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Obesity and labor induction, augmentation and cesarean section

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Abstract

Background. The level of obesity among women of childbearing age continues to increase. Obesity in women is a common problem, and its effects on pregnancy are usually overlooked. The study aimed to assess the common method of delivery and the rates of induction and augmentation of labor among obese pregnant women.

Aim: to assess the common method of delivery and the rates of induction and augmentation of labor among obese pregnant women.

Materials and methods. A retrospective case-control study was conducted in the Lithuanian University of Health and Sciences (LUHS) hospital, using data from their birth registry. Two groups of pregnant women, who gave birth in 2021 were analyzed and compared. The first group consisted of 334 obese pregnant women, and the second group consisted of 324 pregnant women with normal BMI. IBM SPSS software was used for data processing. Results with values of $p < 0.05$ were considered statistically significant.

Results. Results provide that more cesarean section surgeries (33.3 % vs 18.2 %) and vacuum extractions (1.5 % vs 1.2 %) were performed on obese pregnant women compared to women with normal BMI. Natural delivery was more common among women with normal BMI ($p < 0.001$). Obese pregnant women were more likely to experience induction or augmentation of labor. In comparison to women with normal BMI, induction, and augmentation of labor were more often performed on obese pregnant women (36.4 % vs 42.5 % and 12.4 % vs 25.8 % respectively). Women with normal BMI tended to have fewer interventions for initiation of labor as compared to obese pregnant women (51.2 % vs 31.7 % respectively).

Conclusion. In our study, cesarean section surgery, induction, and augmentation of labor were more frequent amongobese pregnant women than among normal-weight pregnant women.

Keywords: obesity, obstetric outcomes, cesarean section surgery, labor induction, augmentation.

1. Introduction

The prevalence of obesity continues to increase worldwide. According to the World Health Organization (WHO) in 2016 39 % of adults 18 years old and older were overweight and 13 % were obese (1). Body mass index is used to classify overweight and obese in adults, where BMI < 18.5 kg/m^2 - underweight, BMI 18.5 – 24.9 kg/m^2 - normal weight range, BMI 25 – 29.9 kg/m^2 - overweight, BMI ≥ 30 kg/m^2 is considered obesity (2). Compared to males, women are more likely to become overweight or obese than males (3). Obesity is a crucial issue in every woman's life as it might affect a woman's reproductive health and pregnancy (4). Obese women have an increased risk of infertility, gestational diabetes, preeclampsia, cesarean section surgery, fetal macrosomia, and neonatal morbidity (5,6). The complex etiology of obesity circumscribing genetic, psychological, and socioeconomic factors makes it difficult to develop successful interventions for weight management (3). The study aimed to evaluate the incidence of cesarean section surgeries, labour induction, and labour augmentation among obese pregnant Lithuanian women.

2. Materials and methods

2.1. Data collection

A retrospective case – control study was conducted in the Lithuanian University Health and Sciences Hospital (LUHS), Clinic of Obstetrics and Gynecology, using data from their birth registry. Two groups of patients were included. The first group – obese pregnant women with BMI ≥ 30 kg/m^2. The second group – pregnant women with a BMI of 18.5 – 24.9 kg/m^2. The study did not include multiparous and overweight (BMI 25 – 29.9 kg/m2) pregnant women. After collecting the data, two groups of pregnant women who gave birth in 2021 were analyzed and compared. The first group consisted of 334 obese pregnant women, and the second group consisted of 324 pregnant women with normal BMI (body mass index).

2.2. Data analysis

IBM SPSS software was used for data processing. Pearson's correlation was used to compare quantitative variables to find a linear relationship. Results with values of $p < 0.05$ were considered statistically significant.

