CHAPTER - I
INTRODUCTION

Introduction:

The importance of optimal nutrition for health and human development is well recognized. Nutritional status during school age is a major determinant of nutritional and health status in adult life. The school-age group (5-18 years) spans the period between pre-school years and adult life. Census-2001 has shown that this age group forms a very large portion of population. Population projection indicates that over the next decade this age group will show by far the largest increase in number. It is therefore essential that efforts should be focused on improving the health and nutritional status of school age children so that they reach adult life with optimal nutrition and health status.

Adolescents comprise about 20 percent of the global population of which 80 percent lives in the developing countries. In India, about 230 million, which is calculated to be 23 percent of the total population, are adolescents (Kaur et al., 2005). The World Health Organization (WHO) defines adolescents as individuals between the ages of 10 to 19 years. This is a period of rapid growth with a growth spurt in the pre-pubertal years. On an average, 80 percent of adolescent growth is completed in early adolescence i.e. 10-15 years (Gopalan, 1989). On an average female gain 15-55 pounds and grow 2-8 inches while male gain 15-65 pounds and grow 4.5-12 inches during adolescence (Ball and Bindler, 2008).
Adolescence is a “high-risk period” for weight gain, characterized by critical changes in body composition, insulin sensitivity, eating and activity behaviors, and psychological adjustments. Various studies have shown that adolescents suffer from a range of health problems. National survey on health status of school children in India by WHO (2010) reveals that evidence of morbidity was found 52.8% in boys and 67.4% in girls (WHO, 2010a). Most of the studies on adolescent weight status have focused on under-nutrition, but some adolescents have the problem of over-nutrition. Adolescent’s weight status is a cumulative effect of the health and nutrition problems occur during early childhood as well as those originating in adolescence. The period of adolescence is also sensitive and lifelong habits are being developed at this stage. Considering this fact, many researchers are now focusing on issues related to over-nutrition in adolescents. Adolescence is a period of unique challenges, particularly for vulnerable youth. Adolescent’s health provides the foundation for adult health status. Preventable health problems in adolescence can become chronic health conditions in adulthood. Studies following children into young adulthood suggest that overweight children might become overweight adults, particularly if obesity is present in adolescence (Whitaker et al., 1997).

1.1 Definitions of overweight and obesity

Worldwide disease profiles are transforming at a rapid pace catching the attention of medical professional and policy makers. The past three decades have witnessed the emergence of over-nutrition as a problem in school age children in developed countries and in affluent
urban segments in developing countries. In fact obesity is classified as a ‘disease of affluence’ in the 19\textsuperscript{th} and 20\textsuperscript{th} century, but today threatens to become a disease with epidemic proportion for the 21\textsuperscript{st} century. Worldwide childhood obesity has more than doubled in children and quadruped in adolescents in the past 30 years. In 2012, more than one third of children and adolescents were overweight or obese globally (Ogden \textit{et al.}, 2014).

According to Centre for Disease Control and Prevention (CDC) “Overweight and obesity results from an energy imbalance, which involves eating too many calories and not getting enough physical activity”. The term overweight and obese refers to a person with an excess of body weight. Overweight is having extra body weight from muscles, bones and fat. Obesity is having a high amount of extra body fat.

The words ‘obese/obesity’ have their roots in French and Latin, where the verb ‘obedere’ means ‘overeat’ and ‘obesitas’ means being very fat. WHO defines “obesity as a condition of abnormal or excessive fat accumulation in adipose tissue to the extent that health may be impaired”. ‘Overweight is an increase in body weight compared to the height, compared with a reference standard’. The terms ‘overweight’ and ‘obese’ are often used interchangeably. Technically ‘obesity’ is the upper end of ‘overweight’. The term overweight rather than ‘obese’ is often used in children as it is less stigmatizing (Besseson, 2008).

Although world hunger remains a significant problem, a recent report from the World Health Organization says that more people die now worldwide from being overweight and obese than from being
underweight. WHO projection for 2015 estimates that over 1.5 billion people will be overweight, of which children are expected to constitute about 10%. An overweight adolescent has a 70% chance of becoming obese (Sharma et al., 2007).

1.2 Measurement of overweight and obesity

It is difficult to develop one simple index for the measurement of overweight/obesity in children and adolescents because their bodies undergo a number of physiological changes as they grow. Obesity can be measured in different ways. The most common method is measuring the weight and relating it to other parameters. Body Mass Index (BMI) is a simple index to classify overweight and obesity in adult population. Other methods commonly used for estimating body fat are skin fold thickness, waist circumference, waist to hip ratio. Techniques such as ultrasound, computed tomography and magnetic resonance imaging are also used.

