eISSN 2255-0569

ORIGINAL

Pregnancy obesity, weight gain during pregnancy, and its association with birth outcomes

Obesidad en el embarazo, aumento de peso durante el mismo y su asociación con los resultados del parto

Dardan Baftiu[1], Erjona Abazaj[2,3], Lila Shundi[3], Ledina Nikolla[2]

1. University Clinical Center, Regional Hospital of Ferizaj, Kosovo
2. University Medicine, Faculty of Technical Medicine Science
3. Institute of Public Health, Tirana, Albania

Corresponding author
Dardan Baftiu
E-mail:

Received: 7 - X - 2022
Accepted: 28 - X - 2022

doi: 10.3306/AJHS.2023.38.01.139

Abstract

Introduction: Obesity is one of the major risk factors for various adverse outcomes for mother and fetus. This study aimed to determine the prevalence and perinatal, intrapartum, and neonatal outcomes of obese women giving birth in Kosovo from January 2019 to December 2020.

Methods: This retrospective cohort study used data from the Ferizaj Hospital system. We analyzed the pregnancy and birth data (mother-child pairs) to assess maternal body mass index and its associations with pregnancy risk factors and childhood health outcomes in this population.

Results: In the overall study population ages 18-45 years, the prevalence of maternal pregnancy obesity was 59%. More than half of maternal obesity (673/1052) was in severe and severe obesity categories at 44.8% and 19.2% respectively. Maternal obesity was inversely associated with preterm birth among those older than 30 years (adjusted OR 0·89, 95% CI [0.63–1.28]), but positively associated with preterm birth among those aged 30 years or younger (adjusted OR 0·921, 95% CI [0.92–2·37]). Furthermore, women with pregnancy obesity, compared to those who did not have obesity, were more likely to report hypertension during pregnancy, gestational diabetes, and C-section delivery with a p-value <0.05.

Conclusion: The findings of this study suggest that the greatest risk of extremely preterm birth was observed in obese women. Also, maternal obesity was associated with increased pregnancy and birth complication rates. We recommend promoting healthy lifestyle changes that could reduce the prevalence of preterm birth among obese women.

Key words: Obesity, maternal pregnancy, complication.

Resumen

Introducción: La obesidad es uno de los principales factores de riesgo adversos para la madre y el feto. Este estudio tuvo como objetivo determinar la prevalencia y los resultados perinatales, intraparto y neonatales de las mujeres obesas que dan a luz en Kosovo desde enero de 2019 hasta diciembre de 2020.

Métodos: Este estudio de cohorte retrospectivo utilizó datos del sistema del Hospital Ferizaj. Se analizaron los datos del embarazo y el parto (pares madre-hijo) para evaluar el índice de masa corporal materno y sus asociaciones con los factores de riesgo del embarazo y los resultados de salud de la infancia en esta población.

Resultados: En la población general del estudio de 18 a 45 años, la prevalencia de obesidad materna en el embarazo fue del 59%. Más de la mitad de la obesidad materna (673/1052) se encontraba en las categorías de obesidad grave y severa, con un 44,8% y un 19,2% respectivamente. La obesidad materna se asoció de forma inversa con el parto prematuro entre las mayores de 30 años (OR ajustado 0-89, IC 95% [0,63-1,28]), pero se asoció de forma positiva con el parto prematuro entre las menores de 30 años (OR ajustado 0-921, IC 95% [0,92-2-37]). Además, las mujeres con obesidad en el embarazo, en comparación con las que no tenían obesidad, eran más propensas a informar de hipertensión durante el embarazo, diabetes gestacional y parto por cesárea con un valor p <0,05.

Conclusión: Los resultados de este estudio sugieren que el mayor riesgo de parto extremadamente prematuro se observó en las mujeres obesas. Además, la obesidad materna se asoció con un aumento de las tasas de complicaciones en el embarazo y el parto. Se recomienda promover cambios en el estilo de vida saludable que podrían reducir la prevalencia del parto prematuro entre las mujeres obesas.

Palabras clave: Obesidad, embarazo materno, complicaciones.

Introduction

Over the past few decades as the result of economic, technological, and lifestyle changes the prevalence of obesity has increased worldwide. Nowadays has been created an abundance of cheap, high-calorie food has been coupled with decreased required physical activity[1]. All of this is thought to have had an impact on the increase in obesity worldwide. Obesity is a significant public health concern and is likely to remain so for the foreseeable future.

