CHAPTER - II

REVIEW OF LITERATURE

Obesity is a global nutritional concern. In every case the origin of obesity can be traced back to childhood and adolescence. This problem is steadily affecting many low and middle income countries, particularly in urban settings. On balance, the obesity epidemic has now become a heavy burden not only on those carrying the extra weight and their relatives, but also for public health systems and health policy. In present study, literature related to different aspects of overweight and obesity is studied and it is presented in this chapter as follows.

2.1 Prevalence of overweight and obesity.

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2.1 Prevalence of overweight and obesity

2.1.1 World scenario:

In 2010, obesity (and being overweight) caused the death of 3.4 million people, according to a study conducted by the Seattle-based institute for Health Metrics and Evaluation. Most of the deaths were caused by cardiovascular conditions. According to the study between 1980 and 2013, the prevalence of overweight or obese children and adolescents increased by nearly 50%. In 2013, more than 22% girls and nearly 24% boys living in developed countries were found to be overweight and obese. Developing countries also recorded high levels of childhood obesity, where nearly 13% boys and more than 13% girls are overweight or obese (Mehta, 2015).

The prevalence of overweight and obesity has also increased in children and adolescents in developing countries, from 8.1% (7.7–8.6) to 12.9% (12.3–13.5) in 2013 for boys and from 8.4% (8.1–8.8) to 13.4% (13.0–13.9) in girls. Prevalence has increased substantially in children and adolescents in developed countries; 23.8% (22.9–24.7) of boys and 22.6% (21.7–23.6) of girls were overweight or obese in 2013. (Ng m. et al., 2014)

Overweight and obesity in pre-school children from developing countries was reviewed by Martorell et al. (2000). Total of 1,50,482 children between the age group of 12 to 60 months were selected from
50 countries, overweight and obesity were defined as weight for height of the WHO/NCHS reference curves. The findings of the study indicated that 32 of 50 countries had a prevalence of obesity below 2.3% in the reference population. The prevalence of overweight and obesity were lowest in Asia and in Sub-Saharan Africa.

A study by Wang et al. (2002) used an international standard of measurement to illustrate weight patterns of children aged 6-18 years in four countries, namely United States, Brazil, China and Russia which represents one fourth of the world’s population. The measurement standard used was developed by the International obesity Task Force (IOFT), 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. Adolescents from the United States showed markedly higher values of overweight prevalence. Brazil trends were similarly reflected. Russia did not show trends towards overweight but inversely demonstrated more underweight children. The hardship in Russia over the last decade was related to the different results.

Wang and Lobstein (2003) reviewed the worldwide trends in childhood obesity in 25 countries for school-age populations and in 42 countries for preschool age populations. They observed that the prevalence of childhood overweight has increased in almost all countries for which data are available, and obesity and overweight has increased more dramatically in economically developed countries and in urbanized populations.
Lobstein (2004) stated that there is steadily increasing epidemic of obesity among school age children. 15 % UK children are obese and obesity in children is associated with a decrease willingness to become involved in physical activities and sports leading to a much lower level of fitness.

Hamiton and Greenway (2004) observed that out of 15349 USA high school students 25% students were overweight.

Hedley et al., 2004 used the 2004 National Health and Nutritional Examination Survey (NHANES II) where in 3958 children between the ages of 2 and 19 years across the United States were surveyed. BMI of 17.1% children was calculated at or above the 95th percentile for age. Using logistic regression, trends were adjusted for race, ethnicity and age and showed a significant increase in obesity in children and adolescents living in the United States from 2000 to 2004.

In United Arab Emirates global school-based students, a health survey was conducted in 2005. The prevalence of overweight and obesity was as follows: 21.5% students were at risk of becoming overweight, 12.1% were classified as overweight. There was no significant difference between male students (21.2%) and female students (21.7%) at risk of being overweight. Also there was no significant difference between the overweight male students (13.2%) and the overweight female students (11.0%) (Ng S. et al., 2011).

Thomas (2005) estimated the prevalence of childhood obesity among 7-13 year old in Canada from 1981-1996 rises from 5 % to 13 % for boys and from 5 % to 11.8 % for girls.
Data from the 2005 Youth Risk Behaviour Study in Montana noticed that 9% high school students were overweight and 13% were at risk for becoming overweight. American Indian children in Montana were particularly at risk for obesity with prevalence more than twice as high as the general population (Kolbe et al., 1993).

Hassink (2006) noted that July 2006 report of National conference of State Legislature highlighted childhood obesity as a primary public health concern. It was noticed that during the period between 1980 and 2002 the number of overweight children and adolescents between the ages of 6 to 19 years tripled.

In USA Hedley et al., (2004) updated the US prevalence estimation among children and adults (children were defined as a person aged 2 to 19 years; adults are persons aged 20 years or above). National Health and Nutrition Examination Survey (NHANES) was the source of data. A complex multistage probability sample of the US non institutionalized civilian population was done. The subjects were 4,115 adults and 4,018 Children (1999-2000) and 4,390 adult and 4,258 children (2001-2002). Height and weight measurements were obtained. Obesity in adults was defined according to WHO cut-off-points. For children, the 2000 CDC growth charts were used. A person is defined as at risk of overweight if his BMI for age and sex are at or above the 85th percentile, but less than the 95th percentile. After classification, children were identified to determine who should be referred for a second level of screening to determine if they are any additional health risks that would warrant intervention. Obesity was defined as at or above 95th percentile for the sex specific BMI for age growth chart.
There was an indication that the prevalence of obesity among USA children was continuously increasing.

Ogden and colleagues demonstrated a significant increase in percentage of overweight among children and adolescents in the United States aged 2-19 year old during six year period from 1999-2004 (Ogden et al., 2006).

Mannino (2007) commented obesity is now reaching epidemic proportions in both developed and developing countries. Total 1804 (26%) Canadian children and adolescents aged 2-17 years were overweight in 2004. The obesity rate has increased dramatically in the last 15 years from 2 % to 10 % among boys and from 2 % to 9 % among girls.

Ogden et al. (2010) stated that rate of obesity among children and adolescents in the United States have nearly tripled between the early 1980 and 2000. It has however not changed significantly between 2000 and 2006 with the most recent statistics showing a level just over 17 %.

A study was conducted at Jamaica to estimate the prevalence of overweight, obesity and high waist circumference in 15 to 19 year old adolescents. The study enrolled 1317 adolescents using multistage, nationally representative sampling. The overall prevalence was 15 %, 6 % and 10 % for overweight, obesity and high waist circumference respectively. (Francis, 2009)

Han et al. (2010) recorded prevalence of overweight and obesity in children had increased during the past two decades in the most industrialized countries, apart from Russia and Poland, and in several
low-income countries, especially in urban areas. By 2010, more than 40% children in the North American and Eastern Mediterranean WHO regions, 38% in Europe, 27% in the western Pacific, and 22% in Southeast Asia were predicted to be overweight or obese.

