

Women's Understanding of the Effects of Obesity on Pregnancy

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### Abstract

Obesity is a serious issue and is becoming a significant problem around the world. Obesity in general causes and complicates many health problems. As obesity increases in the population at large, the incidence of obesity in pregnancy continues to increase. Obesity during pregnancy has been linked in numerous studies to multiple complications, and the issues and risks have been clearly established. Also becoming pregnant or having multiple pregnancies increases the likelihood of developing obesity. Obese women of childbearing age many times do not even know these risks exist. There is a need to educate these women before they become pregnant, and there is a need to educate all women because they may be faced with these problems in the future. This study researched women's understanding of the effects of obesity on pregnancy. The eight participants were college students chosen from a female dorm on a Christian university campus. A pretest, educational intervention, and posttest study design was implemented. The posttest scores were found to be significantly higher than the pretest scores indicating that learning took place during the intervention. This finding demonstrates the need for more education for women in general regarding these risks.

### Women's Understanding of the Effects of Obesity on Pregnancy

The impact that obesity has on pregnancy is profound and can be devastating for both the mother and the baby. Obesity has increased greatly in recent years, and with this increase, complications associated with obesity and pregnancy are becoming more and more common. Obesity during pregnancy greatly increases the risk of complications that may occur. It is essential to understand the impact that obesity has on pregnancy, the possible complications that may occur, the current level of understanding about these complications, and the measures that need to be put in place to raise awareness and decrease the occurrence of these complications.

### **Obesity and Pregnancy Complications**

In recent years, obesity has become an increasingly commonplace issue across the United States. As obesity becomes a more pronounced and widespread problem, the incidence of women being overweight or obese at the start of pregnancy also increases (Sarwer, Allison, Gibbons, Markowitz, & Nelson, 2006). In the United States' population in general, approximately 60-70% of people are considered obese or overweight (American Heart Association, 2013, para. 2). More than one-third of adults in America can be classified as obese which is equivalent to almost 78 million people (American Heart Association, 2013, para. 3). For women specifically, it is estimated that more than 60% of American women classify as overweight, and of that 60%, one-third classify as obese (Office of Women's Health, 2012, para. 1). Body mass index (BMI) is a calculation implemented to indicate approximately how much body fat a person has without actually measuring it. This number is helpful in determining if a typical person is at a healthy weight. A healthy BMI is between 18.5 and 24.9. Overweight is defined as a

BMI between 25 and 29.9 whereas obese is identified as a BMI of 30 or greater (Centers for Disease Control and Prevention, 2012).

### **Obesity**

Obesity is a condition in which a person has an excess of adipose tissue. It indicates that a person's weight is considerably higher than what would be considered healthy for that person. The label of obese is applied to anyone who weighs 20% or greater than the weight that has been determined to be her best in terms of health.

Obesity typically occurs as a result of too many calories being consumed and not enough calories being expended (American Heart Association, 2013). Aspects that influence the development of obesity are personal choice and actions, culture and surroundings, as well as a genetic component. Cultural issues in America that impact obesity include large serving sizes, lack of exercise and inability to prepare nutritious foods due to time constraints, and utilizing motor vehicles as the primary mode of transportation instead of something that would be physically active (Office of Women's Health, 2012).

### **Pregnancy Complications related to Obesity**

Specifically during pregnancy, obesity is linked with both difficulty becoming pregnant and problems maintaining a pregnancy. Also obesity is related to a higher incidence of developing complications during pregnancy (Sarwer et al., 2006). These complications associated with obesity can affect both the mother and the child. Some of these problems include increased duration of pregnancy and obesity later in life (Arrowsmith, Wray, & Quenby, 2011; Ezeanochie Ande, & Olagbuji, 2011; Herring et al., 2010). Other complications include preeclampsia, premature delivery, gestational

diabetes, induction of labor, cesarean delivery, miscarriage, stillbirth, macrosomia, and congenital defects (Sarwer et al., 2006).

**Infertility.** Infertility is described as inability to achieve conception despite 12 months of unprotected intercourse. The two types of infertility are primary and secondary infertility. A couple would be diagnosed with primary infertility if they had not previously conceived at any point. Secondary infertility involves a couple that has conceived in the past, regardless of whether or not the pregnancy progressed to full term, but is currently having difficulty becoming pregnant. Infertility can result from problems in the man or the woman, and the problems are evenly divided between the two with about half resulting from the man and half resulting from the woman. Fertility issues tend to become more prominent as a person gets older. Infertility problems impact approximately 15% of Americans of child-bearing age (Johns Hopkins Medicine, 2008, para. 3).

