Adolescents have a special place in any society, for they are the future of society. Adolescence is one of life’s fascinating and perhaps most complex state, a time when young people take on new responsibilities and experiment with independence. They search for identity, learn to apply values acquired in early childhood and develop skills that will help them become caring and responsible adults. When adolescents are supported and encouraged by caring adults, they thrive in unimaginable ways, becoming resourceful and contributing members of families and communities. This is a stage when they are bursting with energy, curiosity and spirit that are not easily extinguished. Young people have the potential to change negative societal patterns of behaviour and break cycles of violence and discrimination that pass from one generation to the next. With their creativity, energy and enthusiasm, young people can change the world in astonishing ways, making it a better place not only for themselves but for everyone (Goodburn and Ross, 1995).

Adolescence is seen as a trend setting stage in some cultures, and a deviance prone and immature in others. These are however the extreme representations, while the truth is that adolescents are pretty normal persons, who want to have a good family environment, achieve some meaningful goals in life and be autonomous (Singhal and Rao, 2004). Erikson (1968) observed that adolescence is least stormy in that segment of youth which is gifted and well trained in the pursuit of expanding technological trends, and thus able to identify with new roles of competency and invention and to accept a more implicit ideological outlook. Mohan (2000) opined that adolescence is, probably, the most turbulent, challenging, stressful and uncertain of all phases in life, both for themselves as well as for their parents, teachers and health professionals.
Horrocks (1976) gave six major points of reference from which adolescents’ growth and development could be viewed. They were:

1. Adolescence is a time when an individual becomes increasingly aware of self, endeavors to test his ramifying conceptions of self against reality, and gradually works toward the self stabilization that will characterize his adult years.

2. Adolescence is a time of seeking status as an individual.

3. Adolescence is a time when group relationships become of major importance. The adolescent is usually most anxious to attain status with, and recognition by, his age mates.

4. Adolescence is a time of physical development and growth that forms a continuous pattern common to the species, but idiosyncratic to the individual.

5. Adolescence is a time of intellectual expansion and development, and academic experience.

6. Adolescence tends to be time of development and evaluation of values.

DEFINING ADOLESCENCE

The term adolescence has come from a Latin word “adolescere” meaning “to grow toward” or “to grow up”.

The age at which a child ceases to be a child varies with the gender of the child, the economic status and living context of the family, and culture. Different agencies working with this age group tend to make different assumptions about adolescence and view it differently, which shows that it is still a debate and a matter of ambiguity that at what age adolescence begins and when it merges into young adulthood (Singhal and Rao, 2004).

Chronological age, although not always an appropriate marker for development changes, it is certainly the most convenient and is widely
used. There is some disagreement as to the ages that should be used to identify the boundaries of adolescence (particularly the upper age limit), but the onset of puberty is widely accepted as marking the beginning of adolescence (Nutbeam and Booth, 1999). Although the onset of puberty may vary considerably between individuals and typically occurs earlier in females than in males, the age of 10 years is used by many authorities (including the World Health Organization; WHO, 1980) because it includes the onset of puberty in both sexes and in most individuals. Unfortunately, no such phenomenon suggests an appropriate upper age limit to adolescence. Horrocks (1976) opined that adolescence ends when an individual attains emotional and social maturity and has acquired the requisite experiences, ability and willingness to assume consistently over a large range of activities the role of an adult as it is defined by the culture in which he lives. The age of 19 years is therefore commonly used to mark the beginning of adulthood.

In more traditional cultures adolescence may be a relatively brief period, commencing with puberty and ending shortly after, with certain rites of passage which deliver the individual into “instant” adulthood (Arnett, 1992). In western culture, specifically in United States, adolescence is generally considered to begin somewhere between ages 12 and 14, and end at 19 or 20. However, the World Health Organization (WHO) defines adolescence as the period of life between 10 and 19 years of age (Goodburn and Ross, 1995).

CHANGES CHARACTERIZING ADOLESCENCE

Adolescence is a time of many changes, some which are subtle and some which are apparent. Several changes take place simultaneously during this phase, some impacting their thinking, emotions and behaviour more than others (Allen et al., 1994).
PHYSICAL DEVELOPMENT IN ADOLESCENCE

The onset of puberty is generally considered the most important marker of the beginning of adolescence. This period is marked by a rapid physical maturity and involves a spirit of physical growth, the appearance of secondary sexual characteristics and the attainment of reproductive maturity.

