Obesity is the most nutritional disorder in which there is excessive storage of energy in the form of fat as per height, weight, race and gender (WHO, 2005). An analysis of characteristics of different human populations may provide insight into the causes of obesity. There are various theories explaining causes of obesity. It is broadly classified under the following heads.

- Theory of Planned Behaviour
- Behavioural Susceptibility Theory of Obesity
- Schachter’s Externality Theory of Obesity
- Fat Cell Theory
- Set Point Theory
- Theory of Thermogenesis
- External Cue Theory
- Ecological Theory of Obesity
4.1 Theory of Planned Behaviour

In Psychology, the theory of Planned Behaviour (TPB) is a theory about the link between beliefs and behaviour. The concept was proposed by Icek Ajzen (Professor of psychology, University of Massachusetts) to improve on the predictive power of the theory of reasoned action by including perceived behavioural control. The theory states that attitude toward behaviour, subjective norms, and perceived behavioural control together shape an individual’s behavioural intentions and behaviour. It is one of the most predictive persuasion theories. It has applied to studies of the relations among beliefs, attitudes, behavioural intentions and behaviours in various fields such as advertising, public relations and health care (www.wikipedia.org/wiki/theory_of_planned_behavior).

4.1.1 Theory of Planned Behaviour and Obesity

A study by Kassem et al, (2003) identified factors that influence regular soda consumption among 707 female students aged 13-18 years, attending North Los Angeles Country Public Schools. Participants completed a group-administered Theory of Planned Behaviour- based questionnaire. Attitude, subjective norms and perceived behavioural control had statistically significant positive association with intention and were each significant predictors of intention to drink regular soda and together explained 64 per cent of its variance. The strongest predictor was attitude, followed by perceived behavioural control and subjective norm. The results suggest that efforts to reduce soda consumption should include parents and friends. It is also important that soda should not be excessively available at home or widely accessible to teenagers at schools. Healthy eating messages for adolescents need to be developed and incorporated into existing and
future campaigns to reinforce the perception that there are other healthier drinks that quench thirst and taste good as well.

Perceived behavioural control and attitudes predicted children’s intention to participate physical activity. The findings of the study suggests that gender differences related to intent to participate in vigorous activity, perceived behavioural control and sense of competency are evident in eighth grade and may begin in fifth grade. These gender differences in perception therefore precede the gender difference in participation in vigorous activity demonstrated among ninth graders in the 1990 Youth Risk Survey. Promotion of activities children enjoy, and in which they feel a sense of competency, is likely to sustain participation in vigorous activity throughout adolescence and possibly reduce the prevalence of obesity (Craig et al., 1996).

Schifter et al., (1985) conducted a study to know the success of weight reduction among college women on the basis of a Theory of Planned Behaviour. 83 women expressed their attitudes, subjective norms, perceived control and intentions with respect to losing weight. In addition, the extent to which they had made weight reduction plans was assessed as were a number of general attitudes and personality factors. 76 women were reassessed six weeks later. In support of the theory, intentions to lose weight were accurately predicted on the basis of attitudes, subjective norms and perceived control. Perceived control and intentions were together moderately successful in predicting the amount of weight women actually lost over 6 weeks period. Actual weight loss was also found to increase with ego strength, factors that were assumed to increase control over goal attainment.
The aim of a study made Godin et al., (1993) was to verify the basic assumption underlying the theory of planned behaviour for the prediction of exercising, intentions and behaviour among adults of the general population (study 1) and a group of pregnant women (study 2). In both studies baseline data were collected at home with trained interviewers. The self report on behaviour was obtained six months (study 1) and between eight and nine months (study 2) after baseline data collection. In study 1, perceived behavioural control influenced behaviour only through intention. In study 2, none of the Aizen model variables was associated to exercising behaviour. Nonetheless, intention was influenced by attitude, habit and perceived behavioural control.

There is consensus among recent studies that adolescents’ diets are nutritionally far from ideal. In an effort to increase understanding of the factors affecting food choice decisions in this age group, Ajzen’s theory of planned behaviour was employed by Dennison (1995). 675 adolescents comprising both males and females from two age groups and two types of schools completed a questionnaire which focused on intentions to eat three common foods at lunch time. Attitudes and perceptions of control were the components of the model found to account for the most variance in intentions. The addition of a novel measure of friend’s behaviour increased the model’s explanatory power further. Significant gender and age differences in attitudes, beliefs, levels of dietary restraint and perceived social pressure were present. The effects of social background and types of school upon these variables were minimal.

