# A Perspective on Childhood Obesity in General and Libya in Particular

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**ABSTRACT----**
**Aim:** The prevalence of obesity and overweight and their association with socioeconomic status (SES) and the risk factors like diet, physical activity like exercise, sports, eating habits like junk food, chocolate, eating outside at weekend were recorded in school children near Chennai.
**Material and Methods:** The study was carried out in 900 school children of 12–18 years of age and having different SES. The obesity and overweight were considered using an updated body mass index reference. SES and life style factors were determined using questionnaire.
**Results:** Age-adjusted prevalence of overweight was found to be 10.0% among boys and 8.0% among girls whereas the prevalence of obesity was 2.9% in boys and 1.5% in girls. The prevalence of overweight among children was higher in middle socioeconomic status group (SES) as compared to high SES group in both boys and girls whereas the prevalence of obesity was higher in high SES group as compared to middle SES group. The prevalence of obesity as well as overweight in low SES group was the lowest as compared to other group. Eating habit like junk food, chocolate, eating outside at weekend and physical activity like exercise, sports, having remarkable effect on prevalence on overweight and obesity among middle to high SES group.
**Conclusion:** The present data suggest that the prevalence of overweight and obesity varies remarkably with different socioeconomic development levels.

**Keywords---** childhood obesity; Socioeconomic status (SES), Junk food

## 1. INTRODUCTION

Childhood obesity is not just a problem in the United States. It presented a shift globally from childhood under-nutrition to excess nutrition. In spite of variations of economic and environmental factors, most countries except Russia demonstrated similar average increases in prevalence of childhood obesity (Wang et al., 2002).
A study by Wang and colleagues used an international standard of measurement to illustrate weight patterns of children aged 6-18 years old in four countries; United States, Brazil, China and Russia. The measurement standard used was developed by the International Obesity Task Force (IOTF), which utilized BMI cut off points from data compiled of children from many countries. It also incorporated BMI measures derived from gender specific curves that pass through adult BMI curves at age 18 years of age.
The four countries in Wang's study represented one fourth of the world's population.
Analysis of the data demonstrated the trend of overweight and obese children is increasing in both industrialized and developing countries. While adolescents from the United States show markedly higher numbers of overweight prevalence, Brazil trends were similarly reflected. Russia did not show trends towards overweight but inversely demonstrated more underweight children. The authors felt socioeconomic hardship in that country over the last decade may contribute to the different results (Wang ET al.2002).
A scientific statement published by the American Heart Association identified data from two separate studies demonstrating how the prevalence of overweight children in Australia doubled from 1985 to 1995 (Daniels et al., 2005). Increases in childhood obesity have also been noted in Canada, United Kingdom, Germany, France and Finland (Lobstein, Baur, & Uauy, 2004), with rates of overweight children increasing across Europe by more than 400,000 cases per year. Among overweight children in Europe, three million are estimated as obese with eighty-five thousand new diagnoses yearly (Lobstein et al, 2004).

**Causes Contributing to Childhood Obesity**

Attempts to understand the widespread increase in childhood obesity leads to the question of causation. While genetics play a role in childhood obesity, the gene pool does not change rapidly enough to account for the global prevalence of overweight children.

Much of the research reviewed for this study sought to understand treatable causes for childhood obesity by investigating the intersection of environment and behavior.

Fierro (2002), author of the Centers for Disease Control Guidelines, stated in his health policy summary, "poor nutrition and physical inactivity are the leading causes of obesity and represent the best opportunities for prevention and treatment. His conclusions indicated that an abundance of fast food, fewer homemade meals, and increased soda pop consumption are factors contributing to childhood obesity.

A study by Anderson and Butcher (2006), also demonstrated a correlation between elevated BMI in children and soda intake. The nutrition empty, high calorie drinks, contribute to an energy imbalance secondary to availability, ease of consumption and its replacement of other, more nutrient laden substances. This same study identified breast feeding, while not a consistent factor, as having a lowering affect on children's overall weight. Moreover, the research found that very young children seem capable of adjusting their food intake to match their energy outflow.