2.1.2 Indian scenario:

Khadilkar et al. (2004) studied 1228 boys from two affluent schools in Pune and stated prevalence of obesity according to international cut off points (BMI criteria) was found to be 5.7% whereas overweight prevalence was 19.9%. Over the decade, BMI of children is increasing suggesting a worrying trend of a whole adolescent population shift towards higher weights and BMI.

Kaur, S. (2005) observed that in Delhi survey, students from well-to-do High schools and Middle schools were about 27% overweight and 17% obese due to changed lifestyle.

Negi (2006) stated that the number of obese Indian’s has tripled over the last 20 years and is still rising. One out of 10 urban Indian children is obese. Almost 45% boys and 55% girls in Delhi have weight problems, and nearly 17% school children in Delhi are plain fat.

Prevalence of obesity among school children of Davangere city was studied by Kumar et al. (2007) and reported prevalence of obesity was 5.74% and it was more in girls (8.82%) than boys (4.10%). Raj M. et al. (2007) collected anthropometric data from 24,842 students, of 5-16 years of age and reported the proportion of overweight children was significantly higher in urban regions and in
private schools. Childhood obesity showed an increasing trend in a short period of 2 years.

1000 adolescents from public schools of Ludhiana were selected randomly and BMI was calculated using international cut off. Overall incidence of obesity in the study groups was 3.4 % with no significant difference between boys and girls. (Aggarwal et al., 2008).

Bharati et al. (2008) studied correlates of overweight and obesity among school going children of Wardha city, central India. Systematic random sampling technique was used to select the children of different schools of Wardha. Height, weight and BMI of each student was calculated. Overweight and obesity was assessed by BMI for age, overweight and obesity was found to be 3.1 % (95 % CI: 2.5-3.8) and 1.2 % (95 % CI: 3.6-5.2) for overweight/obesity.

Warren et al. (2009) stated that a study on school children in urban Madras found the number of overweight boys to be 17.8 % and girls 15.8 %.

Goyal et al. (2009) studied prevalence of overweight and obesity in Indian adolescent school going children. 5664 school children of 12-18 years of age were screened. Age adjusted prevalence of overweight was found to be 14.3 % among boys and 9.2 % among girls whereas the prevalence of obesity was 2.9 % in boys and 1.5 % in girls.

The study conducted at Hisar city among 3450 school children in the age group of 9-15 years selected from government and private schools on diet, obesity and related factors revealed that, prevalence of obesity was 5.79 %. The percentage of obese females was higher (52.5%) than those males (47.5%) and comparatively a higher
percentage (57.5%) of obese respondents were in the age group of 12-15 years Sikandra and Darshan (2010).

Study of childhood obesity among school children aged 6-12 years in Union Territory of Pondicherry was studied by Mahajan et al. (2011). Children between 6 and 12 years were sampled using multistage random sampling with population proportionate to size. Anthropometric measurements were taken and BMI was analyzed using CDC growth charts. The prevalence of overweight (>85th percentile) among children was 4.41 % and prevalence of obesity (>95th percentile) was 2.12 %. Female children from private schools and urban areas were at greater risks of being overweight and obese.

A cross sectional study on correlates of overweight and obesity among urban school going children of Nagpur city was conducted by Thakre et al. (2011). Total 1524 students in the age group of 5-16 years, studying in class I-X in private schools of Nagpur city were estimated for the study. Height and weight of each student was calculated by using standard procedure. Overweight and obesity was assessed by considering the BMI for a particular age and sex. The result of the study indicates that prevalence of overweight and obesity among children was 9.00% and 5.5% respectively. Over all the prevalence of overweight and obesity was 14.52 %.  

Seshadri et al. (2011) studied overweight, obesity and dietary factors among 400 adolescents in an urban community of West Bengal. As per WHO criteria, BMI percentile was determined for sample. Out of 400 students, 242 (60.5%) were boys and 158 (39.5%) were girls.
The prevalence of overweight/obesity among the selected sample was 20.5% and out of these 17% was overweight and 3.5% was obese.

Ponni and Dorothy (2011) conducted study on assessment of nutritional status and lifestyle modification of obese children. Data was collected on anthropometric measurements, socio-economic background and dietary pattern of children. Results indicate that out of 321 students, 29% boys and 8% girls were obese. 4% boys and 2% girls are undernourished. It is found that 18% boys and 14% girls are having healthy weight whereas 15% boys and 8% girls are overweight.

Magnitude and determinants of overweight and obesity in 6-12 year old school children of Vadodara city was studied by Iyer et al. (2011). Total 1067 children were studied for anthropometric measures. Results noted that prevalence of overweight and obesity as per IOTF and Must et al. standards were 20.3% and 23.4% respectively. BMI of obese children and parents were significantly higher than normal children’s and parent’s BMI.

Priya and Vinothini (2012) conducted a study on the prevalence of childhood obesity among selected obese school going children (10-15 years). Information on socio-economic status, dietary pattern, anthropometric measures and medical history were recorded from 100 student selected from Trichy. Results indicated that 8.3% the children were obese among school going children.

A report from ‘Samrat Endocrine Institute of Obesity, Diabetics and Thyroid’, Aurangabad, Maharashtra stated, one out of four children is obese in urban area whereas one out of six children is facing problem
of obesity in rural area. 30 % obese overweight children are suffering from high blood pressure and 4% from type II diabetes (Divya Marathi, 2012).

Determinants of adolescent obesity in North-Western Karnataka were studied by Rachna et al. (2012). A total of 3053 adolescents aged 12 to 17 years from government, private, and aided schools were selected. Data regarding personal details, family history, life style, nutrition and anthropometric measurements was collected with the help of structured questionnaire and trained doctors. Prevalence of overweight/obesity was reported as 7.3%. Socio-economic status, non Hindu religion, sedentary life style, fast foods were major determinants of overweight/obesity in school going adolescents.

Prevalence of obesity among adolescent girls (15-17 years) was studied by Aisa et al. (2012). 12% adolescent’s girls were found to be overweight and 4% were obese. It was reported that the prevalence of obesity was not high among selected adolescent girls however the small percent found and that was due to sedentary life style and high socio-economic status.

