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OBESITY IN PREGNANCY: SHORT- AND LONG-TERM ADVERSE CONSEQUENCE FOR MOTHER AND CHILD

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ABSTRACT

An increasing concern to public health, obesity has rapidly increased in prevalence during the past ten years. The most prevalent medical condition among women of reproductive age is obesity. Because it is such a rampant problem among women, the implications of obesity on pregnancy are frequently disregarded. Pregnancy-related obesity has unfavorable immediate and long-term effects on the mother and the fetus. Obesity raises the likelihood of obstetric issues for the mother during the prenatal, labor, and delivery periods as well as making fetal assessment more challenging technically. The risk of long-term health issues and the rate of prenatal morbidity are both higher in children of obese mothers. This article reviews the prevalence of obesity in pregnancy, fertility and reproductive health, risk of spontaneous abortion and congenital anomalies, placental changes and long-term effects on the mother and offspring associated with maternal obesity.

KEYWORDS

Maternal Obesity, Fertility, Reproductive Health

INTRODUCTION: BACKGROUND

Around 1.9 billion individuals (aged 18 and older) were overweight in 2016. And over 650 million of these people were obese.[1] Obesity is described as having an excessive amount of body fat that is extremely likely to harm one's health and raise morbidity and mortality rates.[2] Obesity has detrimental effects on health, including an increase in cardiovascular illnesses, type II diabetes, musculoskeletal disorders, and a few malignancies (breast, endometrial, and colon), as well as emotional harm because of the prejudice it brings about.[3,4] Obesity, the most prevalent metabolic illness, affects a variety of people, including women of reproductive age. When it happens before or during pregnancy, it poses a significant risk for difficulties for both the mother and the fetus.[2] Subfertility, miscarriage, thromboembolism, hypertension, metabolic syndrome, premature birth, and a higher incidence of cesarean sections are among the problems of obesity in a future mother. Congenital abnormalities, macrosomia, and intrauterine mortality are examples of fetal problems. Furthermore, the effects of maternal obesity expand far beyond pregnancy into childhood and adulthood.[2] There is evidence that many concerns are linearly related to body mass index (BMI).[5] For instance for each extra 1 kg/m2 of BMI above a BMI of 29 kg/m2, the likelihood of conception decreases linearly by 4%.[5]

Prevalence Of Obesity And Overweight In Pregnancy:

Typically, the body mass index (BMI = kg BW/height in m2) is used to define obesity. The WHO differentiates between overweight (BMI 25–30 kg/m2), obesity (BMI > 30 kg/m2), extreme obesity (BMI > 40 kg/m2).[6] Compared to younger people and older adults, middle-aged adults had a higher prevalence of obesity.[6] In the US, almost over 50% of pregnant women are categorized as obese, with 8% as extremely obese.[7] Prepregnancy obesity in the united states increased by 11% among women, going from 26.1% in 2016 to 29.0% in 2019. Non-Hispanic white women's obesity rate increased by 10% (from 24.1% to 26.6%), non-Hispanic black women's obesity increased by 7% (from 36.4% to 39.1%), and Hispanic women's obesity increased by 12% (from 28.9% to 32.4%). In every year between 2016 and 2019, non-Hispanic black women had the greatest percentage of pre-pregnancy obesity while non-Hispanic white women had the lowest rate. Maternal obesity increased in women under the age of 20 (13%, from 18.1% in 2016 to 20.5% in 2019), women aged 20 to 29, (12%, from 27.2% to 30.4%), women aged 30 to 39, (10%, from 25.8% to 28.3%), and women aged 40 and above (9%, from 28.0% to 30.4%). For every year from 2016 to 2019, women under the age of 20 had the lowest prevalence of pre-pregnancy adiposity compared to women of all other ages.[8] Another data suggested in 2019, almost 3 in 10 (29%) of women had obesity before getting pregnant, rising 11% from 2016 and continuing a trend that began in 2015.[9,10]

A study done in Barcelona hospital, Spain showed obesity prior to conception was prevalent in 8.4% of women and overweight in 18.9% of women. Further showed Pregnancy-related obesity or overweight affected one in four women.[11] A retrospective study conducted in Saudi Arabia, who were pregnant and delivered between the years 2013 and 2018, showed that over the past ten years, there has been an upsurge in female obesity in Saudi Arabia. 2235 out of 9095 pregnant women were known to be obese in this research.[12]