BMI is most frequently used measure for assessing whether adults or children are obese, overweight, underweight or healthy weight. BMI also known as ‘Quetelet Index’ as it was invented by Belgian Mathematician Adolph Quetelet during 1830-1850. It is a statistical measure of weight of a person scaled according to height. It is also defined as weight adjusted for height squared.

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\text{B.M.I} = \frac{\text{Wt. (Kg.)}}{\text{Ht. (m)}^2}
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For adults, BMI cut offs point used to define overweight and obesity have been based on fixed BMI values related to health risk with
BMI = 25-30 kg/m$^2$ classified as overweight and BMI >30 kg/m$^2$ classified as obese (WHO, 1995).

For children, it is difficult as they are constantly growing so statistical approaches based on normal child growth charts and centiles for BMI cut-offs according to age and sex are often used (Cole et al., 2000; Dietz and Bellizzi, 1999).

In 2007, the WHO Department of Nutrition and Health released growth reference data for height, weight, and BMI for children age range 5-19 years to be used internationally. These reference values were based on cross sectional data collected from six countries - Ghana, India, Norway, Brazil, Oman, and North America and were intended to monitor child growth in addition to providing percentile chart data which could be used to define overweight and obesity in children. The terminology, ‘overweight’ and ‘obesity’ is used by International Obesity Task Force (IOTF) and WHO while in the US CDC, the term ‘at risk for overweight’ is used, with the word ‘overweight’ also being used to cover values equating to obesity so to reduce stigmatizing language. Many countries such as Canada, Chile, Australia and Mexico use the US BMI reference values but have not adopted the less-stigmatizing terminology. (Eaton et al., 2006)

A variety of national and international percentile reference data sets are available to calculate overweight and obesity in children. CDC, 2000 growth charts include sex specific BMI for age reference values for ages 2-20 years. For present investigation obesity and overweight is defined as per CDC 2000.
1.3 Prevalence of overweight and obesity

World Scenario

Worldwide, there has been a startling increase in rates of obesity and overweight in both adults (28%) and children (up by 47%) in the past 33 years, with the number of overweight and obese people rising from 857 million in 1980 to 2.1 billion in 2013, according to a major new analysis from the Global Burden of Disease Study 2013 (www.thelancet.com).

Globally, a sharp rise in the incidence of obesity has been noticed in last three decades. It has not only involved developed countries but also developing countries. It is estimated that 170 million children under the age of 18 years are overweight (WHO, 2014 b).

In the past 30 years, the prevalence of overweight among children between 6 to 11 years of age increased from 4% to 10% (NCHS, 2009) globally. The global prevalence of overweight and obesity in children aged 5-17 years is estimated by WHO and IOTF to be approximately 10 percent (Lobstein et al., 2004). IOTF estimates that up to 200 millions of school aged children are either overweight or obese, of those 40-50 million are classified as obese.

Childhood obesity rates are just as alarming. In 2010, the number of overweight children under the age of five was estimated to be 43 million, of whom 35 million are living in developing countries (WHO, 2014 b). The highest rate of obesity was observed in the Americans and Eastern Mediterranean regions, the lowest in the South-East Asian, Western Pacific and African regions (Wang and Lim, 2012). A wide range of prevalence level exists, with the prevalence of overweight in
Africa and Asia averaging well below 10 percent and in the America and Europe above 20 percent. Being overweight is so common in Europe that around one third of teenagers are heavier than is recommended for their health. In a report on obesity level in the 53 countries of the WHO’s European region, the United Nation’s Health Agency observed that up to 27 percent of 13 years old and 33 percent of 11 year olds are overweight (WHO,2010 a).

In most of the Asian countries the prevalence of overweight and obesity has increased many folds in the past few decades and the magnitude varies between countries. South East Asia and Western Pacific region are currently facing an epidemic of diseases associated with obesity such as diabetes and CVD (cardiovascular diseases). India has the highest number of people with diabetes in the World and China occupies the second position. (Ramchandran, 2010)

Wang and Lobstein (2006) stated that approximately 20 percent of Australian children and adolescents are currently overweight and obese. As per report by Healthy Technology Assessment (2000), obesity rates in France is 17 percent, Britain–9.7%, Italy–14.9%, Australia–30%, Finland-2.6to3.6%, Singapore-16.1%, and Malaysia 6%. The rate of obesity among children and adolescents in the United States has nearly tripled between the early 1980’s and 2000. In 2008, the rate of overweight and obese children in the United States was 32% and had stopped climbing (Flynm et al., 2006). During last two decades, the prevalence of overweight in older children and adolescents almost doubled in USA (Hotchkiss et al., 2011). There is a paucity of data on the prevalence of childhood obesity in Asia-Pacific region. Studies in India, Singapore, China, Malaysia and other Asian countries
have shown a rising prevalence of obesity among children. The highest rate of obesity in Asia is in Thailand and the lowest is in India followed by Philippines (Ramchandran, 2010).