Mandal et al. (2012) studied 571 girl students, aged 12-18 years for prevalence of overweight and obesity among the urban adolescent English medium school girls of Kolkata. Cole et al. (2000) recommended cut-off points were utilized to assess overweight and obesity. The overall prevalence rates of overweight and obesity were 28.5 % and 4.2 % respectively. The rate of overweight was the highest when compared with that of different parts of India including Kolkata, and also when compared to rates from the USA and Great Britain.
Shah et al. (2013) carried a single centric epidemiological study among 200 school children selected at random in Mehsana district. Overweight and obesity were assessed using height, weight, waist circumference and hip circumference of each student in the class. The prevalence of overweight and obesity in the students of Mehsana district was found to be 33.88% and 10.67%, respectively. Significant difference in BMI for boys (P<0.001) as well as girls (P < 0.01) was observed in all the three underweight, overweight and obese groups as compared to normal group. The prevalence found in the present study was higher than the national average.

Dhole and Mundada (2013) stated that out of 400 children, selected from different schools from Municipal Corporation area, Aurangabad, Maharashtra, 345 (86.3%) children had normal BMI, 30 (7.5%) were overweight and 25 (6.3%) were obese. The prevalence of overweight was 9.6 % and obesity 7.9 % in private school and 6.6 % for overweight and 5.6 % for obesity in government school. Children from private schools were significantly overweight when compared to those from government schools (9.1 % Vs 5.9 %, P< 0.05) while prevalence of obesity was not different between the two groups (3.6 % Vs 2.1 %).

Sneha Limaye CRF researcher published article in Times of India. Pune based Chest Research foundation (CRF), in collaboration with the Symbiosis International University, conducted a study recently, mapping 1,536 school children from two schools in Pune, age 5-15 years and found 8.2 % of them obese and 28.7 % overweight. The prevalence was higher among girls than boys (8.9 % and 31 % in girls as against 7.7 % and 27 % in boys.) (Times of India, 12 Nov. 2010).
Bishwalata *et al.* (2010) conducted a cross-sectional study among 3356 school children of classes VIII to XII in Imphal West district, Manipur between September 2005 and August 2006. The characteristics of the respondents and related variables such as parental build, watching television, eating habits, playing of video/computer games and outdoor games, dietary pattern and knowledge of obesity were assessed using a questionnaire. Height, weight, waist circumference, hip circumference, fat percentage, fat mass and fat-free mass were measured. Body mass index (BMI) and waist-hip ratio for each student was calculated. Using the WHO standard, the prevalence of overweight was 4.2% and of obesity 0.8%. Using multivariate logistic regression, mother being reported to be obese (OR- 1.9, 95% CI: 1.4-2.6), watching television for > 2 hours a day (OR- 2.052, 95% CI: 1.191-3.536), higher family income (OR- 5.844, 95% CI: 2.135-15.99), not eating other type of vegetables in the past one week (OR-2.338, 95% CI: 1.04-5.24) and waist-hip ratio (OR- 7.737, 95% CI: 4.429-13.51) were found to be independent predictors of a higher BMI. Mother's literacy below class X (OR- 0.6, 95% CI: 0.378-0.997) and eating between major meals (OR-0.447, 95%CI: 0.293-0.681) were significant predictors of a lower BMI.

### 2.2 Anthropometric measurements of overweight and obese children:

Raj M. *et al.* (2007) studied time trends and relationship with hypertension of obese children in India. Blood pressure and anthropometric data was collected from 20263 students of 5-16 years age during period 2005-06. The proportion of overweight children
increased from 4.94% of the total students in 2003 to 6.57% in 2005. A comparison of mean BMI between 2003 and 2005 showed an increase across all age groups. The prevalence of overweight was more in the age group of 12-16 years in 2003 and 2005.

The cross sectional study was carried out in all 31 middle schools and high schools of Wardha city by Bharati et al. (2008). They reported the proportion of overweight/obesity was 4.4% and 4.3% among boys and girls respectively. The proportion of overweight/obesity was higher in late adolescent (> 15 years of age) than in early adolescence (< 15 year of age) but the difference was not statistically significant.

Nutritional profile of selected overweight and obese school going children of Coimbatore city was evaluated by Kalpana and Lakshmi (2009). Total 9191 students from thirty schools of Coimbatore city aged 7-12 years were screened for overweight and obesity. Mean height of obese boys and girls, aged 7 and 10 years was found to be above normal. The mean height of both obese boys and girls aged 12 years was below the normal when compared to standard height. The mean weight of both obese and overweight children was above normal among all the age groups.

Priya et al. (2007) conducted study on nutritional status of Punjabi adolescent girls from high socio-economic group. They mentioned Punjabi adolescent girls who were surveyed were taller and heavier than the other girls. The observed values for height and weight were found to be higher than that of NCHS standards and ICMR values.
Obesity in Hisar children was studied by Sikandra and Darshan (2010). The data on anthropometric measurement of the respondents showed that mean values for most of the parameters (Weight, BMI, waist circumference, hip circumference, waist hip ratio, triceps and skin fold thickness) for obese respondents were significantly higher than non-obese group respondents except mean value for height which was significantly higher in non-obese group respondents.

Mani et al. (2011) carried study on effect of health promotion programme in the management of childhood obesity in school set up by adopting standard procedures, such as anthropometric measurements like height, weight, waist circumference, hip circumference and BMI were taken. The anthropometric profile of control group showed no distinct changes in the pre-post data collected. The overweight / obese boys and girls both had higher waist and hip circumferences compared to normal, apart from BMI. In experimental group, overweight/obese category had a higher waist and hip circumference as compared to normal group.

Thakre et al. (2011) studied correlates of overweight and obesity among urban school going children of Nagpur city. Results indicate that the overall prevalence for overweight/ obesity was 14.52 %. The mean BMI of boys and girls was (15.71 + 3.612) kg/m² and (16.87 + 4.08) kg/m² respectively. On doing univariate analysis, the risk of overweight/ obesity was found to be significantly higher among children from the age group of > 10 years than children from the age group of < 10 years.
Moderate prevalence of overweight/obesity (27 %) as per WHO, 2007 reference data was reported by Sangawan (2013) by a cross sectional study on assessment of weight status of adolescents from Gurgaon.

Anthropometric indices of 850 school children from selected urban and rural areas of Mysore were recorded. The mean weight of children from urban and rural area showed highly significant difference arising due to age (f= 236.740, P=0.000). Significant differences were also seen for BMI (f=7.009, P=0.000). Overall urban children showed better anthropometric indices than rural children and female had better status than male (Naik and Jamuna 2012).

