Chapter I

Introduction

Childhood obesity is a growing epidemic in the United States and all over the world. The prevalence of obesity has increased from 5 percent to 12.4 percent for children between the ages of 2 and 5 years as evidenced by the National Health and Nutrition Examination Survey (NHANES) from 1976-1980 and 2003-2006. This substantial increase in childhood obesity has led to an astounding development of Type II Diabetes, hypercholesterolemia, and hypertension in children and adolescents as per CDC (Center for Disease Control and Prevention, 2008).

“The surge in obesity in this country is nothing short of a public health crisis that is threatening our children, our families, and our future,” said First Lady Michelle Obama. “In fact, the health consequences are so severe that medical experts have warned that our children could be on track to live shorter lives than their parents (Office of Surgeon General-Kathleen Sebelius, 2010).

It is evident that the early onset of obesity can lead to many serious lifelong health implications. Current research suggests that rapid weight gain during infancy can lead to overweight, cardiovascular disease, and cancer later in life (Karaolisa-Danckert, et.al., 2008). Therefore, it is imperative to uncover all possible underlying causes for childhood obesity.

Birth weight (BW) is an important determinant of an infant’s wellbeing and latter life (Barker, 2004). Several factors such as a mother’s genetic characteristics, socio-cultural, demographic and behavioral factors, pre-pregnancy body mass index (BMI), and gestational weight gain (GWG) contribute to the birth weight of an infant (Padilha, et.al., 2009). According to Subcommittee for a Clinical Application Guide, (1992) nutritional intake and the weight gain during pregnancy are the two main modifiable factors influencing maternal and neonatal outcome.
One main factor that affects infant gestational birth weight is pre-pregnancy Body Mass index or pregravid (BMI). It is also one of the leading maternal risk factors for obesity during childhood. When a mother has a high intake of macronutrients, the child also has a high intake of the same nutrients (Brion, et.al, 2010).

Maternal Obesity in the United States and worldwide has grown to epidemic proportions. The latest data from the NHNES (1999-2004) indicate that among non pregnant women, ages 20 to 39 years, approximately 25 percent are overweight and 28 percent are obese, of whom 6 percent are considered extremely obese (BMI- 40). Among adolescent girls, 12 to 19 years old, approximately 30 percent are at or above the 85th percentile of BMI—for-age and 16.4 percent are considered obese. On an average, obesity among women of all ages seems to have peaked at 33 percent, with no appreciable increase between 1999-2000 and 2003-2004 (Ogden, et. al., 2006). It is beneficial to study the association of age, race and becoming overweight or obese before and during pregnancy to provide preventive care.

Epidemiological studies have shown a clear association between maternal pregravid or pre-pregnancy weight and birth outcomes. As a marker of nutritional status, a woman's pregravid body mass index (BMI = kg/m²), if low BMI (<19.8), may reflect chronic nutritional deficiency; whereas a high BMI (>26.1) reflects an imbalance between energy intake and expenditure, and thus varying degrees of adiposity. Overweight is defined by the World Health Organization as a Body Mass Index of 25-29.9; a BMI 30 and over is classified as obese (Haroush, et. al., 2009).

The effects on every birth's outcome differs, with low BMI being associated with intra-uterine growth retardation (IUGR), preterm birth, and iron deficiency anemia. BMI above the normal range of 19.8 to 26.1, however, is associated with a number of adverse reproductive health outcomes. For example, such outcomes include infertility, gestational diabetes, pregnancy induced hypertension and pre-eclampsia, birth defects, large for gestational age (LGA) or macrosomia (>4500 g), cesarean sections, and prolonged labor (Anna-Maria, et. al., 2006). Infants born to obese mothers have a higher
prevalence of congenital anomalies than do offspring of normal-weight women, suggesting that maternal adiposity alters development in the sensitive embryonic period (Anna Maria Siega-Riz, 2009).

Another factor contributing to obesity in the child is metabolic syndrome. Gestational Diabetes Mellitus (GDM) does not always lead to type II diabetes mellitus postpartum, however developing GDM significantly increases the chance of developing type II DM. Pre-pregnancy BMI is the primary predictor of increased birth weight and LGA among women with GDM (Segal et.al, 2008). Studies have shown that women who are obese before pregnancy have an increased risk for pregnancy complications and adverse outcomes, including gestational diabetes and pregnancy induced hypertension, increased cesarean section deliveries, and delivering preterm infants (Callaway, et. al., 2006). It is noted that gestational diabetes has a close association with infants of large gestational birth weight.

Apart from Pre-pregnancy Overweight BMI and GDM, maternal smoking during pregnancy is another modifiable risk factor. Exposure to prenatal maternal smoking is hypothesized to influence child obesity risk and has been associated with greater (overweight) body mass index (BMI). Smoking in pregnancy is associated with lower birth weights. Whereas higher birth weights tend to be associated with later obesity, smaller size at birth has also been associated with increased adiposity and central fatness in later life. It has been hypothesized that metabolic adaptations, linked to maternal smoking, may promote prenatal growth retardation through pathways that may increase risk of obesogenic growth in the postnatal environment (Michelle A Mendez, et.al.,2008). Thus, it is important to provide education on preventing or reducing the maternal smoking and obesity.