Globally, there has been an increased intake of energy dense foods that are high in fat, salt, sugar and preservatives with gradual reduction in physical activity levels due to urbanization, economic transitions and changing modes of transportation. This becomes major contributor of overweight and obesity in world. Changes in dietary and physical activity pattern are often the result of environmental and social changes associated with development and lack of supportive policies in sectors such as health, agriculture, transport, urban planning, environment, food processing, distribution, marketing and education (Goyal et al., 2010).

**Indian Scenario**

India is the most populous country in the world with over 1.21 billion people (2011 census). The children aged 10-15 years constitute about 31.1% (190,075,426 males and 172,799,533 female) and about 15% consist of school children (www.censusindia.net). There is a rapidly escalating epidemic of obesity all over the world. Countries like India have controlled the problem of severe under nutrition to a substantial extent, but are now facing a rising epidemic of obesity. Currently India is facing the double burden of under nutrition as well as over nutrition.

According to a recent report out of an estimated 43 million obese children worldwide in 2010, approximately 81% were from developing countries, half of which (18 millions) were reported to be living in Asia, despite of huge burden of under nutrition (WHO, 2010 a).
A recent study conducted by the Organization for Economic Co-operation and Development (OECD) published in Lancet, has ranked India in the forefront of an obesity epidemic (Han et al., 2010). Due to difficulty of curing obesity and overweight in adults, the prevention of child obesity has been recognized as public health priority (Park, 2011). Nutritional status of the Indian population varies significantly across the regions. Certain regions are associated with extremely high rates of childhood under nutrition (20-80%) whereas others have a high prevalence of adult under nutrition (75%) and some have both (Pednekar, 2008).

In India many studies have shown that, prevalence of overweight among adolescent varies from 10% to 30%. A recent study, which explored the prevalence of overweight and obesity in 20243 Indian children in the age range of 2 to 17 years, found that 18.2% was obese as per International Obesity Task Force (IOTF) classification. But the percentage of obesity was found to be much higher, that is 23.9% as per WHO criteria (Khadilkar et al., 2012).

Current available school based data demonstrates an obesity range of 5.6% to 24% for children and adolescents in India (Reddy et al., 2002). The published literature on the prevalence of childhood obesity in India consists mainly of the cross-sectional studies in different regions of the country. A recent multicentric cross-sectional study in 38,296 children from five urban cities located in different geographical regions of India showed that the prevalence of overweight and obesity in 8 to 18 years old children was 14.4% and 2.8% by IOTF cut-offs respectively (Misra et al., 2011).
Studies from South India reported an obesity prevalence of 3.6% in adolescents of age group 13-18 years of Chennai in 2003 (Subramanyam and Rafi 2003) and 3.4% in children of 5-16 years of Mysore in 2010 (Premnath et al., 2010). Several studies published from North India reporting childhood obesity prevalence in the range of 3.6% to 7% (Ramchandran et al., 2002).

A study by the Diabetes foundation of India found that in a private school of Delhi one of three children is obese. The results of studies among adolescents from part of Punjab, Maharashtra, Delhi and South India revealed that the prevalence of overweight and obesity was in the range from 3% to 29% (Kaur et al., 2005). In Ludhiana, Punjab urban children in the age group of 11-17 years were more overweight (11.6%) than their rural counterparts (4.7%) observed by Kalra and Unnikrishnan, 2012.

Maharashtra is economically advanced state in the country. Studies conducted on prevalence of overweight and obesity from this region also reported increased prevalence in urban sector than rural one. Combined prevalence of overweight and obesity was 4.3% in Wardha city (Sikendra and Darshan, 2010) and it was 19.9% for overweight and 5.7% for obesity in Pune city (Khadilkar, 2004).

Obesity in adolescents is gradually becoming a major public health problem in India. Nutrition transition and shifting to sedentary life style is likely to be important precursors of overweight and obesity among adolescents. In India no significant gender difference for obesity prevalence was seen among the children from a less privileged background, however, among children from affluent families
significantly more boys were obese as compared to girls. When around 25,000 children were followed for three years, the researchers noticed rapid growth and nutritional transitions characterized by a decline in the underweight population along with escalation of the overweight population (Raj M. et al., 2009).