Based on the World Health Organization data in 2016 about 39% of adults aged 18 years and above were overweight, while 13% were obese[2]. This rise in obesity prevalence is more evident in women of reproductive age[3]. Moreover, the rates of obesity in pregnancy are increasing, particularly in developed countries[4-6]. At the global level, in 2014, the number of pregnant women overweight or obese was estimated 8.9 and 14.6 million, respectively[7].

Flegal et al, in their survey in the USA, indicated that 55.8% of women of childbearing age (20-39 years) were overweight or obese, defined as having a BMI of 25 or higher[8]. Greve et al, highlight that pre-pregnancy weight is the most significant modifiable risk factor for stillbirth, with up to 100% increased risk for women with obesity[9].

Maternal obesity is a complex condition strongly associated with socio-economic status and ethnicity inequalities[10,11], making it a public health priority in addition to being a priority area for clinical practice[12]. On the other hand, many studies are reported that during pregnancy and childbirth, obese women are at greater risk of maternal-fetal complications than women with a normal body mass index (BMI)[13,14]. Furthermore, there is evidence that maternal BMI influences also the gestational age at delivery[15]. Additionally, maternal obesity increases the risk of several pregnancy complications, including antenatal, intrapartum, postpartum, preeclampsia, and neonatal complications such as hypertensive disorders of pregnancy, gestational diabetes mellitus (GDM), cesarean delivery, macrosomia, and unexplained stillbirths[16-20]. This study aimed to determine the prevalence and perinatal outcomes of obese women giving birth in Kosovo.

Methods

Subject

Regional Hospital of Ferizaj has its origins in June 1999, the day when the ZO-Nerodima military hospital with 65 wounded and medical personnel from the war zone was placed in one segment of the city's Health House, in which the hospital is still located today. In its beginner, this hospital started to work with three wards and one of them was the gynecology ward, while two others were Emergency, and Surgery wards with about 110 medical staff. Nowadays, the Regional Hospital of Ferizaj is a University Clinical Center, – that offers services in many departments for all communities of Ferizaj. All the medical staffs are very specialized at their work and every time develops knowledge and skills for individual enrichment and to contribute to a healthy life.

Study population

This retrospective cohort study used data from the Ferizaj Hospital system between January 2019 to December 2020. We included in this study the data of 1780 mothers who gave birth at the Ferzaj hospital. We analyzed pregnancy and birth data (mother-child pairs) to assess maternal body mass index and its associations with pregnancy risk factors and childhood health outcomes in this population. The first information was obtained during their first antenatal visit between gestational weeks 6 and 10. Maternal BMI was derived from measured height and weight recorded according to scientific notation. BMI was categorized into six groups: underweight (≤18 kg/m^2); normal weight (19-24 kg/m^2); overweight (25-29 kg/m^2); obese class I (30-34 kg/m^2); and obese class II & III (35->39 kg/m^2)

We have considered as maternal outcomes preeclampsia (mild and severe preeclampsia), chronic hypertension and pre-existing hypertension plus superimposed gestational hypertension, pregestational diabetes mellitus, gestational diabetes, antepartum hemorrhage (such as placenta previa, abruptio placentae, and third-trimester bleeding), cesarean section, induction of labor, and shoulder dystocia (diagnosed clinically by the delivering attending physician).

While on perinatal/neonatal outcomes we have considered the data for fetal presentation. We examine several measures of birth weight: macrosomia: Macrosomia was defined as ≥4000 g[21], (birth weight in excess ≥4000 g, birth weight over≥4500 g, low birth weight over <2500g), preterm birth>37 weeks, meconium-stained amniotic fluid. An Apgar score (used to evaluate neonatal well-being immediately after birth) of ≤7 at 5 min was used as an indicator for referral to a neonatal morbidity meeting. Additionally, we have assessed also the information about admission to neonatal intensive care, and neonatal mortality from 0 to 28 days.

Statistical analyses of data

The data were analyzed using SPSS Statistics for Windows, Version 20.0 The demographic characteristics of the pregnant women (obese and normal) were analyzed using descriptive statistics followed by two-sided independent Student's t-tests for the continuous variables, and the chi-squared (χ^2) test or Fisher's exact test for the categorical variables. The Kolmogorov-Smirnov test was used to check whether continuous data were normally distributed. The data were presented as mean

and standard deviation unless otherwise indicated. To the deep analyses of our data, we performed the univariate and multivariate logistic regression analyses (controlling for maternal age, parity, gestational age, and chronic hypertension). We performed for estimation adjusted odds ratios (OR) and 95% confidence intervals (95% CI), and a value of $p<0.05$ was considered statistically significant.