Shah et al. (2013) assessed height, weight, waist circumference and hip circumference of each student while conducting study for determining overweight and obesity among school children in Mehsana district, India. 200 students aged 10-12 years were selected randomly. Significant difference in BMI for boys (P<0.001) as well as girls (P<0.01) was observed in all the three underweight, overweight and obese groups as compared to normal group. The prevalence of overweight and obesity was found to be higher than the national average. i.e. 33.88 % and 10.67 % respectively.

Gaikwad (2013) studied prevalence of overweight and obesity among adolescents from Parbhani city. The data on anthropometric parameters weight, height, body mass index of selected adolescents was recorded. Prevalence of overweight/ obesity together was 6 % (4 % overweight and 2 % obese) in the entire study population. In the age group of 13 to 15 years, significant difference in height and weight of
obese and control group girls was noticed. The height of all selected 13 to 15 year old girls from three groups and weight of control group girls was significantly less than NCHS reference values.

Dhole and Mundada (2013) carried out cross-sectional study to know the prevalence of overweight and obesity amongst school children in Aurangabad, Maharashtra. They stated out of 400 children, 86.3% children had normal BMI, 7.5% were overweight and 6.3% were obese. Children from private schools were significantly overweight as compared to those from government schools.

A study conducted by Dr. Siddiqui and Dr. Bose (2012) on prevalent trends of obesity in Indian children of different socio-economic class reveals that, the overall prevalence of obesity was found to be 14.97% (6.81% boys, 8.16% girls). Higher values of mean weight, height, BMI and blood pressure was found in obese children as compared to non-obese. They concluded that prevalence of obesity is on rise in Indian children, highlighting the possible role of change in the dietary pattern and physical activities with increase in income level.

Nayak (2011) undertook a study to identify the prevalence of childhood overweight /obesity and to find the relationship between BMI and waist circumference of the children. Eleven schools were selected randomly from Udupi district of Karnataka state, India. A school based survey was carried among 2938 school children in the age group of 10 – 16 years. On the day of survey, the purpose of the study was explained. The demographic performa was administered and standard procedures were followed to assess the anthropometric measurements. Result showed that 7% children were overweight and
5% were obese. The Pearson Correlation computed between BMI and waist circumference showed a positive \( r = 0.763, p \leq 0.0001 \) relationship between BMI and waist circumference. The study concluded that childhood obesity prevalence is increasing among children. Higher BMI was found among children in the age of 10–12 years and among girls than the boys. The gender difference in BMI could be due to sedentary lifestyles of girls. They also concluded that as the BMI of children increases the waist circumference also increases.

**2.3 Socio-demographic aspects of overweight and obesity in school children:**

Kumar *et al.* (2007) studied 1496 affluent school children of Davangere city to know prevalence of obesity and its influencing factors. They revealed presence of obesity increased with, increase in age in both boys and girls.

Bharati *et al.* (2008) discussed correlates of overweight and obesity among school going children of Wardha city, Central India. On univariate analysis, the risk of overweight and obesity was significantly higher among children from urban area than from rural area, children studying in English medium school than in non-English medium school, Hindu children than children of other religions and children whose father and/or mother had service/business.

Obesity among school children of Hisar city in the age group of 9 to 15 years were screened by Sikandra and Darshan (2009). Data revealed that the ratio of obese female was higher (52.5%) than obese male (47.5%) and comparatively a higher percentage (57.5%) of obese respondents were in the age group of 12-15 years. Prevalence of
obesity was high in the respondents belonging to the families having high monthly income.

Goyal et al. (2010) noted prevalence of overweight among children was high in middle SES as compared to high SES group in both the gender, when they noticed overall prevalence of overweight and obesity and its relationship with socio-economic status among 5664 school children in the age group of 12-18 years. They also reported socio-economic 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 whereas no prevalence of obesity was found in children from low SES group.

Keerthan Kumar et al. (2011) observed the prevalence of overweight and obesity in Dakshina Kannada and Udupi districts. The prevalence of obesity and overweight was 2.6% and 3.0% and was found to be higher in male, children studying in private schools as compared to government school and children staying in nuclear family than joint family.

Mother’s education, mother’s occupation, religion, residence, type of school, type of family were not found to be statistically significant, where as father’s education, father’s occupation and class were significantly associated with overweight and obesity recorded by Vohra et al. (2011) while studying overweight and obesity among school going children of Lucknow city.

To identity any variation as per age, gender, place of residence and type of school on prevalence of overweight and obesity, a study
was conducted among school children aged 6 to 12 years in Union Territory of Pondicherry by Mahajan et al. (2011). Results indicate true prevalence of overweight and obesity was 4.98 % and 2.24 % respectively. Prevalence of overweight and obesity was higher in urban areas than rural areas, children belonging to relatively higher socio-economic strata, which were likely to study in private schools and reside in urban areas are at higher risk of obesity. Thus area of residence, socio-economic conditions and age/gender differences were important contributors towards overweight and obesity.

Statistics show that roughly 20 % school children in India are obese. A study conducted by All India Institute of Medical Science (AIMS) among children of age group 14 to 18 found 17% to be obese or overweight. Obesity is more common among Delhi children as compared to kids of other states like Mumbai, Deharadun and Agra. It was found that 32.6 % obese children studied in private schools compared to 9.2 % children in government ones. Mumbai trails behind Delhi with 30.4% obese children in private schools and 7.9% obese children in government schools. It is also noticed that there has been an increase in the obesity from 11.6% to 17 % in private schools in past few years (Mukerjee, 2011).

Recent survey results from the five metros of Delhi, Mumbai, Chennai, Hyderabad and Kolkata have reported that one in every five school going children is overweight or obese. Nutrition and lifestyle transitions are driving childhood obesity into an epidemic. Economic growth, modernization, urbanization and globalization of food market are some of factors thought to underline the epidemic.
Cherian and co-workers (2012) observed prevalence of obesity and overweight in urban school children in Kerala, India and noted the average age specific BMI for boys of upper income group was greatest and the lower income group had the lowest average age specific BMI. There was no age related trend seen in the percentages of obesity or overweight among boys but in girls overweight increased with age. The percentages of obese and overweight girls are consistently higher along all age groups than boys in the same age group. When comparing socio-economic groups, obesity and overweight were more prevalent in upper income group girls than upper income group boys whereas there was not much gender difference in the middle income group and lower income groups.

The study conducted among a sample of 400 school children of Aurangabad state that prevalence of overweight and obesity was higher in private schools than government schools. But the difference found between type of school was not statistically significant (P>0.05) (Dhole and Mundada, 2013).