Developing countries like India are facing the peculiar situation of having to deal with both ends of the spectrum of nutritional disorders. On one hand, mal (under)nutrition is an epidemic which has been in vogue for ages. In India, still around 46 per cent of all children below the age of three are too small for their age, 47 per cent are underweight and at least 16 per cent are wasted. Many of these children are severely malnourished (www.unicef.org). On the other hand, over nutrition evident as overweight and obesity has been recently on the rise and is present in 20.6% boys and 18.3% girls (www.iaso.org). In children, obesity is the most common nutritional disease in developed countries and in affluent class of developing countries.

1.4 Aetiology of overweight and obesity

Like many other diseases, the cause of obesity in an individual is multi-factorial. Obesity is often the result of interplay between many genetic and environmental factors. Obesity is now widely prevalent in several developing countries, particularly those in rapid transition and is affecting both children and adults. The fundamental cause of overweight and obesity is an energy imbalance between calories consumed and calories expended.

Major contributing factors of overweight and obesity are discussed as follows
1.4.1 Heredity

It has been estimated that heredity factors may account for 25-40 percent of the observed variation in obesity phenotypes. At present more than 200 genes has been identified as playing a role in obesity. Family studies have consistently demonstrated that BMI is highly correlated among first degree relatives. 80% off-springs of two obese parents were obese in contrast to less than 10% the offspring of two parents who were of normal weight (Kopelman, 2005). The percentage of obesity that can be attributed to genetics varies from 6% to 85% depending on the population examined (Yang et al., 2007). Heredity has recently been shown to influence fatness, regional fat distribution, and response to overfeeding.

1.4.2 Socio-economic status

Obesity in children and adolescents in most developing countries is a problem of urban children of a higher socio-economic class whereas in developed countries children of lower socio-economic group show higher prevalence of obesity. Transport facilities, medical care, food habits, and educational status, all these living conditions had dramatically improved with increased socio-economic status (SES) in India. Increased prevalence of obesity in high SES, private schools could be the result of generous pocket money, availability of domestic help, and travelling to school by vehicle. According to recent studies, prevalence of overweight and obesity was significantly high in children studying in private schools with high SES than school children from government schools with low SES (Srihari et al., 2007).
1.4.3 Dietary Factors

According to WHO (2003) a potential contributor of obesity development was identified and mainly blamed on dietary habits and eating behaviour including snacking, eating frequency and extensive consumption of high fat, high sugar foods and a concomitant reduction in physical activity. Traditional nutrient rich diets are being replaced by energy dense, processed, commercial packed foods by youngsters. Numerous food preparations like burgers, pizzas, Chinese items, bakery items, chocolates, ice-creams, cold drinks and chat items are easily available and are high in fat, sodium, sugar and calories (Kosti and Panagiotakos, 2006). Currently it is hard to stay lean with portions keep growing for children. Majority of teenagers are replacing their meals with fast foods or junk items.

Research also suggested that increase in availability of junk food near school area can account for about one-fifth of the increase in BMI among adolescents over the last decade (Davis and Carpenter, 2009). Many families eat fried items and sweet foods as a part of daily meal, making meals calorie rich. Parental food choices have strong influence on child’s eating behaviour which aggravates overweight and obesity in children. Changing food prices has encouraged over nutrition, for example prices of fresh fruits and vegetables has increased while prices of sugar, sweets, fats and oil has decreased. The biggest change in diet structure involves the increased consumption of fat and sugar as they are cheap. Intake of excess dietary fat has been implicated as a major cause of obesity for decade.
Ecological Model of Childhood Overweight

COMMUNITY, DEMOGRAPHIC, & SOCIETAL CHARACTERISTICS

PARENTING STYLES, FAMILY CHARACTERISTICS, & in utero INFLUENCES

CHILD CHARACTERISTICS & CHILD RISK FACTORS

CHILD WEIGHT STATUS

Based on expanded version of Davidson & Birch (2003), enhanced by Reed et al, 2011. Obesity in Rural Youth: Looking Beyond Nutrition and Physical Activity. JWE Vol.43, No. 5, Pg. 403.
1.4.4 Sedentary Behaviour