Results

Overall, 1780 pregnant women were included in this study, the age population was 18-45 years with an average of 27.5±6.9 years old in all pregnant women and 29.2±4.3 years old in maternal obesity. Related to the age of pregnant mothers, 67.7% (712/1051) were ≤35 years old while 32.3% were >35 years old. Most than half 61.7% live in rural areas and 38.3% in urban areas. Regarding the education level, approximately 24% referred to the primary level, 55.1% to the high school level, and 20.8% to the university level, while less than 32% were employed. The mean of parity was 1.9 ± 0.4 with a dominance of primiparous 40%, and other mothers referred second, third, and more than third pregnancies in percentages of 37.7%, 13.6%, and 8.6% respectively. The BMI mean in pregnant women resulted in 27.2±3.01, while maternal obesity resulted in 32.5 ±4.2. The prevalence of maternal pregnancy obesity was 59% (1051/1780). More than half of maternal obesity (673/1052) was in obese class I and obese class II & III categories at 44.8% and 19.2% respectively. Regarding maternal obesity outcomes, we have considered mild and severe preeclampsia, and chronic hypertension. Furthermore, we have evaluated the presentational diabetes mellitus, gestational diabetes, and also the use of alcohol, smoke, and drug during pregnancy. Women with pregnancy obesity were more likely to report hypertension and gestational Diabetes Mellitus compared to those who did not have obesity. So, based on the analysis data, about 27.9% of pregnant women have Gestational Diabetes Mellitus and 3.8% have Diabetes Mellitus Type 1&2, while 22% presented Chronic hypertension, 10.8% have mild hypertension, and 4.6% have severe hypertension. About 8.6% were alcohol users during pregnancy, 19.5% were smoker users during pregnancy, and 16.4% were drug users during pregnancy. **Table I** shows the characteristics demographic of pregnant women (**Table I**).

Table I: Baseline demographic characteristics of the pregnant mother.

Maternal variables 1780		Total number of mothers	Obese mothers	P value
Age (ean±SD)	27.5±6.9	29.2±4.3	0.001	
Age	≤35 years old >35 years old	1257 523	712 339	0.001
Residence	Rural Urban	983 797	649 402	0.002
Education	Primary level High school University	429 734 617	252 580 219	0.03
Employed	No Yes	1096 684	724 327	0.0007
Parity mean (mean±SD)	1.7±0.2	1.9±0.4	0.03	
Parity	Primiparous Second Third More than third	708 634 246 192	420 397 143 91	0.04
BMI (mean±SD)	27.2±3.01	32.5 ±4.2	0.0001	
BMI	≤18 kg/m^2 19-24 kg/m^2 25-29 kg/m^2 30-34 kg/m^2 35-39 kg/m^2	177 552 378 471 202	- - 378 471 202	0.0001
Hyperglycemic disorders	No Gestational Diabetes Mellitus Diabetes Mellitus Type 1&2	1408 327 45	718 293 40	0.03
Hypertensive disorders	No Chronic hypertension Mild hypertension Severe hypertension	1284 288 151 57	658 231 114 48	0.005
Alcohol use during pregnancy	No Yes	1586 194	960 91	0.0008
Smoking use during pregnancy	No Yes	1381 399	855 205	0.0007
Drug use during pregnancy	No Yes	1544 236	879 172	0.0003

Table II shows the association between intrapartum and neonatal outcomes with maternal obesity. Maternal obesity was inversely associated with preterm birth among those older than 30 years (adjusted OR 0·89 [95% CI 0·63-1.28]), but positively associated with preterm birth among those aged 30 years or younger (adjusted OR 2.59 [0.89-3·37] with a p-value <0.05). On the other hand, the estimated prevalence of preterm birth was higher among the underweight (≤18 kg/m^2) category compared to obese women. Underweight women were 2.5 times at risk for pattern delivery less than 37 weeks for 95% CI [1.49-3.7] p-value < 0.0001. We have evaluated also the antepartum hemorrhage (such as placenta previa, abruptio placentae, and third-trimester bleeding), cesarean section, induction of labor and induction of labor in late-term pregnancies, and duration of labor ≤360 minutes or ≥ 360 minutes. A significant association was seen for induction of labor in maternal women in obese class I (1.1 times in risk for induction labor for 95% CI [0.05-1.7], p-value 0.048) and maternal women in obese class II &III (2.4 times in risk for induction labor for 95% CI [1.09-3.6], p-value 0.009). While for the duration of labor, a significant association was seen among underweight women and the duration of labor was ≤360 minutes. Underweight women have a predisposition 2.4 times for the duration of labor was ≤360 minutes in risk for 95% CI [0.7-4.5], p-value 0.008. Related to the birth mode obese women have a predisposition for cesarean birth compared to women in normal or underweight. Overweight women were 1.5 times at risk for cesarean [0.7-2.3], women obese in class I was 1.9 times at risk for cesarean [0.9-3.6], while women obese in classes II&III were 3.5 times at risk for cesarean [1.07-7.5], with p-value less than 0.05.