As children grow up their food intake becomes more reliant on external cues, such as the amount and type of food increased screen time (computer and television viewing), the environment promotes imbalance of energy intake and expenditure resulting in more overweight children (Zhang, Christoffel, Mason, & Liu, 2006).

The built environment is a newly coined phrase used to describe many neighborhoods where children are being raised. Studies described built environments as developed neighborhoods where schools and playgrounds do not exist within walking distance; there is a dearth of sidewalks; and clusters of fast food restaurants and convenience shopping are close at hand. The result is increased car time and easy access to nutrition poor food. Research demonstrated that this may have further contributed to higher trends of childhood obesity (Sallis & Glanz, 2006).

Television viewing was the focus of a study by Robinson (1999) who sought to impact survey results by American parents who reported greater than 4 hours per day being spent by children in front of a screen (TV, computer, and video games). This study was conducted over one school year and involved 2nd and 3rd graders. After an educational intervention promoting decreased screen time, the children averaged a reduction of nearly one third of viewing time as compared to their peers resulting in significantly decreased waist size and BMI over the course of the study. Interestingly, less screen time correlated with less calories consumed in the form of snacks.

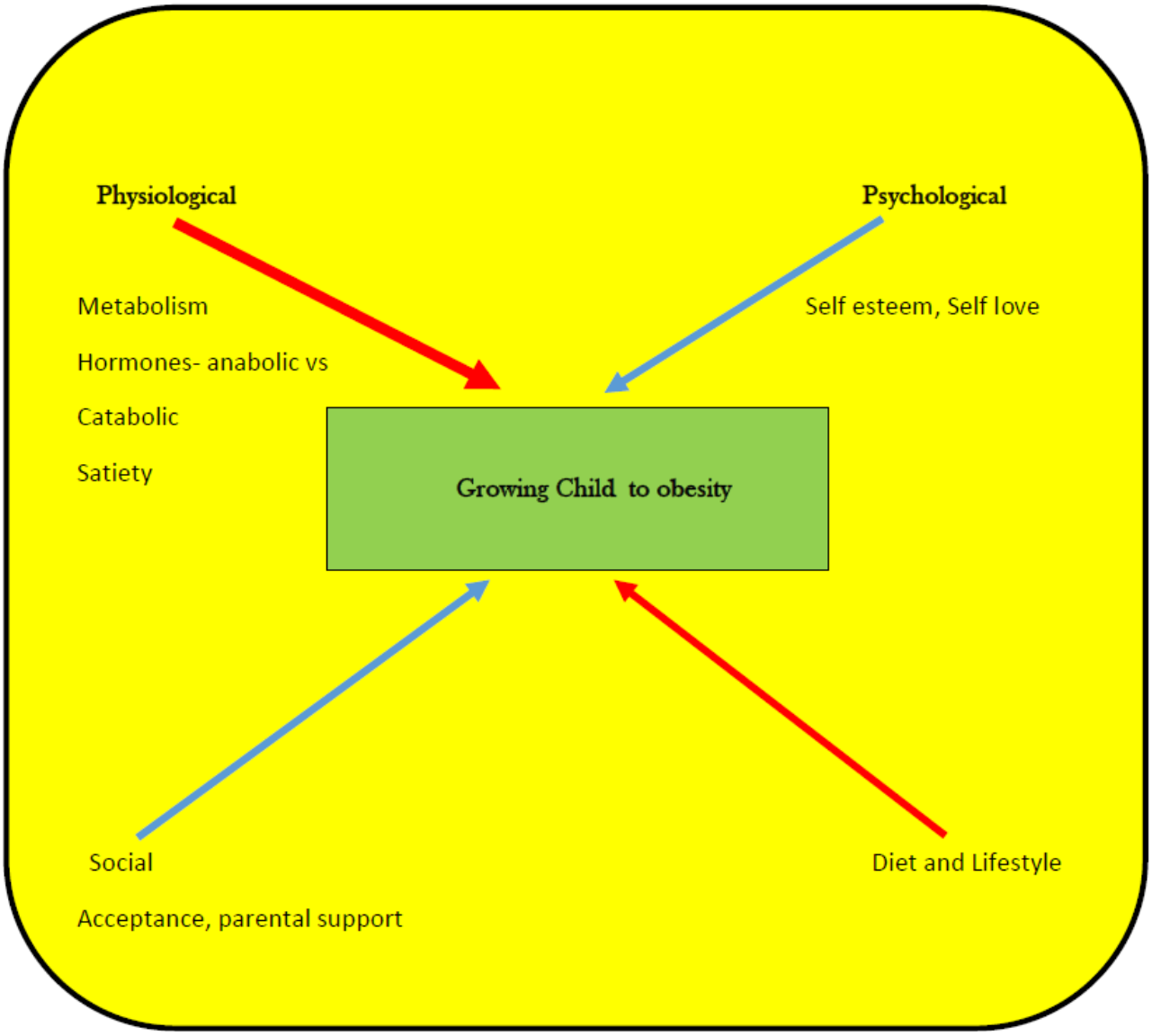


**Fig. Factors that influence the development of a child – A possible dysfunctional Physiology due to Diet and Life Style**

**Consequences of Childhood Obesity**

An understanding of cause cannot have value unless the health consequences associated with childhood obesity have been enumerated. Childhood obesity has been shown to carry varying degrees of emotional, social, physical and economic consequences. Many consequences are far reaching, lasting well into adulthood.