Most of the children, now-a-days are busy with their school activities, tuition and homework. They have very little time to play, exercise or to take part in household activities. Mostly they are engaged in doing immobile activities such as playing computer games, using mobile and watching television for hours. Media-use has been associated with a reduction in metabolic rate, increased snacking during media-use, increased exposure to food marketing, and a reduction in discretionary time that may have been allotted to physical activity (IOM, 2005). It is also noticed that academic pressure to perform well in examinations has also led schools to cut physical education and recess time. As per NIN Dietary Guidelines, children and teenagers need at least 60 minutes of physical activity every day. This amount of physical activity may reduce the risk of some chronic diseases. Scarcity of play areas in schools and colonies is another important factor for decreased participation in sports. Low participation rates in sports and physical education, particularly among adolescent girls are also associated with increased obesity prevalence (Styne, 2005). Walking and cycling to school is also discouraged by most of the parents from safety point and motorised vehicles are preferred as they are quicker and safer.

An important factor in many developing countries including India is the lack of open spaces and playgrounds in schools and communities. Neighborhoods are often considered unsafe for walking and other outdoor activities in these countries. Urban Asian Indian adolescents who participated regularly in outdoor games had lower
prevalence of overweight, with the risk being three times higher in those not participating in outdoor games (Laxmaiah et al., 2007).

1.4.5 Psychological factors

Psychological factors are closely associated with aetiology of obesity. Current research focused that obese individuals react to negative emotions by eating. Emotional factors such as depression, stress, low self esteem, and feeling of nervousness, boredom can also lead to obesity. Researchers discovered a positive correlation between stress and obesity. Feeling of depression can cause an individual to overeat. It is often seen that obese children start dieting or bullying as self imposed calorie restriction with fear. Children with negative body image feel depressed and have a negative effect on their behaviour which gets reflected in their academic and social progress.

Short sleep duration has been shown to be a risk factor for obesity in children through the modulation of hormones such as leptin and ghrelin. Leptin promotes satiety while ghrelin increases appetite and food intake. Sleep restriction is thus associated with the lower leptin and higher ghrelin levels and is likely to increase hunger and appetite and perhaps to decrease energy expenditure (Strauss, 2002).

1.4.6 Environmental factors

Studies have suggested that environmental factors such as family, school and community play an important role in development of obesity. Physical and social environment shape child and adolescent behaviour because most children spent a large part of their day in settings that are susceptible to change such as home, school, transportation between home and school, and after school programs. A
higher level of obesity in migrant populations who have the same genetic composition but moved to a different obesogenic environment is further evidence for the rate of environmental and lifestyle factors in causing obesity (Dhawan et al., 1994; Patel et al., 2006).

Customs and traditions prevalent in community also lead to obesity as food preferences and activity patterns get changed. Over-protection and forced feeding by parents, false beliefs about health and nutrition, lack of proper knowledge regarding food and nutrition also contributes to obesity. There are number of nutrition-related, socio-cultural and traditional beliefs mostly passed down over centuries, firmly ingrained in mothers and grandmothers of children residing in developing countries. Overweight children are often said to have baby fat that parents believe will disappear as they get older, but it is known that a majority of them will remain obese during later life (Wardle et al., 2006).

Environmental factors like air pollution may have also contributed to the obesity epidemic. In fact that chemicals presents in air, food and water can cause obesity. Chemicals called ‘obesogens’ or ‘endocrine disrupting chemicals’ has ability to interfere with the synthesis, secretion, transport, binding action or elimination of natural hormones in the body and therefore responsible to alter metabolic process in the body (Times of India, 29 Oct.2014). Several studies indicated that school environment that include competitive food sales, school canteens and vending machines may negatively impact child weight status (Kubik et al., 2003).
1.4.7 Medical Factors

Some of the medical illness such as injury to hypothalamus, Cushing syndrome, hypothyroidism, growth hormone deficiency and cerebral palsy contribute to obesity in children. Consumption of certain drugs such as antiepileptic and corticosteroids promote obesity among children and adolescents.

1.5 Consequences of overweight and obesity

Childhood obesity has both immediate and long term effects on health and well being.

1.5.1 Health Consequences

Obesity in children can lead to a number of chronic diseases; especially children belonging to Asia pacific region are associated with onset of type II diabetes at a younger age. Obese children suffer from both short term and long term health consequences. Short term health consequences include metabolic abnormalities such as type-II diabetes, non-alcoholic fatty liver disease and sleep associated breathing disorders (Haines et al., 2007). The most significant health consequences of childhood overweight and obesity that often do not become apparent until adulthood, include cardiovascular diseases (mainly heart disease and stroke), diabetes, musculoskeletal disorders, especially osteoarthritis and certain types of cancer. At least 2.6 million people from all over the world pass away every year as a result of being overweight or obese (www.iuns.org).