2.3. Ethics

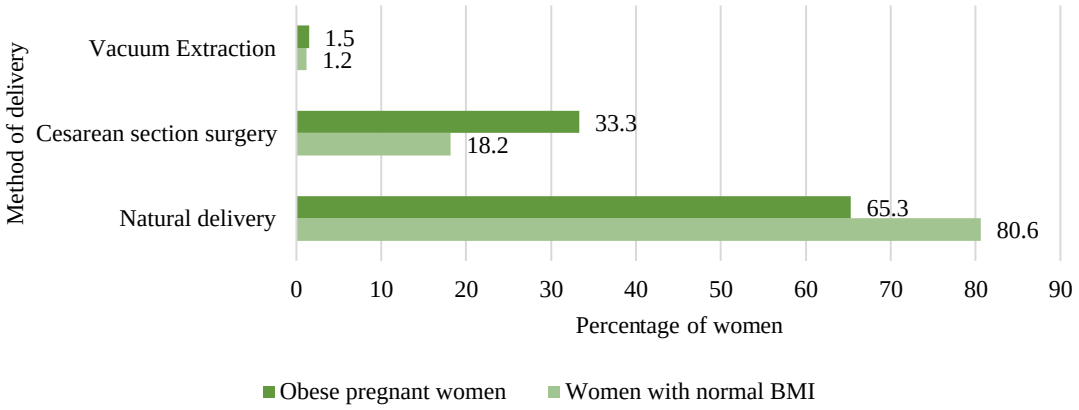
Approval to conduct this study has been granted by the Lithuanian University of Health Sciences Center for Bioethics (reference number: BEC – MF – 443).

3. Results

3.1. The method of delivery among obese pregnant women

As shown in the graph, most women gave birth by natural delivery in 2021. Results provide that more cesarean section surgeries and vacuum extractions were performed on obese pregnant women compared to women with normal BMI (33.3 % vs 18.2 % and 1.5 % vs 1.2 % respectively) ($p < 0.001$). Natural delivery was more common among women with normal BMI ($p < 0.001$) ***(Figure 1).*** In this study, the most common indications for cesarean section surgery for obese women were: suspected unstable condition of the fetus, gestational diabetes, and non – progressive labor. For women with normal BMI, the most common indications for cesarean section surgery were: gestational diabetes, suspected unstable condition of the fetus, failed labor induction, and breech presentation.

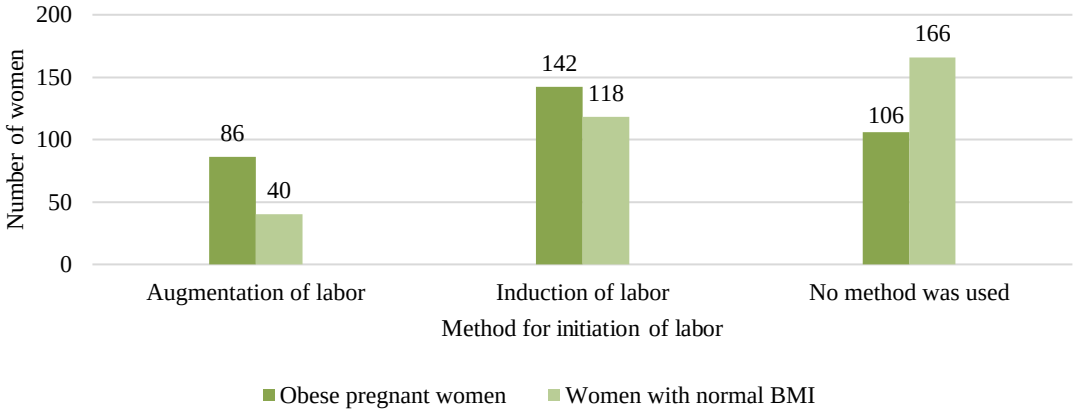
Figure 1. *Method of delivery based on a woman's weight.*



3.2. Induction and augmentation of labor among obese pregnant women

As shown in the second graph, obese pregnant women were more likely to experience induction or augmentation of labor. Compared to women with normal BMI, induction, and augmentation of labor were more often performed on obese pregnant women (36.4 % vs 42.5 % and 12.4 % vs 25.8 % respectively) ($p < 0.001$). Women with normal BMI tended to have fewer interventions for initiating labor than obese pregnant women (51.2 % vs 31.7 % respectively) (Figure 2).