Sources And Selection Of Criteria:

individuals with a BMI of 25 to 30 kg/m^2 are categorized as overweight, and those with a BMI over 30 kg/m^2 are considered obese. According to WHO, the prevalence of obesity in pregnancy ranges from 1.8 to 25.3%.[2]

Effect Of Maternal Metabolism On Fertility And Reproduction:

The effective control of energy metabolism is crucial for female fertility. The oocyte and surrounding somatic cells of the follicle cooperate to successfully metabolize carbohydrates, amino acids, and lipids in the ovary. Reproduction is negatively impacted by excess body weight, calorie intake, and associated metabolic diseases such as diabetes and polycystic ovarian syndrome (PCOS).[13] consequences of maternal obesity and metabolic disruption on early pregnancy, ovulation, and conception are important topic of discussion.

Via many of the same routes as diabetes and high-calorie/high-fat diets, obesity has a negative impact on reproductive health.[13] It has detrimental effects on the ovarian function, oocyte/embryo quality, as well as a number of other mechanisms, such as endocrinologic disruption and aberrant adipokine production.[13] increased oocyte aneuploidy, mitochondrial abnormalities, and follicular cell apoptosis rates are seen in individuals who are obese.[14,15]

Moreover, obese women have higher amounts of insulin and lipids in their follicular fluid, which are linked to poor oocyte quality.[16] Obese women have a different ovarian follicular environment, with higher levels of metabolites, C-reactive protein, and androgen activity in particular. This may be related to the patients' lower reproductive success.[16] Subfertility is the overall result of these issues when trying to conceive naturally during ovulatory cycles.[17]

Obesity causes increased rates of anovulation[18], reduced chance of spontaneous conception[19], and greater chances of miscarriage.[15,20] furthermore obesity has shown to decrease the success of IVF, due to decreased oocytes,[21] increased oocyte spindle defects,[22] reduced rates of clinical pregnancy and live birth.[23]

Increased Risk Of Spontaneous Abortion And Congenital Anomalies In Obese Pregnant Women:

It has been discovered that fetal chromosomal abnormalities account for about 50% of cases of spontaneous pregnancy loss.[24] Pregnancy loss is also significantly impacted by maternal comorbidities like diabetes type 1 and 2, thrombophilia, hypertension, antiphospholipid antibody syndrome, celiac disease, thyroid illness, systemic lupus erythematosus (SLE) and hereditary thrombophilia.[24,25,26] Maternal weight, which caused several problems both during and after pregnancy, is another significant and common health concern in obstetrics and gynecology. One of the most frequent risk factors observed in obstetric practice is maternal obesity.[27] Whether they became pregnant naturally or through assisted reproductive

techniques, pregnant women who are overweight and obese are at a significantly higher risk of miscarriage.[28] Obese women have a 25–37% increased chance of miscarriage and pregnancy loss prior to having their first liveborn.[29] Obese moms carry babies who are more likely to experience stillbirth, congenital abnormalities, preterm, macrosomia, neonatal death, as well as juvenile obesity and metabolic diseases.[29,30] A few studies in the past have explored the connection between maternal obesity prior to conception and weight gain in a variety of congenital abnormalities. A study done in 2003 demonstrated Obese women had a higher chance of having a baby with spina bifida, multiple anomalies, and heart defects than women of normal weight.[31] Also women who are overweight are more likely to have a child with multiple anomalies and heart defect when compared to a women of average weight.[31] This study demonstrated a correlation for omphalocele, heart problems, and numerous malformations among infants of obese women in addition to confirming the previously recognized link between spina bifida and prenatal maternal obesity. Being overweight prior to conception was also linked to heart abnormalities, numerous malformations, and other conditions.[31] A case control prospective study in 2003, compared obese women to women of typical weight to see if the latter have a higher risk of cardio-vascular disease (CVD) in their offspring. The study reported the mothers who were obese had a higher risk of CVD than women of ordinary weight. Obese women had an elevated risk for all examined abnormalities, however only ventricular and atrial septal defects were statistically significant. The authors proposed a potential explanation: early pregnancy with undiagnosed type 2 diabetes.[32] A population-based cohort study showed, as BMI grew from overweight to obesity class III, the risks of congenital heart abnormalities, nervous system malformations, and limb deformities also increased. The results of this study revealed, 3.4% of underweight mothers, 3.4% of normal weight women, 3.5% of overweight mothers, 3.8% of mothers in obesity class I, 4.2% of mothers in obesity class II, and 4.7% of women in obesity class III had offspring with any severe congenital abnormality. The study also exhibited the most frequent malformation subtype (1.6%) was congenital heart problems, which were followed by malformations of the reproductive organs (0.5%), extremities (0.4%), renal system (0.3%), other (0.2%), eye (0.2%), gastrointestinal tract (0.2%), orofacial clefts (0.1%), and neurological system (0.1%).[33] Hence it is seen that with maternal overweight and increasing degree of obesity, the risks of any major congenital deformity and various subgroups of organ-specific abnormalities increased steadily.