Naturally, parents influence their children’s eating habits. There is evidence to suggest that smokers have less healthy diets, and these differences in diet may have been responsible for the higher body and fat mass observed among children of smoking mothers. Moreover, mothers, who smoke during pregnancy, have lower socio-economic
status, and they tend to breast feed their children for less time than non-smokers (Hediger, et.al., 2000).

Thus, obesity in pregnancy carries with it, not just increased risks for the pregnant woman during gestation, but also risks for the future health of the child, or, in public health terms, the health of the next generation. The long-term goal of health care professionals must be to reduce the proportion of women who are obese during the reproductive period, and increase public awareness about the importance of a healthful lifestyle (healthful diet, moderate to vigorous levels of physical activity, and emotional well-being) before and during pregnancy(Anna-Maria Siega-Riz, et.al., 2006).

High intake of calorie-dense beverages and low intake of fruits and vegetable is another modifiable risk factor of maternal and children overweight and childhood obesity. Lack of adequate fruit and vegetable consumption has become an important public health issue. According to the Canadian Community Health Survey, 59% of Canadian children between 2-17 years of age consume fruit and vegetables less than five times a day (Shields, 2005). These children are significantly more likely to be overweight or obese compared to those who consume fruit and vegetables more frequently.

In most Western countries, large population groups, including children and adolescents, eat far less than the recommended amount of fruits and vegetables. Several studies have shown that children's intake of fruit and vegetable tracks into adolescence, and that those food preferences and eating habits established in childhood and adolescence tend to be maintained into adulthood. This makes increasing fruit and vegetable consumption among children and adolescents an important public health issue(Mette Rasmussen, et. al., 2006).

Dairy products intake is another area of focus to impact maternal and childhood obesity. Although adult studies have focused on the role of dairy in weight loss, the focus of most studies is whether dairy has an etiologic role in the development of obesity. Because milk is an energy-dense food, it is possible that higher intake levels will be associated with increased weight or body fat gain during childhood. Several studies,
however, have found no adverse effect of higher milk consumption levels on the amount of stored body fat in children (Phillips, et.al., 2003).

It is well established that excessive sedentary time, independent of too little exercise, leads to a number of negative health outcomes (Stamatakis, E. et.al, 2011). Sedentary behaviors (typically in the contexts of TV viewing, computer and game-console use, workplace sitting, and time spent in automobiles) have emerged as a new focus for research on physical activity and health. Put simply, the perspective that we propose is that too much sitting is distinct from too little exercise. Furthermore, we describe recent studies from Canada, Australia, and the United States, which show prospective relationships of sedentary behaviors with premature mortality. Importantly, adults can meet public-health guidelines on physical activity, but if they sit for prolonged periods of time, their metabolic health is compromised (Neville Owen et.al., 2010).

Research indicates that a decrease in daily energy expenditure without a concomitant decrease in total energy consumption may be another modifiable underlying factor for the increase in childhood obesity. This rise in childhood obesity has been associated with reduced levels of physical activity (energy expenditure), increased consumption of food (energy intake), or both (Sisson, S.B. et.al., 2009).

Medical Nutrition Therapy plays a major role in reduction of the rate of childhood obesity. Nutritional counseling is “a supportive process to set priorities, establish goals and create individualized action plans that acknowledge and foster responsibility for self-care” (Curry and Jaffe, 1998). This process may include assisting the client in recognizing their nutrition-related priorities, establishing patient-stated goals and creating individualized actions plans. Strong evidence supports the combination of behavioral theory and cognitive behavior theory in modifying dietary patterns, weight and health risk factors.

Competency-based nutritional care is at the forefront of resident education for several reasons. Physicians are increasingly recognizing the importance that diet and exercise play in influencing the prevention, risk, and management of a variety of chronic
diseases. Providing good nutritional care to patients is a part of the professional responsibility of every physician (Darwin Deen, 2006).

Research suggests that this can be accomplished by motivational interviewing, which is a client-centered strategy designed to elicit behavior change by assisting clients to explore and resolve ambivalence to change (Miller and Rollnick, 2008).

No matter what theory or behavior change model is providing the greatest influence, the relationship between counselor and client is the guiding force for change. The effect of this relationship is most often cited as the reason for success or failure of a counseling interaction (Curry and Jaffe, 1998). Kathy King Helm, and Bridget Klawit (2007) report that successful clients identify their personal interaction with their therapist as the single most important part of treatment. To set a stage for understanding the basics of an effective counseling relationship, one will investigate the characteristics of effective nutrition counselors, explore your own personality and culture, and examine the special needs and issues of a person seeking nutrition counseling.