Additionally, we have considered the data on neonatal outcomes in maternal obesity. We have evaluated the meconium-stained amniotic fluid, shoulder dystocia (diagnosed clinically by the delivering attending physician), measures of birth weight such as macrosomia ≥4000g, birth weight over≥4500 g, low birth weight <2500g, Apgar score of ≤7 at 5 min. Additionally, we evaluated also the data on umbilical cord arterial pH<7.1, cases that were admitted to neonatal intensive care, and neonatal mortality from 0 until 28 days. The multiple linear regression analysis shows newborn weight was

Table II: Association between intrapartum and neonatal outcomes with maternal obesity.

Variables	Underweight (≤18 kg/m^2)		Normal weight (19-24 kg/m^2)		Overweight (25-29 kg/m^2)		Obese class I (30-34 kg/m^2)		Obese class II & III (35->39 kg/m^2)	
	odds ratio 95% CI	P value	odds ratio 95% CI	P value	odds ratio 95% CI	P value	odds ratio 95% CI	P value	odds ratio 95% CI	P value
Preterm delivery < 37 weeks	2.5 [1.49-3.7]	0.0001	reference		0.2 [0.05-1.4]	0.3	1.4 [1.00-2.7]	0.04	0.3 [0.00-1.1]	0. 11
Induction of labor	0.4 [0.01-1.2]	0.2	reference		0.1 [0.06-1.3]	0.3	1.1 [0.05-1.7]	0.048	2.4 [1.09-3.6]	0.009
Induction of labor in late-term pregnancies	0.1 [0.02-1.3]	0.4	reference		1.6 [0.7-2.6]	0.03	1.9 [1.01-3.5]	0.02	3.4 [1.2-7.1]	0.01
Duration of labor ≤360 minutes	2.4 [0.7-4.5]	0.008	reference		0.4 [0.02-1.5]	0.5	0.2 [0.04-1.7]	0.3	0.6 [0.01-1.9]	0.7
Duration of labor ≥ 360 minutes	0.01 [0.00-0.8]	0.7	reference		0.02 [0.00-1.1]	0.9	0.7 [0.03-2.0]	0.8	0.5 [0.02-1.9]	0.7
Bleeding during labor	1.01 [0.07-1.4]	0.6	reference		1.2 [0.4-2.2]	0.045	1.5 [0.2-2.4]	0.03	1.3 [0.1-1.9]	0.04
Birth mode										
Spontaneous vaginal	1.7 [0.3-2.5]	0.03	reference		0.1 [0.07-1.4]	0.9	0.6 [0.02-1.2]	0.7	1.1 [0.4-1.8]	0.8
Caesarean	0.3 [0.04-1.1]	0.5	reference		1.5 [0.7-2.3]	0.04	1.9 [0. 9-3.6]	0.004	3.5 [1.07-7.5]	0.0001
Instrumental vaginal	1.7 [1.04-2.8]	0.03	reference		0.01 [0.00-0.8]	0.7	0.9 [0.2-1.8]	0.8	0.7 [0.1-1.5]	0.4
Meconium-stained amniotic fluid	0.2 [0.3-1.9]	0.1	reference		1.4 [0.4-2.6]	0.03	2.0 [1.08-3.4]	0.009	2.7 [1.24-6.2]	0.0001
Shoulder dystocia	1.5 [0.2-2.4]	0.04	reference		0.2 [0.01-0.8]	0.3	0.4 [0.1-0.9]	0.5	0.8 [0.02-1.7]	0.6
Apgar score ≤7 at 5 min	2.1 [0.8-3.9]	0.005	reference		1.9 [1.04-3.08]	0.008	1.4 [0.6-2.8]	0.03	1.7 [0.45-3.2]	0.02
Umbilical cord arterial pH<7.1	0.1 [0.00-1.1]	0.2	reference		0.02 [0.00-0.6]	0.7	0.5 [0.01-1.0]	0.9	0.3 [0.01-1.04]	0.4
Birth weight										
Low birth weight	1.3 [0.8-1.7]	0.007	reference		0.2 [0.04-1.3]	0.5	1.4 [0.9-1.8]	0.03	0.2 [0.01-0.9]	0.4
Macrosomia ≥4000kg	0.01 [0.00-0.7]	0.8	reference		1.8 [0.3-2.9]	0.03	2.1 [0.7-4.8]	0.004	2.7 [0.1-7.5]	0.0007
Macrosomia ≥4500kg	0.03 [0.00-0.7]	0.5	reference		1.2 [0.4-1.8]	0.04	2.4 [1.08-3.5]	0.002	1.9 [0.8-3.4]	0.004
Admission of the baby to the neonatal intensive care unit	0.1 [0.00-0.8]	0.2	reference		1.7 [0.3-2.6]	0.03	2.1 [1.02-4.5]	0.002	2.3 [1.3-5.1]	0.0001
Neonatal mortality 2-28 days	1.4 [0.7-1.9]	0.048	reference		0.2 [0.06-1.3]	0.7	0.9 [0.5-1.7]	0.3	1.3 [0.4-1.9]	0.04