The five major internal and external changes of puberty identified are:-

1. An acceleration of skeletal growth followed by a deceleration of skeletal growth, which result in dramatic increases in height and weight (i.e. growth spurt);
2. A change in body composition and distribution of fat and muscle;
3. The development of the circulatory and respiratory systems, resulting in greater strength and endurance.
4. Maturation of the reproductive organs and secondary sexual characteristics, and
5. Changes in the nervous and endocrine systems, which regulate and coordinate pubertal events (Graber et al.; 1996).

Along with the increase in height, the adolescent experiences weight gain during puberty, due to increases in both muscle and fat. However, boys and girls differ in the development of fat versus muscle (Graber et al., 1996). Girls develop more body fat at a faster rate than do boys and muscle tissue grows faster in boys. On an average boys are heavier and taller than girls.

BIOLOGICAL CHANGES ASSOCIATED WITH PUBERTY

As a result of the activation of hormones, adolescents develop primary and secondary sex characteristics, become fertile, and experience increased sexual libido during early stages of puberty (Buchanan, et al., 1999).
Girls mature earlier than boys (approximately 18 months earlier), so girls and boys of the same chronological age are likely to be at quite different points in physical and social development. Early maturers also differ from the late maturers (Williams and Dunlop, 1999). Late maturing boys have relatively lower self-esteem and stronger feelings of inadequacy, whereas early maturing boys are found more popular and have a positive self-image. The later are however at greater risk for delinquency, and other anti-social behaviour, like drug and alcohol abuse, smoking (Williams and Dunlop, 1999).

Early maturing girls are known to have more emotional problems, a lower self-image, and higher rates of depression, anxiety and disordered eating (Ge, et al., 1996).

CHANGES IN COGNITION

The development of the thinking and the organizing systems of the brain is defined as cognitive development. Cognitive changes during this developmental period involve increases in adolescents’ ability to think abstractly, consider the hypothetical as well as the real, engage in more sophisticated and elaborate information processing strategies, consider multiple dimensions of a problem at once, and reflect on oneself and on complicated problems. Such cognitive changes are the hallmark of the Piaget’s formal operations stage, which he assumed began during adolescence (Piaget, 1969).

These kinds of cognitive changes can affect individual’s self-concepts, thoughts about their future, and understanding of others. An integrated, multilevel changes in adolescence arise in the area of cognitive development during this period (Graber and Peterson, 1991). Cognitive abilities are enhanced in early adolescence as individuals become faster and more efficient at processing information – at least in settings in which
Adolescent do not like authoritarian control, but desire consistent guidelines from parents.

**ADOLESCENCE AS A PERIOD OF STORM AND STRESS**

Hall (1904) advanced his view that adolescent is a period of heightened “storm and stress” and became the first person to consider the storm and stress issue explicitly and formally in relation to adolescent development.

Ajdukovic (1993) agreed with Hall’s position and opined that adolescence is a time of great turmoil and external disorder.

Since adolescence is a period of transition from childhood to adulthood, it is a critical period of development which is characterized by dramatic physiological, emotional, and cognitive changes (Ajdukovic, 1998). Family values are challenged as they strive for independence.

The adolescent begins to make important decisions, ones that will permanently affect future life. Such decisions involve education, family and health and the consequences may lead to confusions, excitement, frustration or anxiety. It is not surprising, then, that adolescence has been referred to as a period of “storm and stress” (Seifert and Hoffnung, 1997).

Larson and Richards (1994) reported that there is truth to the storm and stress claim that adolescence is a time of greater mood disruption. Adolescents report experiencing extremes of emotions (positive and negative, but especially negative) more often than their parents do. They report feeling “self conscious and embarrassed” two to three times more often than their parents and are also more likely to feel awkward, lonely, nervous and ignored. Adolescents also report greater mood disruptions when compared with preadolescents.
Arnett (1999) examined three key aspects of this view i.e. conflict with parents, mood disruptions, risk behaviour and expressed support for a modified storm and stress view that takes into account individual differences and cultural variations. Arnett (1999) found that not all adolescents experience storm and stress, but storm and stress is more likely during adolescence than at other ages.

Adolescent storm and stress tends to be lower in traditional cultures than in the West but may increase as globalization increases individualism (Arnett, 1999).