Traditionally type-II diabetes mellitus had been a disease of adults however the same now occurs in increased numbers among
obese adolescents (Daniels et al., 2005). Studies have also demonstrated significant association of obesity with hypertension in children and adolescents (Raj M. et al., 2007; Sorof and Daniels, 2002).

1.5.2 Psychological Consequences

In addition to physical changes, psychological and cognitive maturation, and shifts in understanding social roles are characteristic of adolescence. A marked self awareness of body shape and physical appearance develops during adolescence. So negative social messages associated with obesity in many communities have a major impact on this stage.

Psychiatric morbidities are also more common among obese people. Psychological problems associated with childhood obesity include negative self-esteem, withdrawal from interaction with peers, depression, anxiety and the feeling of chronic rejection. Obesity in children and adolescents affects their overall well being and self-esteem, increasing the risk of depression and even suicide. Increased symptoms of depression were observed among school girls with high BMI and adolescents with the greatest BMI had the highest depression scores (Goodman and Whitaker, 2002).

Among obese children appearance related teasing is more common and upsetting. Due to overweight and obesity both sexes get affected but females may be at higher risk for development of depression due to cultural norms in India.

The psychological stress of social stigmata imposed on a fat child may be just as damaging as physical morbidities. The negative image of disfiguring obesity is so strong that the growth failure and
pubertal delay have been documented in children with self imposed calorie restriction with fear of being more obese (Strauss, 2000).

1.5.3 Economic Consequences

Being overweight or obese has economic consequences. These includes the direct costs of health services, the indirect costs associated with lost economic production and individual costs such as the purchase of so called sliming products. The cost of caring for obese children with typical paediatric diseases such as asthma and appendicitis are increased by their higher incidence of complications. The economic cost of obesity estimated by IOTF as cited in paper by Kumanyika et al., 2002 highlights that obesity accounts for 2-6% total health care costs in many developed countries.

1.6 Prevention of Overweight and Obesity

Overweight and obesity are largely preventable. Supportive policies, environments, schools and communities are fundamental in shaping parent’s and children’s choices, making the healthier choice of foods and regular physical activity the easiest choice (accessible, available and affordable), and thereafter preventing obesity. Prevention of obesity in children is easier than the adults. 50-80% obese children will become obese adults and complication of adult’s obesity is made worse if the obesity begins in childhood (Styne, 2005). Treatment of overweight and obesity in children and adolescents require a multi-disciplinary approach with a holistic outlook. The components of overweight and obesity treatment include pharmacological and non-pharmacological treatments.
1.6.1 Pharmacological Treatments

Various drugs are currently available for reducing weight in children and adolescents. They prevent absorption of fat in the intestine and thus help to reduce weight. Many cases of severe adolescent obesity warrant aggressive approaches including surgical treatment. Bariatric surgery performed in the adolescent period may be more effective treatment for childhood-onset extreme obesity than delaying surgery till adulthood (Inge et al., 2007).

1.6.2 Non-Pharmacological Treatment

Life-style modification with dietary management, physical activity enhancement and reduction of sedentary behaviour helps in managing and preventing obesity.

1.6.2.1 Dietary Management

Ideal body weight maintenance or weight loss must be achieved without compromising appropriate calorie intake and normal nutrition. Emphasis on consumption of healthy snacks, balanced traditional diet and reduction in eating out especially for fast and junk foods of high calorie is an important factor.

1.6.2.2 Physical activity enhancement

Physical activity is important for healthy growth and development across childhood and adolescence. Participation in regular physical activity is essential for normal motor development, including the acquisition of fundamental motor skills necessary for engagement in activities of daily living and sports specific tasks. Physical activities help to burn calories consumed and maintain weight. Regular exercise
decreases fatty tissues, reduce stress, strengthens heart, increases energy level and bone density in obese children. Children should be prescribed physical activity that is safe, interesting, and practical and has a social element. Brisk walking, running, swimming, dancing and cycling help children to burn more fat. Evidence in developed countries exists that physical education may enhance academic performance, self-confidence and mental health in school children (Kain et al., 2008).

1.6.2.3 Reduction of sedentary behaviour

Every hour of sedentary activity increases the chance of obesity and is also contributory to failure of many weight reduction attempts in adolescents and children. Restricting screen time not more than 2 hours per day is essential. Excessive use of computer, mobile, video and television makes child immobile. Active participation in household activities like washing, cleaning, sweeping along with use of bicycles instead of cars, use of stairs instead of escalators are beneficial to avoid sedentary lifestyle. Sedentary time has been shown to increase in adolescence. Greater sedentary time is associated with poorer metabolic health and may be linked to obesity development in adolescents.