Placental Changes Associated With Maternal Obesity:

Several maternal metabolites, hormones, growth factors, and cytokines that are modified in maternal obesity have well-established consequences on placental function and may operate as mediators between maternal obesity's effects on the placenta. Hyperinsulinemia and maternal obesity are linked, as insulin stimulates placental glucose.[34,35] Significantly, in maternal obesity, the placenta seems to ensure stable insulin response despite peripheral insulin resistance.[36] In light of this, it is likely that placental growth and function will be significantly impacted by the hyperinsulinemia that keeps blood sugar levels stable in the face of rising insulin resistance in pregnant obese women.[36] Low plasma adiponectin and high levels of leptin are linked to maternal obesity, and these alterations are thought to affect fetal growth and placental function.[37,38] Leptin doesn't alter lipid production but encourages placental lipolysis,[38]

Decreasing the levels of TG and cholesterol in the placenta in pregnancies complicated by maternal obesity.[39] According to reports, higher IGF-1 levels in the mother's blood have been linked to maternal obesity.[40] Hence, greater placental nutrition absorption and transfer to the fetus may be promoted by higher maternal IGF-1 bioavailability in obese mothers.[39] Many studies show that obese women had lower levels of adiponectin than pregnant women with normal BMI and greater levels of circulating lipids, leptin, TNF-, IL-1, IL-6, and IL-8 causing placental inflammation.[39] While placental inflammation in obese mothers has been linked to changes in metabolism, insulin resistance, and fatty acid and amino acid transport,[41,42,43] Only a small subset of inflammatory mediators have their molecular mechanisms linking them to placental dysfunction in maternal obesity characterized.[41] A substantial amount of epidemiological evidence indicates that alterations in placental shape and function raise the risk of adult-onset illnesses such obesity, diabetes, cardiovascular disease, and cancer.[44,45] Determination of placental oxidative stress, altered mitochondrial function, abnormal lipid management, and low-grade inflammation which are all caused by molecular pathways in maternal obesity, and these changes to the placenta in particular have negative short- and long-term effects is significant as this will serve as a crucial starting point for the creation of therapies that effectively target placental function in obese pregnant women.[39]

Long Term Effect Of Maternity Obesity On The Mother And Offspring

Mothers continue to have an impact on the weight increase and health of their infants after the pregnancy. One element that promotes infant's ideal weight increase is through breastfeeding.[46] Compared to women of normal weight, obese women are less likely to start breastfeeding and have a shorter induration of breastfeeding and early introduction of solids.[47]

There are several stages in the life cycle where both the mother and the child are at risk of developing obesity. [48] In addition to posing health hazards for the woman throughout pregnancy, labor, and delivery, excessive gestational weight gain also significantly raises the chance of postpartum weight retention.[49] studies have shown lowering postpartum weight gain lessens the likelihood of becoming obese in future pregnancies and enhances the mother's long-term health.[50] Future obesity and heart disease risk factors for children and Diabetes is more likely to affect women and their progeny[51] the mothers Pregnancy-related diabetes mellitus (GDM) increases the chance of developing type 2 diabetes, metabolic syndrome, cardiovascular morbidity, vascular endothelial dysfunction, renal, and ocular disease in the future.[52]Preeclampsia is more likely to occur in obese people, and this condition raises the risk of long-term maternal atherosclerotic morbidity and Also connected to a higher chance of developing metabolic syndrome in the future in children Increased incidences of coronary heart disease, stroke, hypertension, and non-insulin-dependent diabetes in adulthood are linked to low birthweight which in turn is linked with maternal obesity.[52] Many researches done also showed that maternal pregnancy increases the risk of childhood asthma, especially if the mother is a known asthmatic.[53]

CONCLUSIONS:

Major public health consequences result from the worrisome rate at which maternal obesity and the accompanying comorbid disorders (diabetes, cardiovascular disease) are becoming more prevalent. In addition to having an impact on the health of the mother, maternal obesity also has an impact on the child's health, increasing the risk of childhood obesity, diabetes and other diseases. Hence weight control and management are very crucial in women who are pregnant or are planning to conceive in the near future.

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