statistically different between the BMI groups ($p < 0.05$). Admission of the baby to the neonatal intensive care unit appeared a significant association with obese women ($p < 0.05$). Neonatal mortality 2-28 days was apparently more significant in underweight and obese classes II&III women. Moreover, the neonatal variables such as Apgar score, fetal birth trauma (shoulder dystocia), and umbilical cord arterial pH<7.1 were not different between the obese women and non-obese women.

Discussion

Giving life to a child is a miracle, but on the other hand, it requires a lot of sacrifices, commitment, and care on the part of the pregnant woman. This is because the mother must be very careful in maintaining this pregnancy, especially in her nutrition to maintain a normal weight without becoming obese. According to Davis's study (2015), for the past 20 years, the rising obesity pandemic has received a great deal of press, policy, and research. Among women of childbearing age, obesity is paramount because of its association with multiple adverse health outcomes for both mother and fetus and even future generations[22]. Having a high body mass index during pregnancy can increase the risk for an array of maternal and perinatal complications, and the risks are amplified with the increasing severity of the condition. It has been estimated that one-quarter of pregnancy complications (like gestational hypertension, preeclampsia, gestational diabetes, preterm birth, and macrosomia) are attributable to maternal overweight or obesity[23]. We undertake this study to determine the prevalence and perinatal, intrapartum, and neonatal outcomes of obese women giving birth in Kosovo for two years. One of the years when this was carried out this study coincides with the time when the global pandemic caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2, COVID-19) appeared. Not much is known about the specific risk factors for maternal obesity and excessive weight gain during pregnancy. Identification of these risk factors and critical periods of gestational weight gain might be useful for the development of preventive strategies (24). The multifactorial etiology of obesity is a consensus in the literature, involving genetic, environmental, socioeconomic, and behavioral factors[25].

Cai et al, in their study highlight that some of the risk factors of obesity, rose significantly during the COVID-19 quarantine[26]. Home quarantine made people more vulnerable to overeating and intake of high-calorie food[27]. Furthermore, social distancing home quarantine limits physical activity, making sedentary daily life adopted obesity to the pregnant women, which will translate in the future to maternal and neonatal outcomes.

The prevalence of obesity in this study resulted in 59% (1051/1780), and from that more were in obese class I and obese class II & III categories at 44.8% and 19.2% respectively. As we highlighted before maternal obesity is strongly associated with socioeconomic status. For example, Hazlehurst et al, in their study found that socio-economic status varies between obesity classes, and pregnant women in the highest obesity class (class III, BMI ≥40 kg m^2) are significantly more likely to reside in deprived locations (odds ratio 4.7, 95% CI [3.2-6.9]) compared with women in obesity class I (BMI 30.0–34.9 kg m^2; OR 2.2, 95% CI 2.1- 2.3)[12]. In our study, more than half (61.7%) of pregnant women live in rural areas and 38.3% in urban areas with a statical significance between them, (p-value <0.05).