Emotional cost for overweight children is described as changes in wellbeing. Psychological problems are cited by some researchers, as the most common short term consequence of childhood obesity. Depression, eating disorders and loss of quality of life have all been linked with childhood obesity. A review of literature estimated binge eating as high as 30% in overweight girls. Furthermore, decreased quality of life scores in children have been accompanied by poor school performance for children ages 9-12 ((Fowler-Brown & Kahwati, 2004; Williams, Wake, Hesketh, Maher, & Waters, 2005).

Social consequences associated with overweight children are poor self esteem and peer difficulties associated with being teased or marginalized (Neumark-Sztainer 2002; Strauss & Pollack 2003). Researchers, who have studied adolescent weight in relation to risk behaviors, found that almost half of adolescent girls in their study had at some time been on a diet. Thirteen percent of overweight girls and 7% of overweight boys reported disordered eating, with strong correlates to low self esteem, suicide ideation and substance abuse in the same population (Newmark-Sztainer & Hannan, 2000). A perspective on childhood obesity published in the New England Journal of Medicine linked the social isolation of overweight children to increased rates of college drop-out and a higher rate of adult poverty (Ludwig, 2007).

Physical consequences for overweight children are associated with increased risk for complex disease processes; type 2 diabetes, metabolic syndrome, dyslipidemia, sleep apnea, asthma,, hypertension, gastro esophageal reflux disease

(GERD) and many orthopedic problems (Anderson & Butcher, 2006; Dilley et al., 2007; Eissa & Gunner, 2006; Neumark-Sztainer & Hannan, 2005; Ogden et al., 2002; Wang, 2001). Overweight children have been linked twice as often to diabetes when compared to non-obese children (Hawley et al, 2006)). These diseases have been found to occur earlier and with more frequency in children who are obese (Fowler-Brown & Kahwati, 2004).