**Rationale for Selecting the Topic**

Childhood obesity is a rising widespread preventable serious public health concern in worldwide, and in United States. Therefore, there is a crucial need to understand all potential underlying causes for childhood obesity. Very few studies have been done to assess the prevalence or extent of maternal risk factors and its association with childhood obesity. Today nutrition professionals are enhancing their efforts to reduce childhood obesity mainly by focusing on healthy lifestyle and increase physical activity. Even with such efforts, the nation is still facing childhood obesity as a fast growing epidemic. So the need to study the underlying maternal links such as risk factors, before and during pregnancy has become absolute necessity. This significant road of prevention has a greater personalized benefit for pregnant clients and nutrition professionals. This aids nutrition professionals to provide an enhanced medical nutrition therapy (MNT). Because this evidence based information can be used as a very effective motivation interviewing discussion during their counseling session to their young and old pregnant clients. This increased knowledge also helps the pregnant mothers to comprehend the importance of a
healthy intra-uterine environment for their infants to grow rich in their health and wellbeing.

**Need and Importance of the Study:**

Current research shows maternal smoking and obesity results in many adverse birth outcomes such as small for gestational age infants (SGA) which later increase in adiposity, large for gestational age infants (LGA), gestational diabetes, hypertension and more. The birth weight of these LGA is affected most by fat mass and not of the lean body mass. Maternal pre-pregnancy BMI is a strong predictor of the fat mass of the infant (Kristensen, et.al., 2005). The maternal risk factors mentioned above are the most preventable or modifiable in terms of preventing early onset of obesity in children, which in return will avoid lifelong health implications during their adult life.

Thus obesity, smoking, gestational diabetes, and poor food intake during pregnancy not only present increased risk factors for mothers during gestation, but also for the future health of their new born. Current research shows, more than one-third of women of childbearing age in the U.S. are overweight or obese and this prevalence is increasing. Therefore, it is of public health importance to study the impact of maternal weight on adverse pregnancy and birth outcomes (Schieve et. al., 2000).

Henceforth, in light of the above, the purpose of this study is to specifically identify the impact of selected modifiable maternal risk factors on birth outcomes among mothers and their infants’ birth weight of Special Supplemental Nutrition Program for Georgian Women, Infants and Children (WIC). They are maternal smoking, pre-pregnancy overweight and obese BMI, gestational diabetes and selected mothers’ intake of food such as fruits, vegetables and dairy products, physical activity and screen time. Since research suggests that infants who are born to smoking mothers have a tendency to be overweight or obese during their childhood and later life, an effort is made to see whether WIC program selected children of smoking mothers have any change in their adiposity from the ages of 1 to 4 years.
Overall, the prevalence of U.S childhood overweight has tripled over the previous two decades (Ogden et.al., 2003), so there is a tremendous need to improve the innovative strategy of nutrition counseling to reducing early childhood obesity among overweight children. Therefore, an additional attempt is made to observe the changes in BMI of overweight and obese children by providing enhanced nutrition counseling strategy through same clinical nutritionists during their bimonthly nutrition clinical visits. Because of this wholesome approach by identifying selected modifiable maternal risk factors during pregnancy and development of enhanced nutrition counseling strategy, can lead to reducing the adverse effect of childhood obesity and prevent possible lifelong health complications.

**Broad objective of the study**

To study the possible underlying causes of childhood obesity such as selected modifiable maternal risk factors like pregravid BMI, smoking, Gestational Diabetes, dietary habits of Georgia WIC mothers during pregnancy and the birth outcomes leading to childhood obesity. Secondly, this study is to measure the impact on BMI of overweight children of 0 to 5 years through enhanced provision of evidence-based, suitable nutrition counseling strategy combined with clear-cut medical documentation by the trained selected Registered Dietitians (RDs).

**Objectives of the study**

- To study the possible underlying maternal risk factors, which causes childhood obesity such as maternal smoking, pre-pregnancy BMI, gestational diabetes, selected maternal dietary factors of Georgia WIC program mothers during their pregnancy and its birth outcomes.
- To study the difference in infant birth weights of smokers, non-smokers, and also between white and black smokers
- To observe the effect on birth weights of mothers who stopped smoking during last trimester.
- To understand the BMI percentile changes during 0 to 4 years of children born to maternal smokers.
• To find the significant difference of infant birth weight of WIC program mothers based on BMI classification

• To assess weekly intake of fruits, vegetables, dairy, daily activity and screen time of selected obese pregnant mothers and children.

• To disseminate nutritional knowledge through power point presentation specially focused on research population and development of medical documentation and training.

• To evaluate the impact of enhanced nutritional counseling strategy by the same clinical nutritionists on the BMI of the selected overweight and obese children

• To develop a professional competency assessment tool for nutritionists to maintain their current knowledge in the area of maternal and child health.

• To Include Asian community throughout the study so that the research can also be applied to worldwide Indian population.