In one study conducted by Boudet-Berquier et al, there was found significant association between primiparae obesity with maternal age of 25-29 years (OR=2.09 [1.13-3.87]) (vs. 30-34 years), high school level (OR=2.22 [1.32-3.73]) (vs. university level), while among multiparae, primary school level (OR = 6.30 [2.40-16.57]), secondary school level (OR=2.89 [1.81- 4.63]), and high school level (OR =1.86 [1.18-2.93]) (vs. university level), no follow-up antenatal classes (OR=1.77 [1.16-2.72])[28]. Furthermore, a systematic review found that low maternal education, rather than other sociodemographic factors such as income and employment, tended to be associated with excessive gestational weight gain[29].

Disparities are also seen with maternal employment status. Pregnant women with a BMI in class I are more likely to be employed, while those in class III are more likely to be unemployed[30]. The findings of our study were similar to the previous studies, but it was controversial to a study conducted by Cheng et al, which did not find any association between maternal education, employment status, or monthly family income and pregnancy BMI or Gestational weight gain (GWG) among pregnant women (31). So, in our study, there was found an association between age, education level, employment, and parity (p-value <0.05).

Numerous studies have reported an association between abnormal pregnancy body mass index (BMI) and the onset of gestational diabetes, hypertension, and pre-eclampsia during pregnancy, cesarean delivery, and infant birth weight above 4000 grams (vs birth weight between 2500 grams and 4000 grams)[31-33].

Moreover, Leddy et al, highlight that obese women are at increased risk of complications at the time of labor and delivery. The rate of successful vaginal delivery decreases progressively as maternal BMI increases. Chu et al, in a meta-analysis of 33 studies showed that the ORs of cesarean delivery were 1.46 (95% CI, 1.34-1.60), 2.05 (95% CI, 1.86-2.27), and 2.89 (95% CI, 2.28-3.79) among overweight, obese, and severely obese women, respectively, compared with normal weight pregnant women[34,35]. The findings of the previous study were

almost the same as our findings. Maternal overweight, obese classes I, and classes II &III were 1.5, 1.9, and 3.4 at risk for cesarean delivery compared to maternal in normal weight.

Few studies have shown that Maternal alcohol, smoking, and drug intake before and during pregnancy is associated with maternal obesity[36-38]. In this study, there was a significant association between the intake of alcohol, smoking, and drug in maternal obesity (p-value <0.05).

There is increasing evidence that maternal BMI influences gestational age at delivery (pre-term and/or birth post-term birth). Additionally, a post-term birth includes interventions to expedite birth, such as induction of labor and cesarean section, interrupting the natural gestation trajectory[39]. Bhattacharya et al results showed that low birth weight was significantly less common in obese (p-value < 0.05) than in normal and overweight mothers[40]. The findings of our study were similar to the previous study. While delivery after 41 completed weeks and macrosomia birth weight were significantly higher in the obese as compared to the normal BMI group and in the overweight group.

Minsart et al, highlight that the reason for this increased rate of neonatal complications in obese women is unknown but could be related to increased maternal pelvic soft tissue, as well as difficulty in estimating the fetal weight, and intrapartum complications such as the inability to adequately monitor the fetus and contractions[41]. On the other hand, there is strong evidence for the relation between macrosomia and shoulder dystocia, but the current evidence for an independent relation between maternal obesity and shoulder dystocia through the excess fat tissue in the birth canal is less clear[42,43]. In our study, we found an association between obesity and macrosomia, while shoulder dystocia was associated with underweight women. The risk for macrosomia increased linearly with the increasing BMI of the mother, in an adjusted Odds Ratio of 1.8 (95% CI [0.3-2.9]) for overweight and 2.1 (95%CI [0.7-4.8]) in obese class I and 2.7 (95%CI [0.1-7.8]) mothers. These results are comparable with some studies[44,45].

Conclusion

The findings of this study suggest that the greatest risk of extremely preterm birth was observed in obese women. Also, maternal obesity was associated with increased pregnancy and birth complication rates. We recommend promoting healthy lifestyle changes that could reduce the prevalence of preterm birth among obese women.

Ethical Considerations

This study was approved by the Ferizaj Hospital Ethical Committee. During this study, we followed the guidelines of the Declaration of Helsinki of 1975, as revised in 2008. We have explained the purpose of the study to all our colleagues before starting this study. No personal data were recorded, and all the data collected will be used only for the current study. We warrant that all ethical guidelines for medical research were strictly respected.