A study conducted by Freedman examined the relationship between children's BMI measurement and cardiovascular disease (CVD). Using seven cross sectional studies spanning more than 20 years, data was analyzed from 9000 children, ages 5-17. The study demonstrated that risks linked to CVD (elevated lipids, insulin and BP), increased with weight > 95th percentile. When compared to non overweight children, fifty-eight percent of overweight children were found to have one cardiovascular risk factor, while over 50% were found to have two risk factors for cardiovascular disease Furthermore, study findings demonstrated overweight children were 2.4 times as likely as children measuring <85th percentile to have elevated total cholesterol; 4.5 times as likely to have elevated systolic blood pressure; and 12.6 times as likely to have elevated fasting insulin (Freedman, Dietz, Srinivasan, & Berenson, 1999). The importance of these findings are emphasized by American Heart Association statistics which identify cardiovascular disease as being responsible for one out of every 2.8 deaths, per year in America (American Heart Association, 2004).

More recently childhood obesity was shown to increase the likelihood that the consequences will be long term, leading to adult obesity and is associated with diverse and complex co-morbidities. Research and evidence synthesis by Whitlock et al. (2005) found 19 fair or good quality longitudinal studies which demonstrated BMI measurements in childhood correlate more closely with adult obesity than other measurement standard. A 50% or greater probability of adult obesity is seen in overweight children >13 years old, and children with BMI >95th percentile.

Far reaching adult consequences for overweight children were also predicted by researchers of childhood obesity and heart disease. They estimated future prevalence of adult obesity related coronary heart disease (CHD), using a computer program, historical trends of overweight adolescents leading to adult obesity, and the CHD policy model.

Their analysis resulted in predictions of adult obesity as high as 44% in adults in 2020 which would correlate with an earlier and increased incidence of CHD related events and death. Furthermore, by 2035, they projected an excess of 100,000 cases of obesity related heart disease.

**Childhood Obesity in Libya**

Obesity is a reported to be present in around 30.5% Libyan adults ,16.9% of children aged 5 or younger (Ministry of Health,2009), and 6.1% of children aged between 10 and 18 are obese (Ministry of Health 2008). The rate of obesity progressively increases with age, from 4.2% in those aged between 10 and 12 to 46% in those aged between 55 and 64 (Ministry of Health, 2009;, 9). The mean BMI in Libyan adults is 27.7 $kg/m^2$ (26.4 $kg/m^2$ in men and 29 $kg/m^2$in women), and the mean waist circumference is 93.3 cm. There was no significant difference between male and female children with regard to overweight or obesity (WHO, 20079); however, obesity was almost two times more common among Libyan women than men (21.4% vs. 40.1%) (Ministry of Health,2009,Rao GM, Morghom,1985), whereas overweight was more prevalent among men than women, a trend being observed worldwide (Flegal et al.2010;Al-Nozha et al.2005). This is because women tend to lead sedentary lifestyles than men and also because women in Libya indulge in binge eating as they spend much time at home and also attend more social gatherings, which are usually associated with consumption of abundance of food. Also, hormonal factors might play a role in accumulation of fat in women than in men.

**Genetic predisposition**

Studies of twins suggest the existence of genetic factors in human obesity. The percentage of obesity that can be attributed to genetics varies, depending on the population examined, from 6 to 85% (Yang W, Kelly T, He 2007). It is postulated that certain ethnic groups, in an equivalent environment, may be more prone to obesity than others (Wells,2009). This is because of what is called 'thrifty gene hypothesis', where the genetic make up of certain ethnic groups gives them the ability to benefit from rare periods of food abundance by storing energy as fat, an ability valued during times of varying food availability but disadvantageous in the modern life, which offers stable food supplies (Neel,1962). Surprisingly, obesity is much more prevalent in Libyan adults than in Tunisian adults (Ministry of Health, 2009, International association obesity, 2010) despite both populations having more or less the same genetic background, which raises the possibility of environmental factors as the main cause of the increased prevalence of adult obesity in Libya.

**Diet**

Energy intake and composition of diet play a major role in the pathogenesis of obesity. Total calorie consumption has been found to be related to obesity. From the late 1960s to the early 2000s, the average calories available per person per day have increased in Libya (FAO, 2005).