HEALTH BEHAVIOUR IN ADOLESCENCE

Health is of primary importance to all normal human being and more so to the adolescents as they are at a stage when maximum bodily and intellectual developments take place, as well as the stage with proneness to multiple risks to health and well being. Archibald et al. (1999) expressed that the impact of globalized economies and of ever spreading network of mass media have made the societies relatively more open, and the adolescents are found widely susceptible to emulating western culture and cinematic role models. So the adolescents should be equipped with proper information, to guard them against falling prey to inadequate, wrong or no information. Verbrugge (1982) reported that females generally show a higher incidence of acute conditions, higher prevalence of minor chronic conditions, more short term restricted activity, and more use of health services and medicines. Males on the other hand have higher prevalence rates for life-threatening chronic conditions, higher incidence of injuries, more long term disability, and after about age 50, higher rates of hospitalization.
DEFINITION OF HEALTH

Health is a unity and harmony within the mind, body and spirit which is unique to each person, and is as defined by that person. The level of wellness or health is, in part, determined by the ability to deal with and defend against stress. Health is on a continuum with movements between a state of optimum well-being and illness which is defined as degrees of disharmony. It is determined by physiological, psychological, socio-cultural, spiritual and developmental stage variables (Nursing Department, 2005).

The World Health Organization has defined health as “a state of complete physical, mental and social well being and not merely the absence of disease or infirmity” (WHO, 1992).

The word health comes from an Anglo-Saxon term meaning ‘wholeness’. The same root-word gives us the words ‘whole’ and ‘holy’. It is interesting that the religious idea of being spiritually holy has a similar origin to the medical notion of being physically healthy. Before the development of modern Western medicine the role of physical healing was often closely connected with the role of spiritual healing, and religious people were involved in the care of the sick. In many parts of the world today, spiritual health is still associated with physical health (Banyard, 2001).

In India, Mohan and Sehgal (2000) conducted a survey among five hundred 15-18 year old teenagers/adolescents. The respondents were asked to write about their cognitions of Health & Illness.

Among boys some of the most common themes of what health is were:

1. It is a condition of the body. It is physical fitness.
2. It is the ability to live normal life without any disabilities or chromic problems.

3. It is having a well-proportioned body.

4. It is the ability to run continuously for 20 minutes; to have stamina.

5. It is leading tension free life.

**Among Girls:**

1. Good health is freedom from disease, and to have a glowing skin.

2. Health means having a good height and looking smart.

3. It is a state of sound mind and healthy body.

4. It is freedom from suffering of any disease.

5. It means having a lot of stamina to stay active.

This shows that health concerns are prominent in the psyche of adolescents.

**HEALTH RISK BEHAVIOURS IN ADOLESCENCE**

Adolescence is both a period of transition from childhood to adulthood and an important period in the life span itself. This period of adolescence has particular importance for health throughout the rest of life span (Nutbean and Booth, 1994). The cognitive changes that characterize adolescents have important implications for adolescents—at-risk behaviour and health promotion campaigns (Larson and Richards, 1994).

Some experts argue that adolescents’ egocentrism is at the heart of their high levels of risk taking behaviour. The argument is that because adolescents perceive themselves to be invincible, invulnerable, and immune to the laws that apply to others, they often engage in health compromising risky ventures (Arnett, 1992).
and aid in coping with life pressures. Most adolescents, however, probably ingest drugs to feel powerful, to be "cool," and to be in with a group.

Another reason was that, adolescents who used one drug were likely to use another drug. They usually began with legal drugs - alcohol or tobacco- progress to marijuana, and may eventually go on to other drugs or combinations of drugs.

According to Haven (2003), adolescents are more vulnerable than any other age group to developing nicotine, alcohol and other drug addiction because the regions of the brain that govern impulse and motivation are not yet fully formed.

Chambers et al. (2003) reported that adolescents impulsivity and/or novelty seeking as a transitional trait behaviour can be explained in part by maturational changes in frontal cortical and sub cortical monoaminergic systems. These developmental processes may advantageously promote learning drives for adaptation to adult roles but may also confer greater vulnerability to the addictive actions of drugs.

PHYSICAL ACTIVITY/EXERCISE

For thousands of years, physical activity has been associated with health. Today science has confirmed the link, with overwhelming evidence that people who lead active lifestyles are less likely to die early, or to experience major illness such as heart disease, diabetes and colon cancer.

Yang et al. (2006) reported that prevalence of abdominal obesity in adulthood was directly affected by adult physical activity and indirectly via youth physical activity. Participation in and maintaining physical activity from youth to adulthood may have an important role in reducing obesity in adulthood.
According to Weight-Control Information Network (U.S. Department of Health and Human Services), regular physical activity can help reach and maintain a healthy weight & it also makes the person more energetic, improves mood and reduce the risk of developing some chronic diseases.

