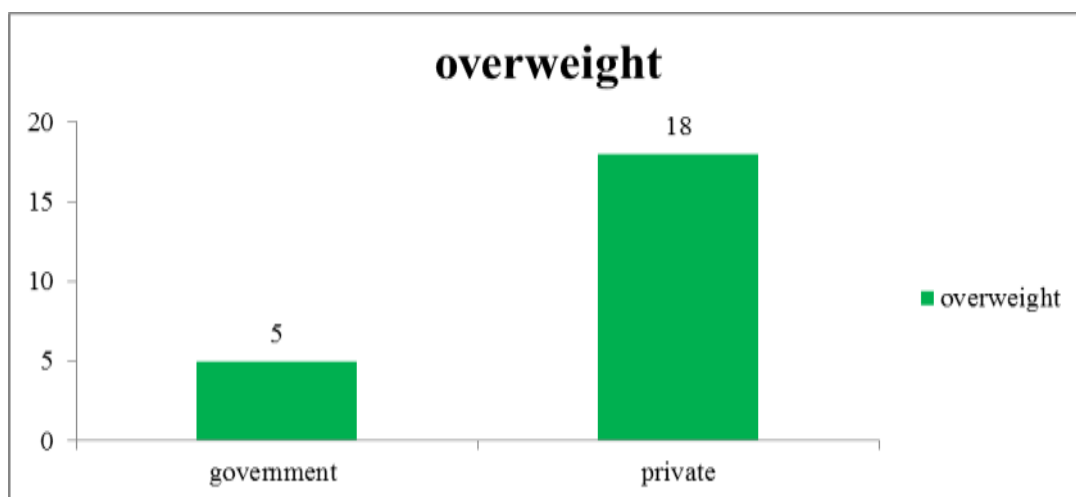


**Fig no 2: Distribution as per type of school**

**Comparison of Overweight and Underweight among Government and Private School Children.**

**1. Overweight**

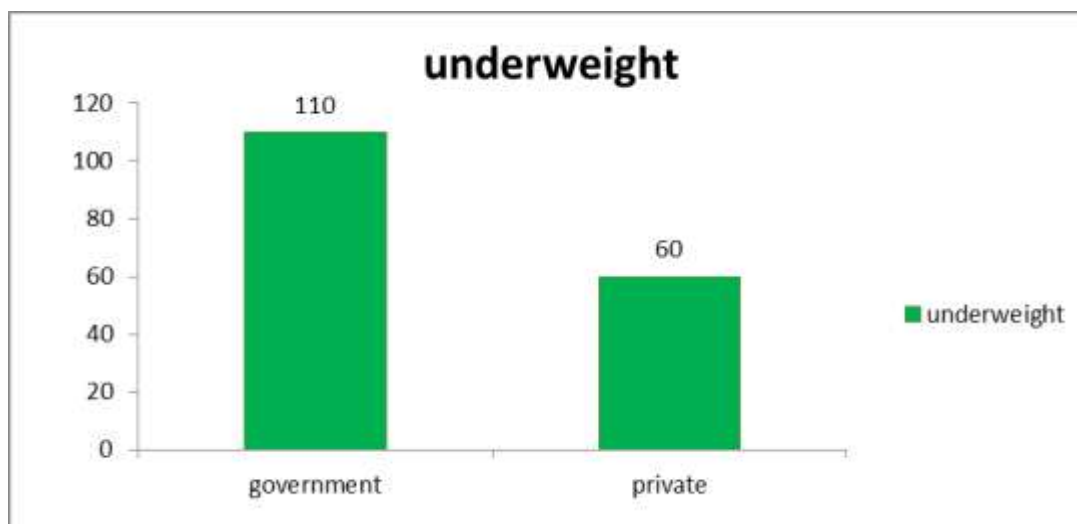
Among 23 overweight children 5(21.73%) from government school and 18(78.26%) were from private school. The results are shown in the below table 8 and graphically represented in fig no.3.