Patel et al. (2013) assessed overweight and obesity among school children in Mehsana District, India and found prevalence of overweight and obesity was higher in males than females. Factors like mother’s education, mother’s occupation, religion and type of family were also not found to be statistically significant.

2.4 Dietary behaviour of overweight and obese school children.

Joshi Prashant (2007) surveyed more than 3800 secondary school students aged above 12 to 15 year in Australia to evaluate their food intake pattern. They found that teenagers need to be eating a variety of
food from five food groups, cereals, meat substitute, vegetables, fruits and dairy. Everyday extra foods, such as fast foods, energy dense snacks and sugar sweetened drink were consumed by nearly 90% teenager on a daily basis.

A school based cross sectional study conducted on 1000 adolescents in public schools of Ludhiana, Punjab, showed overdue incidence of obesity was 3.4 percent with no significant difference between boys and girls. Out of the total obese children, significant percentages (82.3%) were non-vegetarian where only 8.8% vegetarian and 8.9% ova-vegetarian were obese. The incidence of obesity/overweight was found to be significantly higher in those adolescents who ate meals outside home. The mean scores of replacing snacks for meals were significantly higher in obese and overweight adolescents as compared to adolescents with a normal body mass index. (Aggarwal et al., 2008).

Relationship of socio-economic status with obesity was studied by Warraich et al. (2000). Data was collected from 284 students studying in grades 6th to 8th in different schools of Karachi. According to their scoring system, 80% of kids have a high consumption of junk food. Intake was regardless of SES although it had no relationship with nutritional status. Meat consumption was high, 65% ate meat everyday and percentage was higher in children from higher socio-economic class.

Goswami et al. (2009) carried study on nutritional status of Punjabi adolescent girls. Regardless of food habits, majority of girls were vegetarian (60.4%) followed by ova-vegetarian (20.7%) and non-vegetarian (18.9%). Fasting was found in 41.3 percent of the girls and
might be due to religious beliefs, figure consciousness or gaining attention from the family members. Skipping meals (57.2%) was also very common feature among the subjects. Indulgence in consumption of snacks and fast food found high i.e.98.3%. The most commonly skipped meal was breakfast (36.1%).

Effect of fast food restaurants on obesity was studied by Currie et al. (2009) in California. They noticed proximity to fast food restaurant is associated with increase in obesity rates and weight gains; proximity to non fast food restaurants has no discernible effect on obesity rates and weight gains. Results suggest that a ban on fast food in the immediate proximity of school could have a sizeable effect on obesity rates among affected students.

Sikandra and Darshan (2010) studied diet and related factors among school going obese children of Hisar city. Only 4 percent of non-obese group respondents and 42 percent of obese respondents consumed fried foods. Frequency of food consumption outside home weekly or monthly was higher in obese group respondents as compared to non-obese group respondents. They also reported that obese children consumed significantly more fast food than the non-obese children. Majority of non-obese as well as obese respondents use pulse, milk, curd, sugar and fat daily and majority do not consume eggs and meat.

Goyal et al. (2010) collected information on prevalence of overweight and obesity in Indian adolescent school going children. Junk food and chocolate eating habits have positive relation with prevalence of obesity and overweight. Restaurant visit per week was positively associated with BMI. Vegetarian diet or non-vegetarian diet
did not have any effect on prevalence of underweight, overweight and obesity.

Thakre et al. (2011) studied correlates of overweight and obesity among urban school going children of Nagpur city. A cross sectional study on school children aged between 5 and 16 years showed that the risk of overweight and obesity was significantly higher among children who were non-vegetarian (OR=1.88, 95% CI=1.39-2.5, P<0.0001) and among those who did not consume milk (OR=1.66, 95% CI=0.99-2.71, P<0.0345). The risk of overweight/obesity was also significantly high in those who regularly consume junk food (OR=2.54, 95% CI=1.82-3.53, P<0.0001), those who did not consume fruits and in whom the calorie intake was more than the recommended daily allowances. Eating in restaurants regularly, eating green salads regularly and the consumption of drinks/chocolates were found to be non-significant.

Effect of health promotion program in the management of childhood obesity in a school set up was studied by Mani et al. (2011). Total 880 students belonging to 6th to 12th standards were selected. The dietary pattern and average daily intake of the individuals were determined using 24 hour dietary recall and food frequency questionnaire. The prevalence of overweight and obesity in the study group was found to be 12.8 % using IOTF standards. The energy, fat and carbohydrate intake in the obese group was found to be significantly higher than the normal group. Fat intake especially saturated fat due to fast food consumption was above the RDA and contributed to 32-52 percent of energy intake. After intervention the
experimental group displayed a trend of lower energy intake in both overweight and obese group. This change was due to reduced fat and carbohydrate intake.

Seshadri et al. (2011) selected total 400 children to assess overweight, obesity and dietary factors among adolescents in an urban community of West Bengal. Out of them 17% were overweight and 3.5% were obese. Regular consumption of vegetable foods and daily or 3 to 4 times consumption of fruit and fruit juices were more among the adolescents having normal weight. Majority of subjects consumed vegetable foods (80.75%) and fish (78.75%) regularly, most of the children consumed milk/dairy products (83.59 %) and eggs and chicken (87.25 %) sometimes and 75.25 % did not consumed meat. 71 % ate their weekly meals outside the home and only 6 % never ate cooked food outside the home. 30 % consumed soft drinks, ice-creams, sweets either daily or 3 to 4 times/week.

Ponni and Dorothy (2011) observed nutritional status and lifestyle modification of obese children belonging to low, middle and high income groups between 3 to 10 years. Quantitative information on consumption of foods was obtained by 24 hour recall method. The mean nutrient intake was calculated and compared with ICMR Recommended Dietary Allowances. The nutrient intake of the selected children exceeded the ICMR Recommended Dietary Allowances. 44 % children consumed sweets and chocolates and 33 % consumed fried items daily.

A study was conducted by Priti et al. (2012) on impact of media on food consumption patterns of adolescent girls. Eating pattern,
frequency of consumption of advertised food on television and lifestyle of 150 adolescent girls were studied. They found due to consumption of unhealthy foods, less physical activity and more consumption of marketed foods, 18% adolescents were obese.

Prevalence of obesity among adolescent girls (15-17 years) was studied by Aisa et al. (2012). A total of 100 subjects were selected. The results showed that majority of the subjects were non-vegetarian, took three meals per day and the staple grain was rice. They found 29% girls consumed food in college canteen, 11% in hotel and 13% in fast food centres.