**Infant feeding in Libya**

Breast-feeding is shown to be associated with a lower risk of overweight. Exclusive breast-feeding during the first 3 or more months of infancy reduces the risk of overweight in childhood (Hediger et al.2001;Harder et al.2005). In Libya, the rate of artificial feeding is between 5.7% and 40.3% (Baccush Nayak 1992;Maghoub , Stephens 1972), and 47.88% of mothers breast-feed their infants for less than 1 month, whereas 28.18% breast-feed their children for 1–3 months (Baccush and Nayak,1992). This may partially explain the high rate of obesity in children aged 5 or younger in Libya (Ministry of Health,2008).

**Libyan diet**

Epidemiological data suggest that a diet high in fat is associated with obesity. There is a dearth of recent and nationally representative data on food consumption in Libya.

In 1996, Al-Arbah reported that cereals, oil, and sweeteners provided the largest shares of energy, 41, 12, and 11%, respectively (AlAarba,1996). Food and Agriculture Organization (FAO) analysis of yearly production, import, and consumption shows that the staple Libyan diet is wheat (bread, couscous, and pasta). Rice is another major staple in Libya (Neel,1962). The Libyan diet is low in vegetables and fruits (Ministry of Health ,2009). According to the FAO, the quantities of food consumption between 1967 and 2001 have increased 1.5 times, from about 2,061 kcal daily to 3,327 kcal daily, which is well above population energy requirements of 2,144 kcal/capita/day. This means a Libyan adult consumes daily an extra 1,183 kcal.

In 2001, according to the FAO, the proportions of main energy sources in the Libyan diet were 62% of carbohydrates, 27% of fat, and 11% of proteins (FAO,2005). Yet, we think that the contribution of fat to proportion of energy in Libyan diet is higher (Najah ,1995), which is comparable with consumption of fat in Western countries. Furthermore, over the last decade or so, Libyan diet has become more influenced by Western food culture, and Libyans are now consuming more diets high in sugar and saturated fat in the form of fast foods (burger, coca, etc.).

**Lack of physical activity**

Sedentary lifestyle lowers energy expenditure and promotes weight gain. Worldwide, there has been a marked shift toward less physically demanding work. Currently, about 44% of Libyan adults do not get sufficient exercise (51.7% of women and 36% of men)( Najaj,1995). We think this is mainly because of increasing dependence on mechanical transportation and greater availability of effort-saving equipments domestically. Also, the increase in television viewing time, use of computers, and video games could be other possible contributors to the rise in the prevalence of obesity in Libyan children and adults.

## 2. EXPERIMENT

**Subjects for the study:**

The study included 950 school children in the age group of 12–18 years; 570 were boys and 380 were girls. The city had equal distribution of children by socioeconomic state (SES) ethnic variability and gender. Informed consent was obtained by the school authorities and PTA to make anthropometric measurements and provide a health card to their wards. Completed age of the children was noted. Data on weight and height were collected for each through direct physical examinations. Height and weight were measured using standard procedure and BMI (kg/m2) was calculated. Measurements were made by two trained technicians. The BMI of each child was determined and adjusted for expected BMI at age 18. The number of under-weight, normal, overweight and obese was calculated.
Socioeconomic status of parents was classified as high socio-economic group, middle socio-economic group and lower socio-economic group based on the occupations of parents and family income which were found to be a reliable index of SES. Family income data were collected at the same time children's BMI measurements were collected. A questionnaire assessing life style, physical activity, participation in sports, physical exercise, diet (having vegetarian or non vegetarian food), having junk food or not, chocolate eating habit, frequency of visiting restaurants per week.school on the day of the survey. Children who were absent from school because of sickness or other reasons were not followed-up. 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. We examined the prevalence of overweight and underweight in each gender by age group, sex, and SES. Influence of various factors on prevalence of underweight, normal, overweight and obesity are expressed in form of percentage. Results A total number of 900 students with age group between 12-18 years of our school were screened for their height, weight and body mass index. Out of 900 children 524 (58.2%) were boys and 376 (41.7%) were girls . The height, weight and BMI were higher in boys than girls (Table 1). However, these differences were not significantly different with respect to gender at any given age. Prevalence of overweight and obesity. The overall prevalence of boys and girls having normal BMI were