**Fig no 3: comparison of overweight among govt. and private school children**

**2. Underweight**

Total of 170 underweight children 110(64.7%) were from government school and 60(35.29%) from private school. The result shown in the below table 9 and graphically represented in fig no.4.



**Fig no. 4 : comparison of underweight among govt. and private school children**

## Discussion

A lifestyle practice is important determinants of health as Economic development of India has changed lifestyle habits.<sup>5</sup> India are going through an economic and nutrition transition. The nutrition transition is associated with a change in dietary habits, decreasing physical activity and rising prevalence of overweight and underweight.<sup>3</sup> Prevalence underweight and overweight children in present study was found to be 170 (47.8%) and 19(5.4%) respectively. Among 355 children are surveyed 161 (45.6%) were normal weight and 5(1.5%) were obese. Similar studies are conducted India for prevalence of overweight and underweight results are comparable to our study with respect to Overweight and underweight prevalence.

In a similar study conducted by Ahmed I *et al* among children of 10-16 years age in government, aided and unaided schools of Tumkur city, Prevalence of childhood overweight was found to be 7.02% and prevalence of obesity was 6.12%<sup>10</sup>. Also Ahmed M *et al* reported that the prevalence of overweight and obesity in urban area is 6.6% and 2.2%. The prevalence of overweight and obesity in rural area is 3.4% and 0.6%.

In addition, overweight and obesity is favored by risky dietary behaviors such as consumption of fast food and drinks, eating away from home, skipping/missing of meal, regular drinking of sugar rich beverages and low serving/intake of fruit and vegetable etc. According to this study, it demonstrated that being a single child increased the likelihood of a child being overweight ( $p=0.001$ ). other factors such as outing for dinner or lunch ( $p=0.000$ ), consumption of soft drinks ( $p=0.001$ ), consumption of dairy products ( $p=0.004$ ), eating snacks between meals ( $p=0.000$ ), habit of watching TV while eating food ( $p=0.001$ ), no of hours exercise ( $p=0.002$ ), number of hours of watching T.V ( $p= 0.000$ ), mode of transport ( $p=0.002$ ) are highly significant factors leading to overweight. Whereas factors like diet i.e. vegetarian or non-vegetarian ( $p=0.03$ ), habit of skipping breakfast ( $p=0.05$ ), participation in cultural activities ( $p=0.04$ ), number of hours spend in sleeping ( $p=0.05$ ), number of hours spend in studying ( $p=0.05$ ) are marginally significant factors leading to overweight.

Desalew A *et al* reported that from families belonged to high socioeconomic class , preferred sweetened foods , had not engaged in regular physical exercise, had experienced sedentary life style like spent their free time watching , play computer game ,and were not having close friends were significantly associated with overweight/obesity risk<sup>8</sup>. Study conducted by Little M *et al* prevalence of overweight, obesity class I, and obesity class II were 14.9, 16.1, and 3.3 % respectively. Prevalence of underweight was 22.7 %. The following variables were associated with higher BMI or increased odds of overweight, Low physical activity, high wealth index, no livestock, low animal fat consumption, high n-6 polyunsaturated fat consumption, television ownership, time spent watching television, low rurality index, and high caste<sup>45</sup>. Bhuiyan MU *et al* suggest that Technological advances in the form of hand-held electronic devices and computer games, and television programs have probably contributed to adopt a lifestyle that involves to less physical activity and more sedentary activity, The study demonstrated that watching television decreased the amount of time spent on playing outdoor games which might resulted in gaining extraweight.<sup>27</sup>

According to the study of Badawi N E *et al* Prevalence of overweight and obesity was 17.7% and 13.5% respectively, Socioeconomic class, faulty dietary habits, sedentary life, low level of physical activity and positive family history of overweight and/or obesity were significantly associated with student's BMI.<sup>6</sup>

In this present study prevalence of overweight is higher in private school (78.26%) children than in Government school children (21.73%) and prevalence of underweight is more in government schools (64.7%). Similar observation were made by Ahmed I *et al* prevalence of overweight and obesity in government school children was 3.8% (13), in aided schools children 9.4% (47) and in unaided school children 16.8% (230).<sup>10</sup>

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