The correction of overweight and obesity is associated with an improvement of risk factors. Overweight and obesity intervention in children requires a combination of family based and school based multi-component program that include the promotion of physical activity, parent training, behavioural counselling and nutrition education. Mrs. Obama, the first lady of the United States of America introduced “Let’s move” in February 2010. She outlined the campaign’s central anti-obesity strategies, which include revamping the
nutritional labelling of products by the US Department of Agriculture, improving the nutritional standards of school lunches, increasing opportunities for children to engage in physical activity and improving access to high quality foods throughout the country. The Royal College of Paediatrics and Child Health in its April 2012 position statement stress on achieving a cultural shift to reduce childhood obesity. It emphasises on the importance of parent’s lifestyles, universal free school meals following nutritional standards, active travel and play by making the built environment more accessible, ban on ‘junk’ food advertising and increased tax on food high in salt, sugar and fat. High quality intervention campaigns that incorporate sound strategies to curb the ongoing obesity epidemic and cost effective programs for primary and community care are required in developing countries.

1.7 Purpose of the study

WHO has described obesity as one of today’s most neglected public health problem. Following the increase in adult obesity, the proportion of children and adolescents who are overweight and obese also has been increasing. The national health profile 2010 indicates that while we continue to bear the burden of communicable and nutritional disorders particularly in women and children simultaneously there is rise in the burden of non-communicable diseases during the last decade. Overweight and obesity during adolescence increases the risk for the development of non-communicable diseases and predisposes the individual to the development of other disorders in adulthood. Overweight children face an increased risk of compromised physical and mental well-being. Indeed, the consequences of childhood obesity
are far reaching, implicating not only children, but parents, schools, communities and health care systems. Moreover, there is evidence that childhood obesity may become a lifetime sentence.

Height and weight have been increasing since the 18th century, as income, education and living conditions gradually improved over time. While weight gains were largely beneficial to the health and longevity of our ancestors, an alarming number of people have now crossed the line beyond which further gains are dangerous. Severely obese people die 8-10 years sooner than those of normal weight, with every 15 extra kilograms increasing risk of early death by approximately 30%. Obesity is estimated to be responsible for 1% to 3% total health expenditure in most countries (5% to 10% in the United States) and costs will rise rapidly in coming years as obesity-related diseases set in.

Obesity in childhood and adolescence has related to increase in mortality in adulthood. Hoffman et al. (1988) observed almost twice the risk of death in adolescents (>18 year old) with BMI>25 kg/m² during 20 years follow up. Everyone loves chubby children but not many realise that they are not healthy. An overweight child has high probability of remaining overweight in adolescence also (Whitaker et al., 1997).

A child is precious not only to the parents, to the family, community and nation but also to the world at large. School going period is considered as relatively safe period from health point of view. Due to rapid urbanization, westernization and industrialization, India is also facing problem of over-nutrition. Obesity, overweight, central
obesity and sedentary behaviour co-exists with under-nutrition in India. Obesity among children is increasing every year. It is much easier for children today to become fat as lifestyles have become sedentary and metamorphosis of food habit has led to the replacement of nutritious food by things that are tasty, convenient and unhealthy. Most of the parents and teachers are worried as quality of diet has changed a lot. Due to industrialization, there is decline in agricultural employment and families are shifting in urban sector. As more women are working, traditional, homemade family meals are replaced by readymade foods, high in fat and sugar. Due to economic development, socio-economic conditions are improved making children more inactive. Eating outside home regularly is now a fashion among adolescents. Media advertisements are big drivers of the childhood obesity epidemic as they spend maximum money every year marketing food to children. An obesity explosion is occurring among children and its progression to epidemic proportion need immediate attention.