Some of the health benefits of physical activity given by “Weight Control Information Network (2003)” are:-

- Reduces the risk of chronic diseases such as type 2 diabetes, high blood pressure and cholesterol, heart disease, osteoporosis, arthritis, and some cancers.
- Builds strong muscles, bones, and joints;
- Improves flexibility and balance;
- Wards off depression and
- Improves mood and sense of well being.

According to Wikipedia (2002), obese people appear to be less active in general than lean people. A controlled increased in calorie intake of lean people did not make them less active; correspondingly when obese people lost weight they did not become more active. Therefore weight change does not affect activity levels, but the converse seems to be the case.

Kapil (2003) reported that there is an increasing evidence that children and adolescents of affluent families are over weight because of decreased physical activity, sedentary lifestyles and more fat content in the diet.

**UNHEALTHY EATING HABITS IN ADOLESCENCE**

Excessive concern about weight is prevalent among adolescents and is worthy of both research and clinical attention because of its association with problematic eating behaviour (Duncan et al., 1985).
Howarth et al. (2006) reported that older subjects were less likely than younger subjects to skip a meal, but snacking was common in both age groups. Eating more than three times a day was associated with being overweight or obese.

Eating disorders, such as anorexia, bulimia and excessive dieting, can lead to severe and potentially long lasting health and mental health consequences and are ranked as the third most common chronic illness for young women (Abrams and Stormer, 2002).

Pesa (1999) reported that adolescents who are dieting for weight loss even though they are of normal or low body weight have been characterized as “inappropriate dieters”.

The desire to be more physically attractive according to society standards has been linked to weight preoccupations among preadolescents and adolescents. Frequency of reading fashion magazines among older girls (5th graders through 12th graders) was associated with more frequent dieting and exercising to lose weight because of a magazine article (Field et al., 1999).

Both boys and girls in a large national sample (9-14 years of age) who reported making a considerable effort to look like same sex figures in the media were more likely to develop weight concerns and become constant dieters (Field et al., 2001).

Female Adolescents’ reading of women’s beauty and fashion magazines was related to the use of pathogenic dieting methods of restricting calories to 1,200 or less per day or taking diet pills (Thomsen et al., 2002).
WEIGHT GAIN AND OBESITY

Apart from anorexia and bulimia, another health problem which has a global perspective is weight gain and obesity.

Throughout human history, weight gain and fat storage have been viewed as signs of health and prosperity. In times of hard labour and frequent food shortages, securing an adequate energy intake to meet requirements has been major nutritional concerns.

Today, however, as living standards continue to rise, weight gain and obesity are posing a growing threat to health in countries all over the world. According to World Health Organization (WHO, 1997), obesity is a chronic disease, prevalent in both developed and developing countries, and affecting children as well as adults.

Sharma (2002) reported that one of the commonest problems for which parents are seeking help is regarding their obese children.

Obesity is a condition that clinicians have long preferred to ignore, too often perceiving it not as a medical but as a lifestyle choice. It is becoming clear, however, that obesity is the result of a complex interaction of genetic, environmental and psychological factors, and that it can and should be managed (Campbell, 2000).

DEFINITION OF OBESITY

According to Rutter et al. (1976), obesity is an excess storage of triglycerides in adipose cells. There is a difference between obesity and overweight. Obesity is an excess of body fat whereas, overweight is a body weight in excess of some standard or ideal weight. The ideal weight for any adult is believed to correspond to his or her ideal weight from age 20 to 30.

Obesity is a form of disordered nutrition. The word is derived from the Latin Obesus, meaning "eaten away," which shows that overeating
may cause disease and even death. (*International Encyclopedia of Psychology, 1996*)

Defining the levels at which body fat and body weight cross threshold and become obesity and overweight is not easy and has generated considerable debate in the field. The precise point at which scientists and health officials believe increasing weight threatens health ranges from 5% to 30% above deal weight a considerable spread. Furthermore, different tables of "ideal" weights have been embraced by different figures in the field. Obesity is to be distinguished from overweight, which refers to weight in excess of some standard (*Brownell, 1995*)

Obesity refers to an excessive amount of body fat. While obesity is a condition of most concern, overweight is usually measured in clinical settings. Overweight is simply weight that is above some standard of ideal weight (*Kaplan et al., 1993*)

The ideal weight for any adult is believed to correspond to his or her ideal weight from age 20 to 30. The most accurate method of determining body fat is the Body Mass Index Nomogram, which has a correlation of 0.8 with body fat measured by more precise laboratory method (*Glass et al., 1999*).