According to Sarwer and associates (2006), obesity negatively impacts fertility in numerous ways such as causing abnormal menstrual periods, lack of a period, lack of ovulation, and miscarriage. Irregular periods, difficulty conceiving, and miscarriages are especially prevalent when additional weight collects around the abdomen. The reasons behind these findings are not fully known. However, additional adipose may lead to infertility related to the body's development of opposition to insulin, high levels of insulin in the blood, and high androgen levels. Because adipose tissue holds androgens, it has a significant part in controlling the amount that is able to be accessed. The more adipose tissue that a woman possesses, the more androgens that are able to be released. This release of androgens results because increased weight causes decreased levels of sex

hormone-binding globulin which elevates androgen levels. Peptides such as leptin and ghrelin may also be involved (Sarwer et al., 2006).

Polycystic ovarian syndrome (PCOS) may offer a better understanding as to the way in which obesity and infertility are connected. PCOS is a condition in which a woman has high levels of androgens, irregular menstrual cycles, and frequently fails to ovulate. This lack of ovulation may occur due to the formation of cysts. The reasons behind the development of PCOS are not well understood (Sarwer et al., 2006).

However, the pathophysiology is thought to involve the relationship of elevated levels of androgens or insulin—or possibly both—to hormone levels. A person's environment, genetic make-up, body weight, and irregularities in parts of the endocrine system such as the hypothalamus, pituitary, and ovaries are all implicated in the development of PCOS (Teede, Deeks, & Moran, 2010).

PCOS often involves obesity either before or during the formation of the condition which may indicate that obesity is somehow involved in the occurrence of the condition. Around half of women who have PCOS are obese (Sarwer et al., 2006). Obesity by itself elevates androgen levels and the incidence of infertility which may indicate its connection to the occurrence of PCOS. Also when a person has both PCOS and obesity, the obesity further intensifies resistance to insulin as well as other symptoms of the condition related to metabolism and reproduction (Teede et al., 2010).

The reproductive manifestations of PCOS relate to impaired performance of the ovaries. As a result of ovary dysfunction, patients present with no period at all or very minimal and spread out periods. These menstrual irregularities occur because the woman is not ovulating or is not ovulating regularly for a prolonged period of time. Over time,

this lack of ovulation can actually cause sporadic uterine bleeding that is not related to menstruation but can be confused with it. The reason that ovulation does not occur may be the result of high levels of androgens and insulin. When higher levels of luteinizing hormone and insulin develop, they together promote the formation of androgen. When insulin does not function as it should in the body due to an inability of the body to respond to insulin, the levels rise in the blood stream. Hyperinsulinemia subsequently increases the level of testosterone in the blood stream (Teede et al., 2010). In women who have PCOS, testosterone, which is an androgen, can be double the typical level, and high testosterone levels are associated with high levels of luteinizing hormone (Hywood, 2012). Both high androgen levels and high insulin levels lead to a diminished ability of the ovaries to form follicles (Teede et al., 2010). This is because when the amount of androgen in the ovaries increases, follicle stimulating hormone is blocked resulting in the follicles not being able to form or grow (Hywood, 2012). The follicle which contains the oocyte is what eventually turns into the fully developed ovum through a process of maturation and enlargement. The ovum is the egg cell that moves into the fallopian tube and must be fertilized in order for conception to occur. Therefore, without the development of the follicle, pregnancy will not occur (Davidson, London, & Ladewig, 2012).

Along with the overproduction of androgens, problems in the hypothalamic pituitary axis are also involved in PCOS. This is because the hypothalamus pituitary axis is responsible for forming gonadotrophin releasing hormone (GnRH), and in conditions such as PCOS, GnRH is overproduced. This overproduction results in subsequent overproduction of luteinizing hormone which then throws off the balance of luteinizing



hormone to follicle stimulating hormone. When levels of luteinizing hormone are high, follicle stimulating hormone is not produced probably because the hypothalamus recognizes that estrogen levels are already too high (Hywood, 2012).

Another important factor in PCOS and infertility is uterine blood flow. Adequate blood supply to the uterus is a significant factor in the ability of the embryo to implant in the endometrium of the uterine wall. Some women who have PCOS have been shown to have diminished blood flow in the uterus which may contribute to difficulty becoming pregnant as well as miscarriage after conception (Lam, Johnson, & Raine-Fenning, 2009). In general, it has been indicated that weight loss may be able to improve fertility because it helps to normalize menstruation and increase ovulation (Sarwer et al., 2006).