75.5% and 80.0 % respectively. The prevalence of overweight was 10.0 % among boys and 8.0 % among girls. Prevalence of obesity was 2.9 % in boys and 1.5% in girls. The prevalence of underweight is 12.1 % in boys and 10.2% in girls .

**Comparison of relationships between overweight and obesity with SES**

The prevalence of overweight among children was high in middle SES as compared to high SES group in both the gender; however prevalence of overweight was the lowest in the low SES group. By contrast, prevalence of obesity was higher in high SES group as compared to middle SES group. Thus, socioeconomic status was related to children's risks of being obese or overweight and high SES groups were at a higher risk of obesity, while middle SES groups were at higher risk of overweight. While no prevalence of obesity was found in children from low SES group. We found that similar significant associations between obesity and SES exist in both gender in each year of age. The association between SES and prevalence of overweight and obesity was not significantly related to age. The impact on SES did not see to vary much by age.( Table-2)

Moreover our analysis stratified by gender indicates that boys and girls are at different risks even if they have the same SES . Girls from high SES group tend to have lower risk of obesity as compared to boys; similarly those from middle SES groups were found to have lower risk of overweight as compared to boys. Obese and over weight children participated in sports less often than normal-weight and underweight participants, similarly obese and overweight children participated in physical .exercise less often than normal-weight and underweight participants.

The results showed physical activities did influence change in BMI. (Table-3). Non-vegetarian diet did have significant effect on prevalence of overweight and obesity. Junk food and chocolate eating habits have more prevalence of obesity and overweight than underweight indicates that caloric intake is associated with increase in BMI . Obese and over-weight children were more likely to visit restaurant more than once a week than their underweight and normal-weight counterparts.

**Observations**

Our results suggest that junk food (bakery items, pizza, burger, cheese, butter, oily items) chocolate intake tends to be more common among overweight and obese adolescents than among normal-weight adolescents. Junk food contains more amount of fat than carbohydrate and protein. Fat is less satiating than carbohydrate and dietary fat is stored more efficiently than carbohydrate or protein which finally results in obesity or overweight. (Deurenberg et al.1998, Gortmaker et al.1990). Similarly irregular food intake deleteriously affects nutritional health, reduces energy levels and promotes the consumption of high caloric food later in the day. In our study restaurant visit per week was positively associated with BMI. Appropriately, provisions of healthy foods options and physical activities for children are at the forefront of public health initiatives to curb an obesity pandemic. Thus, our data showed influences of sedentary behavior and physical activity on prevalence of overweight and obesity. Questionnaire enabled us to do the analyses of several contributing factors to changes in prevalence of underweight, overweight and obesity. An appropriate follow-up to this study could involve more frequent assessments to better reveal changes in BMI over time. In all, the study demonstrated that socioeconomic status, sedentary behavior and physical activity in children influenced prevalence of overweight and obesity. ( Hernaandez et al.1999;Roass et al. 1990; Nicole and Hamilton,2016)

## 3. CONCLUSION

Our analysis shows that childhood overweight and obesity is related to SES, although the relationships differ little among gender. We used family income as a primary indicator of SES. The prevalence of overweight among children was higher in middle SES as compared to higher SES group in both the gender. However prevalence of overweight was the lowest in the low SES group. By contrast, prevalence of obesity was higher in high SES group as compared to middle SES group. In developed countries such as the UK, an association between social deprivation and childhood obesity was strong, especially in the girls.