Body mass index, also called the Quetelet index (QI), is the ratio of weight in kilograms divided by height squared in metric units.

\[
\text{BMI} = \frac{\text{Weight in kilograms}}{(\text{Height in Meters})^2}
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<th>Condition</th>
<th>Body Mass Index</th>
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<td>Overweight</td>
<td>25-29.9</td>
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<tr>
<td>Obesity</td>
<td>30 and Higher</td>
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A typical Nomogram is shown in Figure A

18
Figure Nomogram for Body Mass Index
Danaberg and Caro (2001)
BMI of 27 or more warrants treatment and attention. A BMI of 30 is roughly equivalent to 30% excess body weight. Overweight is defined as BMI of 25 to 29.9. Obesity is defined as BMI of 30 or more (Glass et al., 1999).

<table>
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<th>Age (Year)</th>
<th>At Risk of overweight BMI&lt;30</th>
<th>Overweight BMI&gt;30</th>
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<td>20-24</td>
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The Body Mass Index (BMI, kg/m²) is also widely used as a measure of relative weight among adults, and its use among children and adolescents is rapidly gaining acceptance (Cole, 1991; Dietz and Bellizi, 1999). Mean BMI levels increase rapidly (by 5 kg/m³) during the first year of life, but subsequently decrease and reach a nadir of 15 kg/m² at 4.8 years of age. Levels subsequently increase, and reach values of 20-25 kg/m² by adulthood. The beginning of this second rise in BMI has been termed the "adiposity rebound" (Dietz, 1997).

Obesity is an excess storage of triglycerides in adipose cells. There is a difference between obesity and overweight. Obesity is an excess of body fat. Overweight is a body weight in excess of some standard or ideal weight. The ideal weight for any adult is believed to correspond to his or her ideal weight from age 20 to 30 (Rutter et al, 1976).

Obesity is a condition in which the natural energy reserve, stored in the fatty tissue of humans and mammals, is increased to a point where it is a risk factor for certain health conditions or increased mortality (Wikipedia, 2002).

Being overweight or obese is not only associated with a reduced life expectancy but also with an extensive range of medical, and psychological conditions which impinged upon the patients quality of life. These include several illnesses in which governments usually set stringent targets for health improvement: cardiovascular diseases such as hypertension, stroke and coronary heart disease, metabolic disorders such as insulin resistance and type 2 diabetes; and a range of cancers (Campbell, 2000).

According to World Health Organization (WHO, 2000), Obesity is defined simply as a condition of abnormal or excessive fat accumulation in adipose tissue, to the extent that health may be impaired.

In the clinical setting, obesity is typically evaluated by measuring BMI (Body Mass Index), Waist Circumference, and evaluating the
presence of risk factors and comorbidities. In epidemiological studies BMI alone is used to define obesity (Wikipedia, 2002).

PREVALENCE OF OVERWEIGHT AND OBESITY IN INDIA

According to an article in Times of India, 18th March, 2007 about 64.67% people in India are obese.

The prevalence of obesity among adolescents is on the rise and is affecting an estimated 250 million world wide and is expected to increase further (Nair, 2005). Obesity has increased more rapidly among adolescents than among the middle aged population, according to an international report.

The percentage of children and adolescents who are defined as overweight has more than doubled since the early 1980s. According to the centers for Disease Control, about 15 percent of children and adolescents are now overweight. Ironically obesity is among the easiest medical conditions to recognize but most difficult to treat.

According to Indian pediatrics, in India, school based data demonstrated an obesity range of 5.6% to 24% for the children and adolescents in the country (Nair, 2005).

Chhatwal et al. (2004), studied the prevalence of obesity in pre-adolescent and adolescent children in India using WHO guidelines for defining obesity and overweight upon 2008 school children aged 9-15 years. It was found that the overall prevalence of obesity and overweight was 11.1% and 14.2% respectively. The prevalence of overweight as well as obesity was higher in boys as compared to girls (12.4% vs. 9.9%, 157% vs. 12.9%). Significantly more children from higher socio-economic status were obese and overweight than those from lower socio-economic status group.
GLOBAL OBESITY (GLOBESITY)

The problem of obesity is a global phenomenon. And, with 1.1 billion persons across the globe suffering from obesity, the weight of the facts is too alarming to ignore. So much so, ‘Globesity’- a term coined by the World Health Organization to represents the epidemic of obesity – is being used with increasing frequency. Since it is a global issue, if immediate action is not taken, millions will suffer from an array of serious health disorders (The Times of India, Chandigarh, 28th October, 2003).