**Miscarriage.** Miscarriage is also associated with obesity during pregnancy (Sarwer et al., 2006). Miscarriage is the unplanned loss of the baby that occurs prior to the twentieth week of gestation (Storck, 2012). It is usually a result of issues related to the chromosomes of the fetus and typically happens during the initial 12 weeks of gestation. The link between obesity and miscarriage is not fully understood and is likely related to several different aspects. Many different theories have been developed, but it is probably associated with abnormal oocytes, an alteration in the ability of the endometrium to receive the embryo, as well as inflammatory issues. Obesity is linked with both insulin resistance and a prolonged period of inflammation. Numerous inflammatory mediators which are elevated in those that are obese adversely affect the ability of the embryo to both grow and implant. Also leptin is found to be higher in women that are obese which has been shown to inhibit development of the follicle which leads to substandard oocytes and embryos. Improper oocytes and embryos result in

issues with implantation and a higher probability of miscarriage (Pandey & Bhattacharya, 2011).

**Congenital Defects.** In addition, there is an elevated incidence of congenital defects in infants of obese women. These problems may involve neural tube defects including spina bifida and anencephaly which are likely related to the mother's dietary intake and especially consuming foods with a high glycemic index on a regular basis (Sarwer et al., 2006). Proper intake of folic acid before pregnancy is especially important for women that are obese in order to prevent birth defects, particularly neural tube defects (Phillips, 2012). Women who are obese or have diabetes should be consuming larger daily amounts of folic acid than women who do not have these conditions. The recommendation is that these women should be consuming 5 mg of folic acid each day starting two months before they plan to become pregnant and continuing through the first trimester of pregnancy (Kennedy & Koren, 2012). Other defects include problems with the heart and the presence of multiple defects (Sarwer et al., 2006). In addition, other defects that are more likely to occur in the baby of an obese woman include cleft lip, cleft palate, anorectal atresia, hydrocephaly, and abnormalities involving the extremities (Maxwell & Glanc, 2011). These problems may not be found because of technical issues that occur at the time of the ultrasound (Phillips, 2012).

Ultrasounds during pregnancy are used to determine the anatomic structure of the baby, how well the baby is doing, if uteroplacental insufficiency is occurring, and to estimate the size and weight of the baby. Another type of imaging that may need to be used especially in obese patients is MRI. Detection of congenital defects through ultrasound is especially important and demanding in obese women because the baby of

such a woman is more at risk for having a defect, and because the actual imaging itself is harder to do. It is also harder to correctly determine fetal weight and the development of macrosomia through the ultrasound of obese women. Ultrasounds can be restricted in their ability to accurately visualize the fetus when the woman is obese. The ultrasound can be challenging and in some cases cannot actually be fully finished. In previous research, it has been demonstrated that in obese patients it is easier to miss considerable findings such as defects, and it is harder to see the heart, head, and spinal cord. It also causes more strain on the person doing the imaging and can actually lead to issues in the person's musculoskeletal system (Maxwell & Glanc, 2011).

It may become necessary for these women to have the analysis of their baby's anatomical structures sooner in pregnancy via the transvaginal ultrasound in order to improve visualization. The reason the images are not as clear is because of the amount of tissue that the ultrasound waves have to go through as well as the fact that there is more adipose tissue which soaks up the energy from ultrasound waves. New technology and methods of imaging for obese patients are being created and tested (Maxwell & Glanc, 2011).

**Stillbirth.** If a mother is obese, there is a greater likelihood of loss of the baby through stillbirth as opposed to those that weigh a normal amount. It is not completely understood why this occurs, but several factors may be implicated including diabetes, preeclampsia, small gestational size of the infant, and high cholesterol levels. High cholesterol may be a causative factor due to the related risk of blood clot formation in the placenta which may result in diminished blood flow to the placenta and subsequently to the fetus. This problem becomes additionally complicated if the mother also has diabetes

because high cholesterol along with the body's inability to use insulin properly results in the impaired ability of the body to break down clots. If the body cannot break down clots, there is even more of a possibility of an inadequate blood supply reaching the developing baby (Kristensen, Vestergaard, Wisborg, Kesmodel, & Secher, 2005).

Stillbirth is also more of a risk possibly because the baby's development is sped up as a result of too much insulin in the mother's blood stream together with the fact that there is uteroplacental insufficiency. Together, the result is insufficient oxygen reaching the baby and death of the baby (Maxwell & Glanc, 2011).

**Preeclampsia and premature delivery.** Obese women are at a higher risk of developing preeclampsia and hypertension during pregnancy (Nur Laila, Nor Aliza, Ismail, Zaki, & Shukri Othman, 2012). Preeclampsia is considered the occurrence of high blood pressure as well as protein in the urine that takes place after the twentieth week of pregnancy in a woman who had up until that time had normal blood pressure (Huppertz, 2008). The connection between obesity and pregnancy is related to the body's inability to use insulin properly, high levels of lipids and cholesterol in the blood, inflammation that occurs on a regular basis, and oxidative stress. These issues occur in obese women, and they are also present in women who develop preeclampsia. These similarities serve to clarify at least part of the connection that exists between these two problems. Because of these common components, obese women are more highly susceptible to developing preeclampsia during pregnancy. Numerous risk factors for developing preeclampsia include a low socioeconomic status, hypertension in the family history, past diagnosis of hypertension, the development of gestational diabetes, and a lifestyle that does not maintain health (Nur Laila et al., 2012).