Figure 2. *The number of women to whom the labor initiation method was adapted.*



4. Discusion

The results of our study indicate that obese pregnant women experience labor augmentation twice asoften astheir lean counterparts. In addition, statistically significantly more obese patients experience labor induction ($p < 0.001$). Results of a cohort study, conducted in Spain, show that induction of labor was performed more often on obese pregnant women than normal BMI patients, 59.6 % and 47.3 % respectively (7). These results occur due to physiological changes in obese women during labor - slower progression of labor which is a risk factor of labor dystocia, chorioamnionitis, emergency cesarean section (8). Moreover, there is a higher rate of post-term pregnancies, cases of diabetes, chronic and gestational hypertension, preeclampsia (7). Therefore the need for labor induction and augmentation is increasing among obese pregnant patients. Carlhäll and co-authors conducted research comparing median labor time among obese women and normal BMI pregnant patients. The results of the study show significantly longer labor duration in the

obese pregnant women group, class I obesity - 9.1 h; class II obesity 9.2 h and class III obesity - 9.8 h, while normal BMI women's median labor time was 8.8 h (9). It is thaught that the latent phase of labor is longer and there are more post-term deliveries among obese women because of impaired contractility of myometrium. The main physiological factors contributing to weaker contractility of the uterus are higher levels of leptin and cholesterol in the system which impaires the calcium flow in the myometrium weakening the muscle contractility (10,11). In fact, because of the weight, obese women require higher oxytocin doses to have an effect during labor interventions (cumulative oxytocin dose among normal weight women was 2278 mU and among obese patients 4082 mU ($p<0.0001$)) and, results indicate, longer birth after the oxytocin infusion (8). In addition to that, obese pregnant women have a higher risk of cesarean section surgery after labor induction than women with normal BMI. In a retrospective cohort study published in 2019 by Carlhall S and other co-authors, the CS rate among underweight women was 7.4 %, and among women with BMI ≥ 40 kg/m2 – 22.0 % (12). In a retrospective cohort study, the rate of vaginal delivery after induction of labor among women with normal BMI was 83.0 %, and among women with class III obesity – 61.8 % (13).

In our study, the rate of cesarean section surgeries was almost two times higher among obese pregnant women compared to normal-weight pregnant women ($p < 0.001$). According to the Centers for Disease Control and Prevention, in the United States, in 2020 the cesarean section (CS) rate was 31.8 %. CS rates were lowest among underweight and normal-weight women (20.7 % vs 25.1 % respectively). As BMI increased, the rate of CS rose steadily and was as high as 52.3 % among women with morbid obesity (BMI of 40 and higher) (14). In a cross-sectional study, the risk of CS was 4.46 times higher in class I obesity compared to normal-weight pregnant women and 3.04 times higher than the risk in the overweight group (15). Usually, obesity is not an indication for cesarean section surgery, although CS rates might increase due to complications that arise from obesity. For obese pregnant women, cervical ripening is often slower than for normal-weight pregnant women. The slower cervical ripening can often be interpreted as primary dystocia and might lead to unnecessary interventions and contribute to increased CS rates (16). In the study published in 2022 by Bjorklund J. and other authors, it is proven that for women with higher BMI, the latency phase extends to a cervical dilatation of five centimeters. This is crucial in clinical practice to avoid the risk of CS to women that have not yet left the latency phase (17). Women with higher BMI have a significantly increased risk of fetal weight over 4000 g (fetal macrosomia) which might lead to an increased risk of cesarean section surgery. Based on a cohort study there is a 60 % risk of delivering a macrosomic neonates for overweight and 90% risk for obese pregnant women (18). In a meta-analysis published in 2017 by Dai RX and other authors, prie-pregnancy maternal obesity was associated with fetal macrosomia (OR 1.93) (19).

Maternal obesity is associated with other complications, such as increased rates of midline vertical incision, CS wound complications, and longer operative time. In a study published by Conner SN, Verticchio JC, and others, BMI was associated with an increased risk of wound complications. The higher the BMI, the greater the risk of developing wound complications: BMI 30.0 – 39.9, 9.2 %; BMI 40.0 – 49.9, 16.8 %; BMI ≥ 50, 22.9 % (20). In a cross-sectional study published by Khalifa E and co-authors in 2021, the intraoperative duration of CS was longer as compared to overweight and normal-weight pregnant women (65.6 ± 14; 54.0 ± 12.5 and 50.9 ± 17.9 minutes

respectively) (21). Developing a multidisciplinary approach for overweight or obese women before or during pregnancy might help reduce the rates of negative obstetric and neonatal outcomes.

5. Conclusions

In our study, cesarean section surgery, induction, and augmentation of labor were more frequent among obese pregnant women than on normal-weight pregnant women.

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