- Globally, there are more than 1.1 billion overweight adults.
- In United States, 50 million adults are obese.
- Obesity levels range from below 5 per cent in China and Japan, to more than 75 per cent in Urban Samoa.
- World wide, an estimated 17.6 million children under the age of five are overweight.
- In India, 27 percent of school kids in Delhi are obese.
- In Delhi and Chandigarh, one in every four teenagers is obese, while in Chennai 18 percent boys and 16 percent girls are overweight (India Today, 4th August, 2003).
- India was on a rise from 9 percent in 1995 to 24 percent by 2020. (Sharma, 2006)

OBESITY AND GENDER BIAS

There is some difference regarding the way body fat gets distributed in a male’s and a female’s body. In women, excess body fat is distributed as subcutaneous fat in the thighs, buttocks and breasts (gynoid obesity). In men it is stored in the abdominal cavity and as abdominal subcutaneous fat (android obesity). Women get relative protection from coronary heart disease because of estrogen secretion till menopause sets in. Males with
abdominal or central obesity are easy candidates for syndrome X, which leads to diabetes, abnormalities in cholesterol fraction, hypertension and coronary heart disease (Times of India, 26th November, 2003).

Body weight increases with age in both sexes. However it is more pronounced in women that men especially during menopause. Basal metabolic rate (BMR) normally decreases by one percent every year in both men and women. For an individual who continues with the same pattern of eating and exercise, the gain in weight is about five kg in 10 years. Therefore one needs to reduce their calorie intake by 10 per cent for every decade of their life from 45 years of age and add some cardiovascular exercise to their daily routine (Times of India, 26th November, 2003).

THEORETICAL PERSPECTIVES OF OBESITY

Two theories of the physiology of obesity are currently supported by research and are receiving the most attention in the literature (Brownell, 1982).

1. **Fat Cell Theory:** This theory states that there are at least two types of obesity. Hyperplastic Obesity which has is an excess number of fat cells and Hypertrophic obesity which refers to fat cells of excess size. Obesity that begins in childhood is usually due to hyperplastic cells and these children may have 5 times the number of fat cells than normal weight children. Obesity with adults tends to be due to excess size fat cells. According to Sjostrom (1980), health risk of obesity are more related to fat cell size than fat cell number.

2. **Set Point Theory:** According to this theory, set point is thought of as the body’s ideal weight, and the body will work to stay as close to that ideal weight as possible. Keys et al. (1950) studied 36 men who were put on a starvation diet of half their usual calories for an extended period. It was found that the men became preoccupied
with food and had numerous psychological problems. However, they also conserved calories so as to lose as little weight as possible. They became listless and ceased most activities. A landmark animal study by Brownell et al. (1986) indicates that repeated dieting may create physiological changes but does not change the set point.

EPIDEMIOLOGY OF OVERWEIGHT AND OBESITY

The diseases of overweight and obesity are global in scope. For every developed and developing countries in the world, in which data are available, the incidence and prevalence of excessive weight has increased over time. Currently it is recommended that body mass index (BMI, weight divided by height squared) (Kg/m²) be used for establishing diagnoses of overweight (BMI of 25.0-29.9 Kg/m²) and obesity (BMI ≥ 30.0 Kg/m²). Based on these criteria it is currently estimated that 67 percent Americans are overweight and another 29 percent are obese (Kuezmarski, et al., 1997). Obesity is also a growing concern in India. Sharma (2006) reported that India was on rise from 9 percent in 1995 to 24 percent by 2020.

ETIOLOGICAL PERSPECTIVE OF OBESITY

Obesity is a very complex condition. There are several causes of obesity.

1. **Genetic Factors**: Genes are important contributors to obesity and obesity runs in the family. Only 20 percent of the children with no obese parents are overweight, while 40 percent of the children with one obese parent are overweight. However, if both parents are obese, almost 80 percent of the children will become overweight (Garner et al., 1983).

   Stunkard et al. (1986) studied a large number of twins and found similarities only between children and biological parents.

2. **Emotional disorders as a cause of obesity**: It is viewed that psychological or psychiatric disorders play a significant role in the
etiology of obesity, however, the case reports of patients are found neither drawn from representative sample nor use replicable methods. Specker et al. (1994) found that some disorders, particularly depression and anxiety, do appear to be over represented among the sub-set of obese patients. The psychosomatic theory of obesity proposes that certain personality characteristics or dispositions are linked with obesity (Kaplan and Kaplan, 1957).

3. Appetite/Satiety disorders as a cause of obesity: Schacter and Rodin (1968) developed the idea of 'externality' and proposed that obese people were unusually responsive to food cues and therefore ate more when food was attractive or accessible.