Children are the wealth of any nation as they constitute one of the important segments of the population. The trend of children becoming obese started over a decade and needs planning for prevention. Evaluating overweight and obesity in school children is important for several reasons; firstly it offers the best hope for preventing and secondly preventing progression of disease which is associated with many diseases in adulthood. The increase in obesity rates can lead to increase in significant health problems, both physical and psychological. Obese children are more likely to have high cholesterol, high blood pressure, increased risk of insulin resistance,
impaired glucose tolerance and other disorders. It is responsibility of health professionals to bring awareness about the risk factors and to prevent obesity in future generations specially the children and adolescents. Poor health and obesity can result in learning setbacks or even disabilities. Health and success in school are inter-related. Schools cannot achieve their primary mission of education if students are unhealthy. Health related behaviour i.e. physical activity pattern and dietary habits consolidate during school age and then persist into adulthood. Therefore, identifying individuals who are physically inactive, overweight and obese in school age is very important. Obesity is harder to treat in adults than in children. WHO has also emphasised on urgent need of understanding the prevalence trend, factors contributing and development strategies for effective interventions. As adolescence is a time of developmental plasticity in which lifelong habits can become established, lifestyle interventions during this period may have a significant influence on lifelong health. Specifically, the promotion of sensible eating and physical activity during adolescence may modify an adolescent’s risk of adult obesity.

Therapeutic lifestyle changes targeting food habits and physical activity through potential participation and social support are the cornerstones of preventing childhood obesity. Overweight, obese children and their parents and teachers should be focused for counselling such target groups need to be identified to know the severity of problem. It is important for parents to understand the cause of obesity that is often a combination of three factors including genetic causes, overeating and insufficient exercise. Impressing the fact on the
parents who control the food preparation that, diet control and family participation in physical activities will all aid in the treatment of obesity in children. Adolescent interventions to improve lifestyle behaviors should be designed to maximize impact and minimize harm with a focus on lifestyle and behavior change, rather than weight as an outcome. This is important to reduce the risk of negative self-esteem and unhealthy relationships with diet and exercise. There may also be a role for interventions delivered by social media (Facebook, Twitter, smart phones) in the provision of programs that focus on lifestyle change.

In India, specific studies have been conducted on obesity in research institutes. Most of the studies reported that there is consistent increase in obesity and overweight among school children. As very few studies are conducted on prevalence of overweight and obesity among school children of Marathwada region of Maharashtra, limited literature is available on prevalence. Creating awareness and health education to children and their parents which will help to control the problems was the basic aim to plan the study. Studying trends of changes in prevalence of overweight and obesity becomes important as it allows the researchers and policy makers to design specific and targeted programs aimed at checking the problem of obesity. Considering all these facts the present study is undertaken.

1.8 Significance of the study

The present study will help to establish the status of overweight and obesity among school going children of Aurangabad city, Maharashtra, India. The findings from the study would be helpful in
raising awareness among students, parents, teachers and health professionals about influence of overweight and obesity on child’s physical, social and psychological well being.

The study would facilitate parents, students and teachers for adoption of healthy lifestyle. By understanding the causes of overweight and obesity preventive measures can be adopted. Special intervention programs can be organised at school and community levels. It would also help to keep school environment and relationship healthy.

Keeping in mind the increasing trend of obesity in school children, present study was conducted in order to understand seriousness of obesity in school children of Aurangabad city (M.S.) with following objectives.

1.9 Objectives of the study

1. To screen the study sample for prevalence of overweight and obesity among children in selected schools of Aurangabad city (M.S.).
2. To estimate difference in the prevalence of overweight and obesity among selected school children from government and private schools of Aurangabad city (M.S.).
3. To find factors contributing to overweight and obesity among the study sample.
4. To assess the weight perception of respondents. (parents and children)
5. To record reasons reported by parents for child’s overweight/obesity.
6. To notice psycho-social problems faced by selected overweight and obese school children.
7. To observe remedial measures adopted by respondents for controlling problem of overweight and obesity.
8. To develop a tool for imparting health and nutrition education to students, teachers and parents.
9. To compare BMI status of selected overweight /obese children before and after counseling.

1.10 Hypothesis of the study

1) The combined prevalence of overweight and obesity increases as per advancement in age.
2) There is a significant difference gender wise in overweight and obesity prevalence rates among school children.
3) The prevalence of overweight and obesity in school children is more in private school than government school.
4) There is a significant association between unhealthy food behaviour and overweight /obesity among children.
5) Children with sedentary lifestyle have higher risk of being overweight and obese.
6) Perception of respondents (parents and children) is not an influencing factor for overweight/obesity among children.
7) Nutritional counselling to overweight and obese children and their parents is effective method to overcome this problem.
1.11 Limitations of the study

1) The study is limited to school children of age group 10-15 years from Aurangabad city (M.S.).

2) The study is limited to 6000 school children.

3) Twelve government and twelve private schools are selected covering 2616 and 3384 children respectively.

4) The study is limited to 518 overweight/obese and 518 normal weight children covering 3220 male and 2780 female students.

5) Self reported height and weight of parents are used to determine BMI.