Women who have hypertension during pregnancy are more apt to require labor induction and early delivery (Nur Laila et al., 2012). Early delivery occurs because the cause of preeclampsia is the placenta (Huppertz, 2008). The origin of preeclampsia is not completely understood; however, the emphasis of current theory involves the placenta being the source. The placental theory involves two phases. To begin with, some instigating trigger occurs that causes the placenta to form proteins or *debris*. This material then moves into the women's blood stream. At this point, the second phase starts involving the actual symptoms of preeclampsia such as hypertension, issues with the kidneys, problems with clotting, and liver irregularities. These placental proteins prevent new veins and arteries from forming. It is thought that these proteins are made in excess and that is part of why preeclampsia results although this is still unclear (Preeclampsia Foundation, n.d.).

Another important factor in the development of preeclampsia involves the spiral arteries. During the beginning of a normal pregnancy, the spiral arteries of the uterus go through a change in which the muscular layer is replaced with cytotrophoblasts which work to wear down the myometrial layer. The breakdown of the myometrial layer improves perfusion to the placenta and developing baby by enlarging the diameter of the spiral arteries and taking away their ability to vasoconstrict. Also nitric oxide and prostacyclin, which are vasodilators, are elevated and serve to maintain a normal blood pressure (Gilbert, 2011).

When preeclampsia occurs, the cytotrophoblasts do not invade the spiral arteries as they should which means that they do not become enlarged, and there is not adequate placental blood flow. The placental ischemia that occurs leads to damage of the

endothelial cells. When endothelial injury occurs, prostacyclin and nitric oxide are not sufficiently manufactured. The lack of prostacyclin leads to an imbalance of prostacyclin and thromboxane, a vasoconstrictor. Low levels of nitric oxide compared to thromboxane bring about blood clot formation in the intervilli and decreased perfusion to the baby. The endothelial cell injury also results in substances being secreted that make nitric oxide ineffective and brings about the formation of free radicals and peroxides. Endothelial damage continues and occurs in many different organs throughout the body. The end outcome is vasospasm which decreases overall blood flow to the organs and elevates vascular resistance which causes hypertension (Gilbert, 2011).

Because the cause of preeclampsia is the placenta, it can only be cured by delivery. As a result, if symptoms become too serious or become life-threatening, the mother may have to be induced to stimulate labor regardless of whether or not the baby is full term (A.D.A.M., 2012). In addition, women with preeclampsia have a higher incidence of their babies going to the neonatal intensive care unit for treatment and monitoring. The infants are more likely to be premature, have decreased Apgar scores, and have low birth weight (Nur Laila et al., 2012). The low Apgar scores may occur because the baby is born preterm and is subject to intrauterine growth restriction.

A full term pregnancy lasts anywhere from 38 to 42 weeks. Premature delivery is defined as delivery that takes place between the twentieth and the thirty-seventh week of pregnancy (Davidson et. al, 2012). Apgar scores are calculated to assess how well an infant is doing physically at the time of delivery. These scores are calculated first at one minute and then at five minutes after birth. The infant is given a number that can be anywhere from zero to 10 depending on how well he is doing. Areas that are included in

the Apgar scoring system include cardiac function, the respiratory system, muscle tone, reflex irritability, and color of the skin. Each category receives between zero and two points depending on how the baby presents. The higher the score, the better the newborn is doing. If the number is between seven and 10, then the baby is doing well and will need minimal interventions. However, if the number is three or less, then the baby is not doing well at all and will require resuscitation (Davidson et al., 2012). As stated above, low Apgar scores are associated with women who experience preeclampsia during pregnancy (Nur Laila et al., 2012).

**Gestational diabetes.** Obesity is also linked with the development of gestational diabetes (Rosenberg, Garbers, Lipkind, & Chiasson, 2005). Women with gestational diabetes have developed intolerance to glucose due to the body being unable to either properly respond to or produce insulin. This resistance causes high glucose levels to be present in the blood stream. The risk of developing this complication is further increased when the woman is already obese to begin with because obesity by itself causes an inability to use insulin normally (Phillips, 2012). Numerous ideas have been suggested to demonstrate how obesity is connected with insulin resistance. The cause is not fully understood, and at this point, no proposition is fully satisfactory or agreed upon. However, some of the ideas are related to inflammatory issues, issues with the mitochondria, high levels of insulin in the blood stream, lipotoxicity, oxidative stress, strain on the endoplasmic reticulum, genes, senescence, lack of oxygen, and excess energy at the cellular level (Ye, 2013).