4. The role of dietary restraint: Restraint theory suggested that eating behaviour in the obese were caused by restrained eating, and were not necessarily a cause of obesity. Data on control of eating in everyday life also showed that restrained eaters reported more food craving and binge eating (Specker et al., 1994), while clinical data from eating disorder patients suggested that development of binge eating was almost invariably preceded by dieting.

DISEASES ASSOCIATED WITH OBESITY

1. Mortality: According to Danaberg and Caro (2001) obesity and overweight themselves independently confer increased risk of mortality. The increase in risk begins to rise at a BMI greater than 23 Kg/m². The risk rises slowly at levels over 25 Kg/m² and deeply at levels greater than 30 Kg/m². The data relating obesity to mortality risk were primarily conducted on White populations. In Black Americans, mortality risk appear to rise at BMI levels of 27 Kg/m² and greater.
2. **Cardiovascular and Cerebrovascular Disease:** Mc Gill et al. (2002) expressed that the reasons for increased risk for cardiovascular and cerebro-vascular diseases may include elevations of blood pressure, low density lipo-protein cholesterol (LDL-C), triglycerides, total cholesterol, fibrinogen, insulin and decreases in high-density lipo-protein cholesterol. Jausilahti et al. (1996) published a 15-year follow up study which shows 26% to 40% increase in the relative risk for cardiovascular diseases in individuals who were 30% over ideal body weight vs individuals at ideal body weight.

3. **Hypertension:** Lawler and Allen (1981) quoted the INTER SALT study involving more then 10,000 men & women reported that 10 kg increase in weight was associated with a 3.0 mm Hg rise in systolic blood pressure has been associated with a 12% increase in CHD and a 24% increase in stroke.

4. **Congestive Heart Failure:** Both overweight and obesity have been shown to be independent risk factors for the development of congestive heart failure (Danaberg and Caro, 2001). Further, because both hypertension and diabetes are also associated with cognitive heart failure, the overall risk is proportionally increased.

5. **Stroke:** An association has been established in the evaluation of both fatal and non fatal strokes particularly when a subset of patients with isomeric stroke is evaluated. The risk of stroke is nearly two fold higher in women with a BMI greater than 32 Kg/m² than in a women with a BMI less than 21 Kg/m² than in a women with a BMI less than 21 Kg/m² (Sharper, 1996).

6. **Diabetes Mellitus:** In the Nurses Health study, BMI values above 22 Kg/m² were associated with an increased risk of diabetes. It has
been estimated that the relative risk for diabetes increases by 25% for each unit of BMI above 22 Kg/m² (Wadden et al., 2002). It has also been estimated that more than a quarter of all newly diagnosed cases of diabetes in the United States were due to weight gain of more than 5 Kg. Sharma (2006) quoted that by 2025 Asia is expected to have 190 million diabetic cases.

7. **Cancer:** According to Le Marchand et al. (1992), Cancer of the colon, particularly the distal end of the colon, has been shown in a number of studies to be strongly associated with obesity in men as well as woman (but to a lesser extent). In some cases, the incidence of colon cancer is nearly two fold greater in individuals with BMI greater than 29 Kg/m² than in those with a BMI less than 21 Kg/m².

8. **Female Reproductive Health:** According to Kirschner et al. (1982) Polycystic Ovarian Syndrome, a disorder that includes hirsutism, obesity, ovulatory and menstrual dysfunction, and insulin resistance, is among the most common causes of altered reproductive function in women who are overweight. Even modest increase in weight in young women can adversely affect fertility. Obesity during pregnancy is also associated with excessive morbidity.

9. **Other Diseases associated with obesity:** Maclure et al. (1989) reported that women with a BMI greater than 40 Kg/m², the risk of gallstones is nearly seven times higher than for women with a BMI less than 24 Kg/m². A twin study conducted by Danaberg and caro (2001) estimated that for every 1-kg rise in body weight, the risk of osteoarthritis increases by approximately 10%. Sleep apnea is another morbidity associated directly with weight gain.
ASSESSMENT OF OBESITY/WEIGHT STATUS

According to World Health Organization report (2000), assessment of obesity is valuable because it allows identification of individuals and groups at increased risk of morbidity and mortality & it allows identification of priorities for intervention at individual and community levels.

There are various tools available for the measurement of weight status, but the most commonly used ratio is the Body Mass Index (BMI). Lambert Adolf – Jacques Quetelet is credited with the concept of Body Mass Index (BMI). It is also known as the Quetelet Index for the man who first proposed it 100 years ago. The body mass index is most highly correlated with percentage of body fat. The body mass index (the Quetelet Index) is the ratio of weight divided by the height squared (in metric units).