Stefamine and Smith (2006) investigated the efficacy of the Theory of Planned Behaviour to predict healthy eating behaviour in a group of
urban Native American youth. Native American boys and girls (n=139) ages 9-18 years old were given self-administered survey to assess eating behaviour using TPB constructs (intention, attitude, subjective norms, barriers, self-sufficiency and perceived behavioural control). Youth were also measured for height and weight and BMI was calculated. Bivariate correlations and stepwise regression analysis of TPB model were performed with SPSS software. No association was found between intention and healthy eating behaviour. However, independently healthy eating behaviour was correlated with barriers, attitude, perceived behavioural control and subjective norm. The most predictive barriers to eating healthy included the availability and taste of foods.

Childhood obesity is a significant problem in the United States. A number of communication campaigns and intervention have been conducted to combat the problem, with parents being recognized as an important target audience. A critical aspect of involving parents in such campaigns is formative research on parents’ perceptions of their role in preventing childhood obesity. To facilitate this process, a study was conducted in which parents (n=201) responded to theory of planned behaviour survey items as they relate to providing healthy foods and limiting unhealthy foods for their children. Results indicated support for TPB predictions. Additionally, the degree to which parents viewed providing healthy food and limiting unhealthy foods as effective in preventing obesity was predictive of parent tracking of children’s unhealthy eating behaviour. Finally, parents’ TV viewing behaviour was related to perceive response efficacy of limiting children’s TV viewing hours (Andrews, 2010).
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4.2 Behavioural Susceptibility Theory of Obesity

One factor contributing to weight variation could be genetically determined differences in appetite that modulates susceptibility to the environment. Some individuals are more susceptible than others to both negative and positive environmental conditions. This theory proposes that individual differences in appetite are heritable behavioural characteristics which in concert with, environmental exposures determine weight gain.

4.2.1 Behavioural Susceptibility Theory and Obesity

Recent behavioural and psychometric studies demonstrate that appetitive characteristics such as responsiveness to internal satiety signals and external food cues not only differentiate obese and normal weight groups, but are quantitatively associated with weight. The results indicate that sensitivity to internal and external appetitive signals are heritable phenotypes that increase the risk of overeating in obesogenic environment. A behavioural susceptibility model helps to explain how weight is both highly heritable and highly responsive to environmental characteristics (Carnell and Wardle, 2009).

Carnell and Wardle examined associations between adiposity and two appetitive traits: satiety responsiveness and food cue responsiveness in children. Parents of two groups of children, 8-11 years old and 3-5 years old completed the child eating behaviour questionnaire. Association between appetite and adiposity are consistent with a behavioural susceptibility model of obesity. Assessing appetite in childhood could help to identify higher risk children while they are still at a healthy weight,
enabling targeted interventions to prevent obesity (Carnell and Wardle, 2008).

Webber et al. (2009) collected data from 406 families to test the hypothesis that quantitative variation in eating behaviour traits shows a graded association with weight in children. Satiety responsiveness in eating and food fussiness showed a graded negative association with weight, whereas food responsiveness, enjoyment of food, emotional overeating and desire to drink were positively associated. There was no systematic association with weight for emotional under-eating. The results support the idea that approach-related and avoidance-related appetitive traits are systematically related to adiposity and not exclusively associated with obesity. Early assessment of traits could be used as indicators of susceptibility to weight gain.