Obesity and diabetes are connected with many complications during pregnancy such as preeclampsia, increased incidence of cesarean sections, large birth weight

newborns or small birth weight infants, and preterm labor (Rosenberg et al., 2005).

Complications of gestational diabetes that specifically impact the newborn include macrosomia, premature delivery, respiratory difficulties, hypoglycemia, jaundice, type 2 diabetes in the future, and possibly death. Complications that impact the mother include the development of hypertension, preeclampsia, eclampsia, and later diabetes. These complications are especially likely to develop if the gestational diabetes is not meticulously treated and controlled (Mayo Clinic, 2011).

Macrosomia can develop because the mother has hyperglycemia. This high level of blood glucose will then pass through the placenta and cause more insulin to be produced by the infant's pancreas. When this overproduction of insulin occurs, the fetus is able to grow excessively. This accelerated growth can then lead to problems during delivery such as an inability to fit through the birth canal, harm to the infant during birth, and the need for a cesarean delivery. In these infants, birth that occurs too soon is also associated with hyperglycemia in the mother. Hyperglycemia raises the chances of the mother experiencing preterm labor and subsequently having the baby too soon. Another reason that premature delivery occurs for these infants is because if they are becoming too big, it may be deemed best by the physician to deliver the baby early. Respiratory difficulties can then occur because of the early delivery; however, respiratory issues can also happen in full term infants simply because the mother had gestational diabetes. These respiratory problems are called respiratory distress syndrome and result in problems with breathing for the baby. Ventilatory support may be necessary while the baby's lungs develop further (Mayo Clinic, 2011).



Hypoglycemia can occur in the infant soon after delivery as a result of the baby's body being accustomed to making excess insulin related to the mother's hyperglycemia. When hypoglycemia develops, it can cause seizure activity so it is important for the baby to be fed quickly after delivery as well as possibly receive a glucose preparation intravenously in order to prevent hypoglycemia. Jaundice can develop and presents as yellow-colored skin and sclera. This complication arises as a result of an underdeveloped liver that is unable to metabolize bilirubin that is released from the breakdown of red blood cells. It is vital that the baby's bilirubin levels are closely watched (Mayo Clinic, 2011).

Women who develop gestational diabetes in one pregnancy are more apt to develop it again in subsequent pregnancies and then are more prone to acquire type 2 diabetes later in life. Changes such as a healthy diet and regular physical activity can be beneficial in preventing this (Mayo Clinic, 2011).

**Increased pregnancy length, induction of labor, and cesarean section.**

Another complication related to obesity involves the actual length of pregnancy as well as the delivery method implemented. Obesity can lead to an increased gestational length, the need for labor to be induced due to length of gestation, and possible cesarean delivery if the woman does not progress (Arrowsmith et al., 2011; Denison, Price, Graham, Wild, & Liston, 2008).

***Increased pregnancy length.*** Increased pregnancy length can result from obesity. The reason why a lengthier pregnancy occurs is not fully known, but it probably involves many different aspects. This complication may be associated with nutrition, cortisol levels, and estrogen levels. Cortisol levels are decreased in women who are obese during

pregnancy which may impact the point at which labor takes place and possibly delay the onset of it. Also because of increased adipose tissue, which stores estrogen, there may be less estrogen in the maternal blood stream which can disrupt the balance between estrogen and progesterone. The amount of these hormones is supposed to shift, and estrogen levels are supposed to rise before labor occurs. This shift may be disrupted due to obesity (Denison et al., 2008).

***Induction of labor and cesarean section.*** Delayed onset of labor may necessitate induction of labor, and induction of labor in obese women is frequently associated with the need for cesarean delivery due to the absence of cervical dilation following attempted induction (Arrowsmith et al., 2011). Complications that can result in obese women during cesarean delivery include issues with intubation, line insertion, and effective anesthesia. These issues are particularly significant if the woman is undergoing an emergency cesarean delivery, and they can lengthen the time it takes to complete the procedure as well as make it harder. Even though it is hard to insert the needle needed for the epidural, general anesthesia is usually not used because of the issues that occur with trying to intubate the woman and adjust the ventilator. High pressures from ventilation can lead to barotrauma. Also once the procedure is underway, the additional tissue covering the abdomen will need to be pulled back from the abdomen in order to deliver the baby. This retraction of tissue may lead to ineffective and inadequate breathing by the mother because of the extra weight on the chest and abdomen which could be upwards of 100 pounds in some cases. Ultrasound is now being utilized to direct the insertion of anesthesia needles in order to increase the level of precision (Maxwell & Glanc, 2011).