Food habits and nutritional status of children from secondary schools in urban Pune was evaluated by Rama and Chandrakala in 2012. Height, weight and physical activity data was collected from 286 children of 6th and 7th standards. The prevalence of obesity/overweight was 5.9% (5% boys & 7.2% girls). Food frequency questionnaire was administered to assess intake of snacks and fruits. Frequency of eating outside home at least once a week was reported by 61.2% children, out of which 6.6% eat outside daily. Frequency of eating food outside home especially from open place was prevalent in school children. Daily consumption of bakery products, fried foods and desserts was reported by 57.7%, 27.6% and 26.9% children respectively where as only 14.7% children reported daily consumption of fruits.

Mandal (2012) studied prevalence of overweight and obesity among urban adolescent English medium school girls of Kolkata, India. Data was collected from 571 girls in age group 12-18 years regarding eating habits such as main meals, intake of fast foods, consumption of
ice-creams, cold drinks and chocolates and consumption of snacks in between meals. Result showed girls of lower ages (12-15 years) consumed fast food more frequently as compared to the girls of higher ages (16-18 years), who consumed them comparatively less. Consumption of ice-creams, cold drinks and chocolates per week were more in girls of lower ages than their senior counterparts, who consumed these more cautiously and much less. The study presumed that the higher prevalence of overweight in school children may be due to their eating habits, as well as to their lack of awareness on proper eating habits.

Increasing proclivity for junk food among overweight adolescent girls in district Kurukshetra, India was studied by Goel et al. (2013). Dietary intake of the overweight adolescent was collected by 24 hour recall method for three consecutive days. Results indicate that most of the adolescent girls were vegetarian (66.25 %) and 51.25 % were consuming four or more meals per day. Majority of subjects (68.75 %) consumed in between meals. Consumption of junk food was observed among majority (60.37 %) of the subjects as a replacement for meal skipping. 47 % adolescent girls consumed junk foods twice a week. Potato chips were the most (100 %) preferred junk food item and ‘kachori’ the least (8.75%) preferred item. Maximum (91.25%) subjects were consuming carbonated drinks. The data also revealed that girls were consuming excess of energy, protein and fat but inadequate micronutrients like iron and beta-carotene, which may be one of the causes of girls being overweight.
Shah et al. (2013) reported the frequency of intake of fast food had an impact on the prevalence of overweight; however the observations were not statistically significant when they conducted study on prevalence of overweight / obesity among school children in Mehsana district, India.

2.5 Activity pattern of overweight and obese school children:

There has been a significant decrease in the average amount of physical activity over the past 30 years, especially for youth. The advent of video games, computers, cable television, mobiles, public transportation systems, and employment opportunities that do not require great amounts of physical exertion are some of the reasons for decline in activities.

Causative factors associated with childhood obesity were studied by Sabhikhi et al. (2005). It was observed that the subjects spent only 1.20 hours in moderate activities like walking and playing outside. The average hours spent in moderate activity by boys and girls were 1.28 + 0.08 and 1.12 + 0.15 hours, respectively. Boys spent more hours in moderate activity than the girls. The subjects spent most of the time in sleep (12.47 + 0.11 hrs) and light activities (10.33 + 0.11 hrs). Light activities included TV viewing, playing video, mobile or computer game and study or any other indoor activity. Subjects spent 2.27 + 0.1 hours in TV viewing and 8.06 + 0.12 hrs in studying or any other indoor activity, so little energy is expended in such type of light activities.

Nemet and Barkan (2005) carried a study on short and long term beneficial effects of a combined dietary–behavioural physical activity...
intervention for the treatment of childhood obesity. It was found that increasing energy expenditure by decreasing children’s sedentary behaviour and increasing physical activity level was likely to reduce paediatric obesity.

The school based cross-sectional study was conducted by Aggarwal et al. (2008) to know prevalence of obesity and overweight in affluent adolescents form Ludhiana, Punjab. Results explained one of the major reasons for childhood obesity is watching television or using computers. More than half of the adolescents from study spent 1 to 4 hr/day on sedentary activities i.e. 57.2 % boys and 52.8 % girls spent 1 to 4 hr/day viewing TV or sitting at the computer.

Prevalence of obesity in school going children of Karachi was revealed by Warraich et al. (2009). Results indicate that lack of physical activity was found to be associated with obesity in children. Cricket was found to be the most popular sport followed by football, basketball, games involving running and cycling. About 30 % all kids play cricket 7 days a week, except for obese kids, of whom only 6 % do so In fact, 47 % obese were not playing cricket at all.

Obese and overweight children participated in sports less often than normal weight participants, similarly obese and overweight children participated in physical exercise less often than normal weight and underweight participants. The obesity and overweight were somewhat more prevalent among children who were having sleeping habit in afternoon than normal. The difference was very slight between those who did or did not have sleeping habit in afternoon (Ramesh et al., 2009).
Kalpana and Lakshmi (2009) conducted study on nutritional profile of selected overweight and obese school going children of Coimbatore city. Total 9191 (5119 boys, 4272 girls) in the age group of 7-12 years were screened for overweight and obesity. The prevalence of overweight and obesity among children was found to be 9.3 and 6.9% respectively. 44% overweight and 47% obese children played computer games while 35% overweight and 37% obese children played chess daily. Outdoor games like cricket, tennis and football were played by a lesser number of children when compared with indoor games indicating lack of physical activity among overweight and obese children.

3450 school children in the age group of 9-15 years were selected from government and private schools from Hisar city, to study obesity. It was observed that playing games was the main activity of non-obese children (42%) and obese children were least interested in playing games. Majority of obese children were not doing any physical activity. The obese subjects were significantly less active based on the activity score compared with non-obese group. The prevalence of overweight children was significantly related to the amount of time (hrs/day) that the children spent on TV and video denoted by Sikandra and Darshan (2010).

Keerthann kumar et al. (2011) conducted cross sectional study of 500 participants from selected schools in Udupi and Dakshin Karnata district. Severity of exercise based on duration was labelled as mild-equal to less than 30 minutes, moderate as 1 to 2 hours, heavy as more than 3 hours. Regular physical activity is inversely related to obesity.
The percentage was high in those who do not exercise regularly as compared to those who exercise regularly, and in those who exercise for less than 2 hrs per day. The study concluded that regular exercise more than 5 days a week, plays a major role in combating overweight and obesity, and should hence be encouraged. Since TV viewing for more than 2 hrs a day, is a major culprit for childhood obesity, parents and teachers should be advised to engage children in outdoor games and healthy activities.

Overweight and obesity among urban school going children of Nagpur city was reported by Thakre et al. (2011). The risk of overweight/obesity was significantly higher among children who viewed television for > 1 hour, who slept for only > 7 hours and who used vehicles to go to school. The prevalence of overweight and obesity was significantly lower among children who swam, danced regularly and played outdoor games than their counterparts. Its association was found to be protective against overweight and obesity.