The modern environment is ubiquitously ‘obesogenic’, yet people vary enormously in weight. One factor contributing to weight variation could be genetically determined differences in appetite that modulate susceptibility to the environment. They assessed the relative contribution to genes and environment for two aspects of appetite that have been implicated in obesity. The high heritability of appetite traits that are known to be related to weight suggests that genetic vulnerability to weight gain could operate through behavioural as well as metabolic pathways. Intervention strategies aimed at improving satiety responsiveness reducing food cue responsiveness in high risk individuals could help in preventing the development of obesity (Carnell, 2008).
4.3 Schachter’s Externality Theory of Obesity

In the late 1960s the social psychologist Stanely Schachter proposed that obese people eat not because of hunger, stress or boredom but in response to external food cues which drive eating in the obese until those cues are removed or consumed (Grossberg and Grant, 1976). When external cues are absent, these obese are not motivated to eat, even if they are substantially food-deprived. This theory achieved widespread attention because it challenged long standing ideas about the causes of obesity by means of several innovative and dramatic experiments. Schachter’s research was correlational, showing that obesity is associated with externality. He assumed that externality causes obesity. According to this theory, the eating behaviour of normal weight individuals is primarily controlled by internal hunger cues, while that of the obese is more influenced by external stimuli such as the sight, smell and taste of food, talk about food, etc. The obese should be less reactive than normal at low levels of stimulation and more reactive at high levels.

4.4 Fat Cell Theory

Fat Cell Theory has been popular in medical fields for more than 30 years. The idea behind the theory is that each body is programmed to have a basic set number of cells. Fat cell theory shows that during growth, fat cells increase in number. When energy intake exceeds expenditure, fat cells increase in size. When fat cells have reached their maximum size and energy intake continues to exceed energy expenditure, fat cells increase in number again. When fat loss, the size of the fat cells shrinks, but not the number. The theory states that the creation of new fat cells is far easier than
losing old ones, a fact that plays an important role in adult weight loss (www.livestrong.com/article/4208-need-fat-cell-theory/).

Fat accretion in the body as it relates to obesity occurs in fat cells known as ‘adipocytes’. These cells originate either directly or indirectly from the embryonic mesenchyme tissue, but can’t be identified as adipocytes until they begin to accumulate lipid. As an individual grows and develops, the size of the adipose tissue will be affected by factors that modify cell division and the enlargement of the cells.

Adults whether normal or obese, have a fixed number of adipocytes in the body. Obesity developing in adult life is associated only with the enlargement of fat cells (hypertrophic obesity). Obesity developing in infancy or childhood is associated with an increase in cell number (hyperplastic obesity). Current infant feeding practices, particularly those which involve high energy intakes, stimulate fat cell hyperplasia. Hyperplastic obesity is more resistant to weight reduction therapy than hypertrophic obesity, and the two types may have a different morbidity and mortality.

The possible etiologies of obesity are numerous. The primary cause may be in adipose tissue or in other tissues that influence energy expenditure. While number and size of fat cells influence the quantity of adipose tissue, new information indicates that changes during maturity in these cellular parameters are also important to the success of weight reduction program (Bulter and Allen, 1979).

The contribution of cell number and size to the growth of the fat deposit in non obese children varies with age (Knittle et al., 1979).
Deviations from this normal development were observed in obese children shortly after one year of age. By eleven years of age obese children exceeded the mean cell number found in non-obese adults. Indeed, obese subjects displayed more rapid and earlier elevations in both cell number and size. Thus obese children display both quantitative and qualitative differences in fat tissue development when compared to non-obese children. The data indicate that the rate and type of adipose tissue cellular development one encounters in children may play a role in the development of the enlarged fat deposits found in obese subjects.

4.5 Set Point Theory

Obesity is a consequence of the complex interplay between genetics and environment. Set point theory states that body weight is maintained at a stable range known as the ‘set point’, despite the variability in energy intake or energy expenditure. The body tends to maintain a certain weight by adjusting hunger, appetite and food energy intake compared to metabolism so that a person’s effort to alter weight may be unsuccessful.

The theory states that body maintains its normal weight and body fat level with internal regulatory controls that dictate how much fat one has. According to set point theory, some individuals have a high set point and others have a low set point. This theory suggests that despite dieting efforts, the body tends to return to its set point weight. However, regular, consistent exercise may help to adjust the natural set point.

(www.weightloss.about.com/od/glossary/g/setpoint/html).
4.6 Theory of Thermogenesis

This theory states that our bodies produce heat by a process called thermogenesis. This production requires energy which utilizes our metabolism and burns calories. The theory revolves around ramping up this heat production function with the idea that if we are able to increase our thermogenetic capacity, our bodies will metabolize excess calories or body fat as heat rather than tucking them into storage (www.ehow.com/about-5543982-thermogenic-theory.html).