In obese women, a cesarean delivery can increase the risks of developing infection and bleeding (Arrowsmith et al., 2011). Wound infections after cesarean delivery have been associated with obesity. Wound infections in general can lead to slower healing time, wound disturbance, wound dehiscence, discomfort, and longer length of hospitalization. The connection between impaired wound healing and obesity involves adipose tissue, impaired mobility, inadequate nutrition, and other coexisting conditions. Adipose is under perfused and has fewer blood vessels. Also adipose tissue that collects around the neck and diaphragm inhibits ventilation which decreases overall oxygenation of the body as well as the incision site. Also the heaviness of the tissue in the abdomen can inhibit proper blood flow to the incision site which can lead to ischemia. This lack of perfusion combined with low oxygenation increases the chances of developing an infection because oxygen is essential in wound healing (Nobbs & Crozier, 2011).

Another area impacting healing is mobility. Movement is essential for healing as it improves blood flow and breathing. Movement can be challenging in obese women who have abdominal incisions. It is hard to move them, and position changes are problematic. Nutrition is also key. Women who are obese have been found to use up lean tissue instead of adipose tissue as a source of energy resulting in a negative nitrogen balance which impairs healing. It is important that protein intake is increased as it is essential in wound healing. Other conditions that are present also impact wound healing. One of the most frequently coexisting conditions occurring with obesity is diabetes which by itself impairs healing (Nobbs & Crozier, 2011).

The explanation of why obesity increases the risk of bleeding after delivery is twofold. It may be because macrosomia which commonly occurs in the infants of obese women results in a bigger space where the placenta has attached and therefore more bleeding. Also the substances that cause the uterus to contract are not as accessible because of the large area over which they have to be dispersed due to obesity (Arendas, Qiu, & Gruslin, 2008). A physician caring for an obese patient who is overdue will have to weigh the risks of continued pregnancy and further complications against the risks associated with induction of labor and possible cesarean section (Arrowsmith et al., 2011).

**Macrosomia.** Being born to an obese mother increases the risk of the infant having macrosomia and eventually developing childhood obesity (Herring et al., 2010). An infant that is unusually big before delivery is considered to have macrosomia. Typically, newborns weigh around 7 pounds. To be considered macrosomic, an infant must weigh a minimum of 8 pounds 13 ounces at the time of delivery. A baby that has macrosomia is more likely to have complications such as the need for cesarean section. If a vaginal birth is attempted, there is an increased likelihood of injury to the birth canal and harm to the infant (Kohnle, 2013). Some of the other complications involved with macrosomia are hemorrhage after delivery, tears involving the anus and rectum, harm to the baby due to shoulder dystocia, suffocation, and increased length of labor (Maxwell & Glanc, 2011). After delivery, the newborn is at higher risk of developing hypoglycemia, jaundice, and respiratory problems (Kohnle, 2013).

**Obesity and diabetes mellitus later in life.** If at birth a newborn's weight exceeds the 90<sup>th</sup> percentile, and if the baby's mother is obese or diabetic during her

pregnancy, then the child is more likely to have metabolic syndrome and later become obese during childhood. This cycle is dangerous because it may lead to obesity being passed from one generation to another (Guelinckx, Devlieger, Beckers, and Vansant, 2008).

### **Obesity Following Pregnancy**

The more pregnancies that a woman goes through, the more likely she is to develop obesity. This weight increase is related to weight retention that may occur after each baby is born. With each subsequent pregnancy, more weight is retained. If the mother does not shed the excess weight between each pregnancy, then the more pregnancies she goes through, the more likely it is that she will eventually become obese (Ezeanochie et al., 2011). Also putting on excess weight during the course of a pregnancy may lead to increased weight retention after the pregnancy (Sarwer et al., 2006). Normally, a woman is only supposed to increase her weight by 25 to 35 pounds during the course of her pregnancy. However, if a woman begins her pregnancy already overweight or obese, she does not need to gain as much weight. A woman who is overweight should gain between 15 and 25 pounds, and a woman that is obese should only gain between 11 and 20 pounds during pregnancy (Martin, n.d.). If the woman gains enough weight with her pregnancies to be considered overweight or obese after, then she may encounter the complications associated with obesity in future pregnancies which she was not at risk for previously.

### **Teaching Opportunities**

These complications are serious issues related to pregnancy and obesity, but many times pregnant patients who are obese do not know or understand these complications

until they are already pregnant. This realization, once discovered, can lead to increased anxiety in the mother. Physicians and health care providers do not always address obesity as an issue even while the woman is pregnant. Increased patient education is essential so that these patients are informed about these issues (Keely, Gunning, & Denison, 2011).

Multiple studies have investigated pregnant women's understanding of the risks associated with obesity and pregnancy (Brooten, Youngblut, Golembeski, Magnus, and Hannan, 2012; Keely et al., 2011; Khazaezadeh, Pheasant, Bewley, Mohiddin, & Oteng-Ntim, 2011; Kominiarek, Vonderheid, & Endres, 2010). Although these studies have investigated the knowledge level of women who are pregnant or who are trying to become pregnant, a search of numerous databases indicated that only one other study has previously reported research to determine the understanding of women in general regardless of current pregnancy (Richards & Mousseau, 2012).