Understanding of the biologic and psychosocial factors that influence eating behaviors and body weight regulation may help to develop multi-pronged approach involving a behavioral, pharmacological, and surgical therapeutic strategies taking into the account the regional and cultural ethnicity of the population one studies.

**Table-1 .Average anthropometric measurements and BMI in children of the present study.**

| Boys | | | | | Girls | | | |
|---|---|---|---|---|---|---|---|---|
| **Age** | **%** | **Height (Cm)** | **Weight (kg)** | **BMI** | **%** | **Height (Cm)** | **Weight (kg)** | **BMI** |
| 12 | 52 | 152.4 | 44.7 | 19.47 | 48 | 148.1 | 44.6 | 20.54 |
| 13 | 81 | 150.6 | 46.7 | 20.88 | 19 | 146.2 | 43.5 | 20.6 |
| 14 | 57 | 156.6 | 47.3 | 19.31 | 43 | 152.1 | 44.0 | 19.04 |
| 15 | 62 | 158.0 | 47.7 | 19.22 | 38 | 151.6 | 42.3 | 18.17 |
| 16 | 47 | 160.0 | 50.3 | 19.53 | 53 | 153.7 | 46.8 | 19.81 |
| 17 | 54 | 158.3 | 52.9 | 20.82 | 46 | 155.5 | 45.3 | 18.49 |
| 18 | 46 | 160.0 | 53.6 | 20.70 | 54 | 157.1 | 47.8 | 19.47 |

**Table – 2. Comparison of Obesity Percentage in Relation with Socioeconomic Status**

| | Boys | | | Girls | | |
|---|---|---|---|---|---|---|
| **Age** | **High SES %** | **Middle SES %** | **Low SES %** | **High SES %** | **Middle SES %** | **Low SES %** |
| 12 | 20.1 | 80.1 | 0.0 | 20.3 | 75.1 | 4.2 |
| 13 | 17.3 | 77.6 | 4.2 | 15.1 | 80.8 | 3.6 |
| 14 | 46.1 | 50.5 | 30.8 | 30.7 | 65.3 | 3.8 |
| 15 | 32.3 | 64.5 | 2.2 | 22.1 | 77.1 | 0.0 |
| 16 | 37.6 | 62.4 | 0.0 | 50.1 | 50.1 | 0.0 |
| 17 | 26.5 | 69.3 | 3.6 | 32.4 | 67.7 | 0.0 |
| 18 | 32.9 | 67.3 | 0.0 | 35.6 | 64.5 | 0.0 |

**Table- 3. Comparison of Physical and dietary Parameters studied**

| **Characteristics** | **Under weight** | **Normal** | **Over Weight** | **obese** |
|---|---|---|---|---|
| Age 12-18 | 12.1 | 75.5 | 10.0 | 2.9 |
| Participated in sports Yes (%)<br>NO (%) | 55.2<br>40.2 | 53.1<br>40.1 | 42.6<br>58.3 | 35.2<br>65.8 |
| Physical Exercise<br>Yes (%)<br>No (%) | 56.3<br>43.2 | 55.1<br>45.3 | 38.5<br>61.5 | 28.2<br>76.1 |
| Diet Habit<br>Non-Vegetarian (%)<br>Vegetarian (%) | 95.0<br>5.0 | 96.0<br>4.0 | 91.2<br>8.8 | 90.1<br>9.8 |
| Restaurant Visit per week<br>Visits more than once (%)<br>Visits once or No (%) | 75.0<br>25.0 | 82.1<br>17.1 | 81.1<br>18.0 | 80.9<br>19.1 |
| Takes Junk Food Regularly<br>Yes (%)<br>No (%) | 43.7<br>56.8 | 45.9<br>54.1 | 60.1<br>39.9 | 65.8<br>34.2 |
| Chocolate Eating Habits<br>Yes (%)<br>No (%) | 42.9<br>57.6 | 54.3<br>45.6 | 60.0<br>40.0 | 68.9<br>31.1 |

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