4.7 External Cue Theory

This theory states that people overeat as a response to stimuli in their surroundings – foremost among them, the availability of a multitude of delectable foods (www.asianbariatrics.rxpinoy.com/new-1-index.html).

A study by Currie et al, (2010) supports the external cue theory. How changes in the supply of fast food restaurants affect weight outcomes of 3 million children and 3 million pregnant women are investigated by the researchers. Among the ninth graders, a fast food restaurant within 0.1 miles of a school results in 5.2 percent increase in obesity rates. Among pregnant women a fast food restaurant within 0.5 miles of residence results in a 1.6 per cent increase in the probability of gaining over 20 kilos. The implied efforts on caloric intake are one order of magnitude larger for children than for mothers, consistent with smaller travel cost for adults.

Calorie underestimation is often alleged to contribute to obesity. By developing a psychophysical model of meal size estimation the authors show that the association between body mass and calories underestimation found in health science research is a spurious consequence.
of the tendency of high body mass people to choose and thus estimate larger meals. They also find that using a piecemeal decomposition improves calories estimation and leads people to choose smaller but equally satisfying fast food meals. The finding is that biases in calorie estimation are caused by meal size and not body size has important implications for allegations against the food industry and for the clinical treatment of obesity (Chandon and Wansink, 2007).

The two most viable pathways according to Gable and Lutz (2000) to prevent and reduce childhood obesity seem to be through parent’s education and television-reduction programs for children. All parents need to understand the important role they play in socialising children’s healthy eating habits and how to best enact that role through food selection and mealtime expectations. Guaranteeing that all adults who are involved with a child’s life are operating from the same base of information about general child nutrition and about specific child likes and dislikes is crucial for children’s healthy development.

**4.8 Ecological Theory of Obesity**

The ecological theory states that driving force for the increasing prevalence of obesity in populations is the increasingly obesogenic environment rather than any pathology in metabolic defects or genetic problems within individuals. Current strategies are not containing the obesity pandemic. A shift is needed away from the traditional view of obesity as a personal disorder that requires treatment. An ecological approach regards obesity as a normal response to an abnormal environment rather than vice versa. Understanding, measuring and altering the obesogenic environment is important to reduce obesity. A paradigm shift to
understanding obesity as “normal physiology within a pathological environment” signposts the directions for a wider public health approach to the obesity pandemic (Egger and Swinburn, 1997).

Environmental policy and social changes are important contributors to the rapid rise in obesity over the past few decades and there has been substantial progress toward identifying environmental and policy factors related to eating and physical activity that can point toward solutions (Sallis and Glanz, 2009).

There is relationship between childhood obesity and many obesogenic environment variables such as deprivation, urbanisation, access to local amenities as well as dietary and physical activity behaviour (Procter et al, 2008).

The aim of the study was to determine whether socio-economic status is associated with overweight and obesity in prepuberal children. The cultural resources of the mother and the economical resources of the family seem to influence the prevalence of weight gain in prepuberal children. This should be taken into account when planning programmes for the prevention or reduction obesity in children (Gnavi, 2000).

Research indicates that parents’ food selections are related to demographic characteristics of the family. Single parent households and households in which both parents work full time have a tendency to favour the consumption of prepared food items, which tend to be high in fat and sodium (Crockett and Sims, 1995).

Television is a complex phenomenon and contributes to obesity through multiple mechanisms: children are physically idle, cognitively
under the influence of television advertisement, and have less opportunity to engage in extracurricular activities (Robinson, 1999).

The data also support the claim that children will eat high sugar, high fat and junk foods if they are available in home. Nutritionists believe that socializing healthy child eating habits requires parents to provide a wide variety of nutritious foods and to allow children to choose what, and how much, to eat. Children are innately equipped to monitor their own food intake and to determine when they are satiated (Birch and Fisher, 1995).

4.9 Conclusion

All these theories explain the influence of socio-economic background, dietary habits and sedentary lifestyle of modern people. However, External Cue Theory and Ecological Theory, Behavioural Susceptibility Theory, Theory of Planned Behaviour and Schachter’s Externality Theory of obesity are prominent and more acceptable in the changing socio-economic background, dietary habits and sedentary lifestyle of people in modern world. The analyses of the present study also support these theories.
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