The current study will show the basic knowledge level that college-age women possess regarding this issue of obesity and pregnancy. It is important for these women to know and understand these risks because it is likely that they will soon be having their own children. If these women are overweight or obese, they may encounter these very problems. It is important that they are educated before they become pregnant so that they have the opportunity to make changes that could potentially save their lives and the lives of their children. Even if they themselves are not overweight or obese, they may have a friend or family member that is who could benefit from the knowledge they gain through this study. The goal of the current study was to discover whether or not women sufficiently understand the effects of obesity on pregnancy. The hypothesis was that

women did not have a thorough understanding of the topic, but that their knowledge would increase after the educational intervention.

## **Method**

### **Participants**

The participants of this study were women who were attending a Christian university in Virginia. They were invited to participate if they lived in any of the dorms in a specific building on campus. This was a convenience sample as the participants were not randomly selected. Eight women participated in this study, and no demographic information was obtained during the study.

### **Materials**

The women who were selected went through a pretest, education class, and then a posttest. The test questions were obtained and used with permission from a study that was previously conducted by Dr. Kominiarek and associates in 2010. These questions investigated the level of knowledge these women had regarding the complications of obesity and pregnancy. Specific questions investigated patient knowledge related to risk of gestational diabetes, congenital defects, preeclampsia, cesarean section, complications related to cesarean section, stillbirth, macrosomia, small-for-gestation newborn, and risk in general. It also questioned participants about nutritional requirements for pregnant women. The educational session was presented by the principal investigator and was developed through researching the effects of obesity on pregnancy. The topics addressed in the presentation were obesity in general, infertility, preeclampsia, premature delivery, gestational diabetes, pregnancy length, cesarean section, miscarriage, stillbirth,

congenital defects, macrosomia, childhood obesity, nutrition, and obesity following pregnancy.

### **Procedure**

The women for this study were selected from a building with six dorms on a Christian university campus in Virginia. All women living in these dorms were asked to participate, but only those who were willing were given the pretest and posttest. Informed consent was reviewed by each participant before beginning, and the research was conducted in November of 2013 and January of 2014. Initially only one dorm from the building was selected to participate. This study took place in November 2013; however, due to a low number of participant responses, a second section of the study was conducted in order to try to achieve a larger sample size. This section took place in January 2014; however, no additional participants took part in the study. A pretest was administered. After the pretest, a short education session took place with approximately 15 minutes of teaching regarding these complications. The educational session was presented by the principal investigator. A posttest was then administered, and the pretest and posttest scores were compared.

### **Results**

A total of eight people participated in the study. Approximately 300 people were invited to participate making the rate of participation less than 3%. The pretest and posttest scores were compared using a statistical software package, Statistical Package for the Social Sciences version 21 (SPSS). For the purposes of consistency, any questions that were answered twice, unanswered, or answered as “I don’t know” were marked wrong. A test for differences between the two groups was run to measure the degree of



learning after the education session. A paired  $t$  test was performed, and the posttest was found to be significantly different from the pretest,  $t(7) = -3.87, p = .006$ . Out of nine, the mean pretest score was 5.25 ( $SD=2.54951$ ), and the mean posttest score was 8.5 ( $SD=0.75593$ ). After the education session, the participants' scores improved by an average of 3.25 (see Figure 1), and they demonstrated increased knowledge and awareness of the topic. On the pretest, five of the eight participants indicated that there were risks associated with obesity and pregnancy. This result changed on the posttest with all eight participants indicating that they understood there were risks of obesity and pregnancy. The most frequently missed or unknown questions from the pretest were questions that related to the need for cesarean delivery, the risk of stillbirth, and the risk of abnormal gestational size. Each of these questions was missed by five of the eight participants on the pretest.