A comparative study in Nigeria to know pattern and determinants of obesity among adolescent females in private and public schools recorded that the prevalence of being overweight and of obesity was higher among the girls in private schools than among girls attending public school. Most of the respondents from private schools (64.2 %) lived sedentary life styles while most from public schools (64.0 %) lived active life styles (Ojofeitimi et al., 2011).

The study on prevalence of childhood obesity in school children from rural and urban areas in Karnataka was carried out by Saraswathi et al. (2011). A total of 2189 school children aged 13-17 years
participated in this study. Out of them, 1439 were from urban and 750 were from rural area. There was significantly higher prevalence of overweight and obesity in children with only indoor activities such as television viewing ( > 20 hrs./week), computer and video games ( > 10 hrs./week), indoor games ( >10 hrs./week), sleeping ( >10 hrs/day ) and long school hours. The results were statistically significant which supported the strong influence of physical activity on overweight. The odd ratios were significant at 95 % confidence interval for the effect of physical activity on overweight/obesity.

TV viewing behaviour of adolescents and obesity was studied by Anuradha and Kalapriya (2012). A sample of 90 adolescents was selected from English medium school in Tirupati town. Results indicate significant association between types of TV viewing of adolescents to their BMI. A positive correlation was found between television viewing time and BMI.

Assessment of physical activity of children was undertaken by Shah et al. (2013) while determining prevalence of overweight and obesity in children from Mehsana District. The prevalence of overweight and obesity in the students of Mehsana district was found to be 33.88% and 10.67% respectively. Risk of overweight and obesity was significantly higher in children who spent time in television viewing and / or with computer. Children with higher levels of television viewing and / or time spent with computer had greater BMI. Overweight / obese children were least active in physical activity at all times.
Low levels of physical activity, long hours of watching television, and consuming junk foods are associated with high prevalence of overweight, reported by Hormis and D’silva (2013) when studied obesity among adolescents of urban and rural schools in Mangalore. The present study has revealed various factors that have been strongly linked with obesity like poor dietary practices (OR = 48.50), physical inactivity (OR = 76.77) poor sleep pattern (OR = 0.459) and pattern of watching television (OR = 3.14).

2.6 Psycho-social aspects of overweight and obese school children

An article in Lokmat Times (10 April 2015) mentioned experiencing certain family stress repeatedly throughout the childhood can make kids obese by the time they turn 18. Long term exposure to financial stress and family disruption can make adolescent girls vulnerable to gaining extra kilos by the time they turn into adults.

Swallen et al. (2005) and other researchers have documented the relationship between obesity and psychological aspects of health such as depression (Erickson et al., 2000), socialization (Strauss and Pollack, 2003), body image (Skemp-Arlt et al., 2006) and increased level of loneliness, sadness, nervousness, self worth or self esteem (Franklin et al., 2006, Strauss, 2000, French et al., 1994).

Data of 17,557 high school adolescents enrolled in the National Longitudinal study of Adolescents Health (1994) in the United States, showed that overweight adolescents were more likely to be socially isolated (Strauss, 2003).
Khadri F. A. (2010) demonstrated lower levels of self esteem among obese and overweight adolescents and stated body image concern become more predominant during early adolescence.

Body image dissatisfaction can also be common in preadolescent children as young as 6 to 7 years olds preferred a body figure thinner than they were (Collins, 1991).

Huang et al. (2007) noticed that overweight adolescents and particularly overweight girls documented greater body dissatisfaction, lower self-esteem and lower body image compared to boys among 657 US adolescents aged 12 to 14 years old. A study on a longitudinal sample of American children found that over a four year period, obese girls showed significantly decreased levels of global self-esteem compared with non-obese girls. Childhood obesity affects the child’s overall well being and self-esteem, increasing the risk of depression and even suicide (Gardner, 1999).

Eisenberg et al. (2003) found that overweight adolescents who had been teased by peers or family members were more likely to have increased suicidal thoughts and attempts.

Research led by Paul Veugelers at the University of Alberta’s School of Public Health has found that, body weight and self-esteem are inversely related in children. He reported that for each BMI unit increase, self esteem scores decreased by 4.8%. The study conclude that rising childhood obesity rates, through their deleterious effects on self-esteem and cognitive development, could shape an upward trend of mental health problems and less educational attainment adding to the health burden in adulthood and that of future generations (www.obesitynetwork.ca/de.asps.).
In a University of Manitoba study published in the Journal of Psychosomatic Research (April 2009), researcher Amber Mather and colleagues found that obesity was associated with a 25% to 50% increased risk of lifetime psychiatric disorders, mood or anxiety disorders and suicidality.

Anxiety and self-esteem issues associated with childhood obesity can generate the development of various eating disorders. This can include serious problems like overeating and bingeing, anorexia, bulimia and other types of eating disorders. Among adolescent girls especially, depression related to obesity is associated with anorexia nervosa (Pinto-Foltz et al., 2009).

According to Ogg et al. (1997) stress can influence a child’s eating habits. An inventory of 28 college females discovered that those who were binge eating had a mean of 29.65 points on the perceived stress scale, compared to the control group who had a mean of 15.19 points.

The study from Delhi by Sharma and Sharma (2007) among 4399 children (56.7% boys and 43.3% girls) of 4-17 years of age revealed that obesity is associated with several risk factors. Psychological consequences seen among adolescents include emotional ramifications, secondary to ridicule and labelling by their peers, including lower levels of self esteem.

Farhat et al. (2010) analysed data from nationally representative sample of students aged 11 to 17 years old which included height, weight and substance abuse and bullying. They concluded that overweight and obese children are at risk of developing healthy
behaviours of concern, which may lead to both medical and social problems associated with weight.

2.7 Weight-perception of overweight and obese school children and their parents

Gardner and Colleagues stated in order to obtain valid and reliable results regarding perception of body size, the accuracy of perceptions of body size by youth must be examined. They also noted that the knowledge of children’s perception of their whole body size is limited by the methods that are available for accessing perceptions (Gardner et al., 1999).

Lundahl et al. (2014) conducted a systematic literature review to determine the proportion of parents worldwide who underestimate their children’s weight and moderators of this misperception. Data from 69 articles, representing 78 sample and 15,791 individuals were included in a meta-analysis of overweight/obesity samples. The researchers found that 50.7 percent of parents underestimate their overweight/obese child’s weight.