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BMI = \frac{\text{Weight in Kilograms}}{(\text{Height in Meters})^2}
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The World Health Organization (WHO) guidelines define adults with a BMI of 25 Kg/m² or more as overweight, and those with a BMI of 30 or more as obese.

Although being overweight in childhood is thought to be an important determinant of later weight gain, the centile which should be used to delimit those regarded as at risk is difficult to define.

Greenlund et al. (1996) found that father’s body size was positively associated with participants baseline body mass index among Black men, White men, and White women. Mother body size was positively associated with baseline body mass index among all race-sex groups and with changes in body mass index among White women.

Greenlund et al. (1996) also reported that parental education may influence body mass index and changes in young adulthood, especially
among White women. Such associations may be both genetic and environmental and may be important for obesity prevention efforts.

Williams (2001) in a study tracked BMI from childhood and adolescence to early adulthood, showing that in general those with a high BMI at an earlier age were more likely to be overweight at age 21. Dividing BMI into categories at 7, 11 and 15 using the median and 75th centile showed that up to 16% of those below the median at ages 7 or 11 were overweight at age 21. Those with a BMI above the 75th centile at one of these ages were between 4 and 10 times more likely to be overweight at age 21 than those with a BMI below the median.

Buchan et al. (2006) conducted an annual cross-sectional surveys from 1988-2003, found that the largest increase in BMI has occurred in the tallest children, whereas in the shortest children, BMI has hardly changed. Tall stature has therefore become important for child obesity.

Brunet et al. (2006) found that the relationship between BMI and Waist Circumference (WC) was highly significant in boys and girls (r=0.90 and r=0.86, P<0.0001). However, both BMI and WC correlated negatively with physical fitness and that these associations are more pronounced in older children. This study thus emphasizes the necessity to develop early interventions to improve physical fitness in children and to prevent the increase of childhood obesity.

ADDITIONAL TOOLS FOR THE ASSESSMENT OF OBESITY

In addition to the anthropometrics assessment methods, there are various other tools that are useful for measuring body fat (WHO, 2000). These tools are particularly useful when trying to identify the genetic and the environmental determinants of obesity. Thus, obese individuals can be characterized by measuring body composition, anatomical distribution of fat, energy intake and insulin resistance, among others.
Waist Circumference and Waist: Hip Ratio

According to James (1996), over the past 10 years or so, it has been accepted that a high WHR (Waist-hip ratio) (WHR>1.0 in men and >0.85 in women) indicates abdominal fat accumulation. However recent evidence suggests that waist circumference alone measured at the midpoint between border of the rib cage and the iliac crest may provide a more practical correlate of abdominal fat distribution and associated ill health.

Waist circumference is a convenient and simple measurement that is unrelated to height and correlates closely with Body Mass Index and WHR is an approximate index of intra-abdominal fat mass and total body fat (Lean et al., 1995).

Dexa Technique

According to Reddy (2006), DEXA is a more sophisticated method of measuring body fat than BMI. DEXA (Dual X-ray Absorptiometry) imaging is more precise as it shows the actual fat content in the body. It is almost 98% accurate. DEXA used x-ray to penetrate the body and measure body fat, muscle and bone mineral. The whole body scan takes approximately 15-20 minutes. It can also find the density of bones and is therefore useful for treatment of osteoporosis.

Despite its great benefits, Internationally BMI is still used as a screening test because its not practical to use DEXA all the time. Moreover the cost ranges from Rs. 3000-5000 (John, 2006).

Although BMI has been most commonly used for measuring body fat, doctors are now saying that it may not be the best way to check if one is overweight. BMI is extremely popular, but can be misleading. Studies have proved that it can result in over 20% error (Aggarwal, 2006).
The reason is that BMI does not take body composition into account, i.e. the percentage of muscle and fat. If a person has above average amount of muscle, as young people generally do, the equation simply interprets the added muscles as fat and overestimates obesity. Incidentally muscle weights more than fat (John, 2006). Conversely, with older persons and those with below average amount of muscle, BMI underestimates obesity.

However, despite its limitations, BMI is still considered as the best indicator of obesity and overweight and is used worldwide.

Hence, considering the above viewpoints, the present study was focused on studying the Weight Status and Health Habits of the Adolescents in relation to their Personality, Stress, Coping Styles and Parental Weight Status and Health Habits. BMI was used as an index of Weight Status.