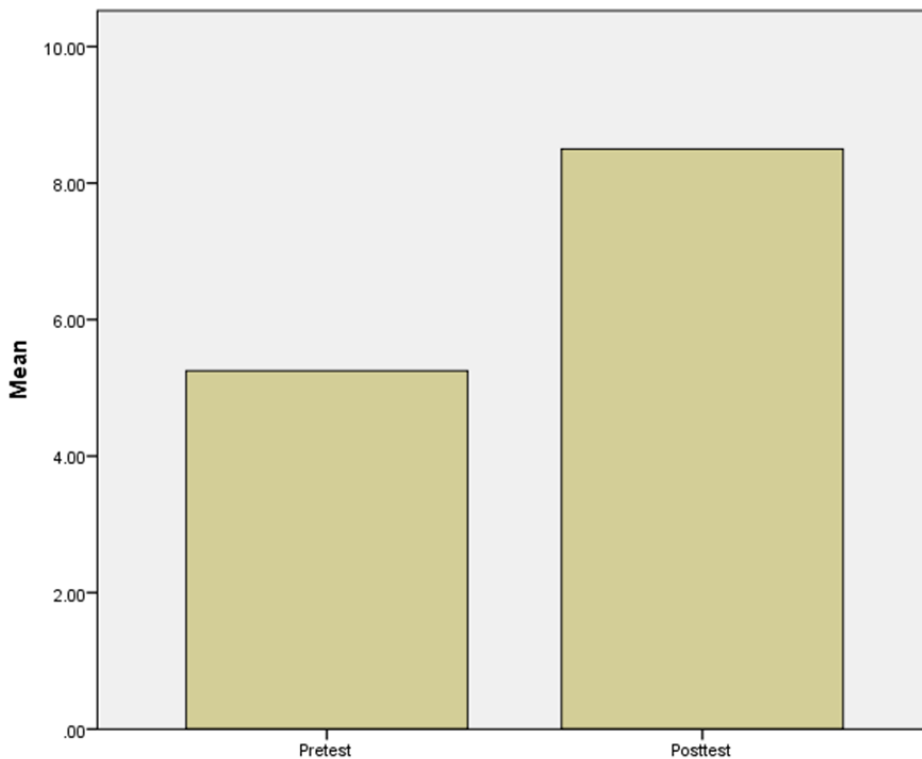


Figure 1. Mean pretest and posttest scores out of 9 questions.

### Discussion

Due to the higher scores on the posttest as compared to the pretest, it can be concluded that these women were more knowledgeable on the issue of obesity and its effects on pregnancy after the educational intervention took place than before the study. This lack of knowledge may be related to the fact that this type of education is not emphasized in the healthcare systems or in school. Previous studies have shown that pregnant women often do not know the complications of pregnancy and obesity before they actually become pregnant, and the significant risks to the mother and baby demand more patient teaching to any overweight women that may become pregnant (Keely et al., 2011). This idea of educating all women who could become pregnant is supported by Kominiarek who points out that many pregnancies are not planned (Kominiarek et al., 2010). However, education is needed for all women regardless of current BMI. This need is partly because of the risk of becoming overweight or obese after pregnancy as well as the possibility of gaining weight in the future unrelated to pregnancy. It is important for all women to become educated on this issue regardless of BMI. The findings in this study are supported by a previous study that researched American Indian women who were high school-aged and found that after the intervention, the intervention group scored significantly better than the control group in regards to teaching related to preconception and obesity (Richards & Mousseau, 2012). It would be most beneficial if women received this teaching at a younger age so that the issues of obesity could be dealt with before pregnancy ever occurs. If women actually applied this teaching and implemented changes to decrease their weight, it could eliminate these complications resulting from obesity during pregnancy. Although it is unlikely that every woman

would take these recommendations and implement them, it is clear that without education on this topic the issue is not going to be remedied, and the current situation will not change. The educational session does not necessarily have to be extensive or lengthy. The educational intervention used in this study was less than 15 minutes, and the difference between the pretest and posttest scores was significant indicating that even short interventions can make a difference in knowledge level.

### **Limitations**

This study cannot be generalized to all college-aged women; however, it does provide a starting point from which to investigate this issue more extensively. Limitations to this study included a small sample size, the use of a convenience sample, and time constraints due to the nature of this thesis project. Also all of the participants were attending the same university which may indicate that they possessed a more commonly shared background and knowledge base than others at a different institution.

### **Future Research**

A future study involving a larger sample size, a greater number of questions addressing more topics, a longer time frame, and multiple locations would be advantageous and more likely to result in more usable and generalizable findings. Also a different method of recruiting participants would be helpful in order to achieve a higher rate of participation. Further research related to women's knowledge level regarding these issues would be greatly beneficial in order to add to the literature available as well as aid in developing interventions for this issue. It would also be beneficial to study whether or not an increase in knowledge from the educational intervention leads to actual behavioral changes or simply results in knowledge acquisition.

### **Conclusion**

Obesity and the risk of dangerous complications during pregnancy have been clearly linked through numerous studies. It is important that this information is now utilized to prevent these complications. This study indicates that the group of women that participated did not have an adequate knowledge level regarding the potential complications of obesity on pregnancy before they took part in the study. The education that took place resulted in higher scores on the posttest which indicates that the education was effective and has potential benefits for participants. This information demands further research to assess other groups of women and their knowledge level. This is not an issue that can be brushed aside. It has the potential to save lives, and it needs to be addressed so that solutions can be implemented in the future.

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