Swaminathan et al. (2013) studied association between body weight perception and weight control behaviour in South Indian children. They noticed that misperception of weight status by parents and children. Correlation between the actual weight status of the child and the child’s or parent’s perception of desired body weight ranged from 0.12 to 0.31 (p<0.01), indicating a low to moderate correlation between these variables.

Alijunaibi et al. (2013) estimated parental perceptions and their determinants in the Emirati population. Out of 945, 33.8%
misclassified their children’s weight status; underestimating (27.4%) or overestimating (6.3%). A significant percentage (53.8%) of parents of underweight children classified their children as normal weight another 1.3% thought that their child is overweight or obese.

In 2010, Duncan and colleagues conducted a study to determine if there was a connection between weight perception, body fatness and weight control in adolescent girls. They observed a high level of misclassification across all levels of body fatness. The results showed that 81% participants were classified as normal weight, while only 62% classified themselves as normal weight and 31% classified themselves as overweight (Duncan et al., 2011).

The Delaware Survey of Children’s Health (DSCH) sponsored by Nemours discussed parental perception of children’s weight. Survey results revealed a significant gap between how parents of overweight and obese children classify their children’s weight. 80% parents of overweight children and 58% parents of obese children (birth to 17) surveyed in Delaware in 2011 reported that their child was at a healthy weight (Weight, 2008).

Noor et al. (2008) while studying parental perception of their children’s weight status, and it’s association with their nutrition and obesity knowledge noticed that more than one third (38.2%) of the parents had inaccurate perception of their child’s weight status especially those with obese children.

In a study undertaken to describe perception of child weight status among US children, adolescents and their parents, researchers found among children and adolescents, 27.3% underestimated and
2.8% overestimated their weight status. Among parents, 25.2% underestimated and 1.1% overestimated their child’s weight status (Chen et al.).

He Meizi et al. (2007) compared children’s actual weight status with their parental perception of their weight status in Middlesex-London, ont. Total 770 child-parent pairs were observed, the study confirms that a sample of Canadian parents did not recognize their children were overweight or obese, 22 percent of parents wrongly classified their normal-weight children as being underweight, 63 percent considered their overweight children as normal weight and 63 percent perceived that the obese children were overweight. A large proportion of parent’s did not recognize that their children were overweight or obese. Parent’s misperceptions of their children’s weight status seemed to be unrelated to their levels of education, family income or their children’s ages.

The study conducted by doctors from India’s National Diabetes, Obesity and Cholesterol Foundation, looked at the attitudes of parents towards diet and health and recorded concerns over widespread ignorance, in particular among mothers. Dr. Anoop Misra, one of the report’s authors said that many of the women were not concerned about their child’s weight. If child is overweight they consider them healthy rather than fat. Many of the mothers were feeding their children with pre-packaged ready meals because they regarded home cooking as old fashioned (Ravi, 2013).

According to Hudson et al. (2012) parents were significantly less likely to be correct about their son’s weight status and more likely to be
correct the older the child. Parents were over 86% less likely to be correct about their child’s weight if their child was overweight and approximately 59% less likely to be correct if the child was obese, compared to parent’s ability to correctly classify their child’s weight status, suggesting that parents are failing to recognise overweight and obesity in their children.

Among adolescents in Dubai a higher proportion of overweight males and females considered themselves as average (45% and 52.3% respectively). Similarly, 56.9% obese male and 46.4% females considered themselves as average weight. Of non-overweight/obese males and females, 27.6% and 39.3% respectively, were pressured by parents to gain weight. Compared to their current body image, overweight and obese adolescents chose a significantly lighter figure noticed by Musaiger et al., 2012.

As reported by Warren et al. focuses the fact that awareness of a thin western ideal is becoming more accessible to non-western cultures through mediums like the internet, television, movies, direct travel accessibility, and music.

2.8 Counselling for overweight and obese children:

As early as the 1950s, the American Medical Council on Food and Nutrition cited the benefits of nutrition counselling, as well as inadequacies in nutrition education in US medical schools. Further counselling has been shown to be valuable in helping patients to change their behaviour and to achieve weight loss. It can be made more beneficial if used as a part of a coordinated approach with health education materials.
Kreuter and colleagues reported that patients who received a combination of health education materials, followed by physician counselling were 51% more likely to increase their leisure time physical activity and 35% more likely to reduce fat from dairy sources at follow-up (Kreuter et al., 2000).

Stafford et al. found that physicians offered dietary counselling to obese patients 41.5% the time, while exercise counselling was offered only 32.8% the time. Among healthy weight participants, Branner and colleagues found higher rates of nutrition compared with exercise counselling among and adolescents (42.1% and 26.1%) respectively (Branner et al., 2008).

A targeted, school based education programme produced a modest reduction in the number of carbonated drinks consumed, which was associated with a reduction in the number of overweight and obese children (James et al., 2004).

A study was conducted to know the trends in nutritional and exercise counselling among adolescents in the health care environment by Peart and Crowford. They demonstrated that the downward trend in obesity prevention counselling in California among racial/ethnic groups and health insurance groups has changed course and has began to increase (Peart and Crowford, 2012).

Edward et al. (2006) worked on family based behavioural treatment of obesity for acceptability and effectiveness in UK. 33 families with obese children aged 8-13 years were assessed before and after treatment. They noticed children lost 8.4% BMI over the time of
treatment indicating that significant loss of overweight can be achieved using such programs.

Small scale intervention may provide some improvement in middle school student’s awareness of obesity risk factors and the importance of physical activity and healthy diets, reported by Sinha et al. (2002) while studying effects of educational intervention of children’s knowledge of obesity risk factors.

Research conducted by the International Obesity Task Force concluded that evidence for effective prevention and treatment strategies of childhood obesity is poor. A scientific review found only 10 trials of sufficient size, quality and duration to provide data on current interventions. Three of four long term studies used diet and physical activity intervention, but found this did not support long term improvement for overweight children. Two studies showed a multimedia approach to diet change appeared effective, while another long term study demonstrated physical activity had slightly greater rate of weight reduction (Lobstein et al., 2005).

The prevalence, consequences and management of childhood obesity may be further complicated by geography and whether a child lives in a rural or an urban environment. While specific research is limited regarding overweight children, a recent analysis attempted to qualify child well-being secondary to where they lived. Researchers demonstrated children living in non metropolitan neighborhoods had poorer health and lack of reliable access to health care (Ritz et al., 2009).
A study to evaluate the effect of a parent-focused behavioral intervention on 32 parent and child eating changes and on percentage of overweight changes in families showed that the effect of a parent-focused behavioral intervention on parent and child eating decreased the percentage of overweight in families (Epstein et al., 1985).