Ethical Considerations

This study was approved by the Ferizaj Hospital Ethical Committee. Before enrollment of all contributors the researcher explained the purpose of the study. During this study, we followed the guidelines of the Declaration of Helsinki of 1975, as revised in 2008. No personal data were recorded. We warrant that all ethical guidelines for medical research "On the protection of personal data" were strictly respected.

Author contributions

All the authors have accepted responsibility for the entire content of this submitted manuscript and approved submission.

Research funding

None declared.

Honorarium

None declared.

Competing interests

All the authors played a significant role in the study design; in the collection, analysis, and interpretation of data; in the writing of the report; or in the decision to submit the report for publication.

Conflicts of interest

The authors have no potential conflicts of interest to report in connection with this article.

Acknowledgments

Firstly, I would like to acknowledge all our colleagues that contribute in this study. Secondly, I would like to acknowledge my co-authors for their support, assistance, and contribution during the preparation of this paper. And finally, the acknowledgments go to the head of the "Ferizaj Hospital" Kosovo, for his permission and assistance in finalizing this paper. Without all contributors' help, this work would be difficult to accomplish.

References

1. Chen Z, Wen G, Cao X, Li S, et al. Group B streptococcus colonization and associated risk factors among pregnant women: a hospital-based study and implications for primary care. Int J Clin Pract 2019;73: e13276. https://doi.org/10.1111/ijcp.13276.

2. World Health Organization. Obesity and overweight (Key facts), 2016, https://www.who. int/news-room/fact-sheets/detail/obesity-and overweight

3. Ng M, Fleming T, Robinson M, et al. Global, regional, and national prevalence of overweight and obesity in children and adults during 1980-2013: a systematic analysis for the Global Burden of Disease Study 2013. Lancet 2014; 384(9945): 766-81. doi: 10.1016/S0140-6736(14)60460-8.

4. Tsoi E, Shaikh H, Robinson S, Teoh TG. Obesity in pregnancy: a major healthcare issue. Postgrad Med J. 2010;86(1020):617-23. doi: 10.1136/pgmj.2010.098186.

5. Poston L, Caleyachetty R, Cnattingius S, Corvalan C, et al. Preconceptional and maternal obesity: epidemiology and health consequences. Lancet Diabetesl Endo. 2016;4(12):1025-36. doi: 10.1016/S2213-8587(16)30217-0.

6. Liu L, Ma Y, Wang N, et al. Maternal body mass index and risk of neonatal adverse outcomes in China: a systematic review and meta-analysis. BMC Pregnancy Childbirth. 2019; 19:105. https://doi.org/10.1186/s12884-019-2249-z

7. Chen C, Xu X, Yan Y. Estimated global overweight and obesity burden in pregnant women based on panel data model. PLoS One. 2018;13(8): e0202183. doi: 10.1371/journal.pone.0202183

8. Flegal KM, Carroll MD, Kit BK, Ogden CL. Prevalence of obesity and trends in the distribution of body mass index among US adults, 1999-2010. JAMA. 2012;307(5):491-7. doi: 10.1001/jama.2012.39.

9. Greve T, Lundbye-Christensen S, Nickelsen CN, Secher NJ. Maternal and perinatal complications by day of gestation after spontaneous labor at 40–42 weeks of gestation. Acta Obstetricia et Gynecologica Scandinavica. 2011;90(8):852-6. DOI:10.1111/j.1600-0412.2011.01175. x.

10. Heslehurst N, Rankin J, Wilkinson JR, Summerbell CD. A nationally representative study of maternal obesity in England, UK: trends in incidence and demographic inequalities in 619 323 births, 1989–2007. International Journal of Obesity. 2010;34(3):420-8. doi: 10.1038/ijo.2009.250.

11. Fisher SC, Kim SY, Sharma AJ, Rochat R, Morrow B. Is obesity still increasing among pregnant women? Prepregnancy obesity trends in 20 states, 2003-2009. Prev Med. 2013;56(6):372-8. DOI: 10.1016/j.ypmed.2013.02.015

12. Heslehurst N, Vieira R, Hayes L, et al. Maternal body mass index and post-term birth: a systematic review and meta-analysis. Obes Rev. 2017;18(3):293-308. doi:10.1111/obr.12489

13. Torloni MR, Betran AP, Horta BL, Nakamura MU, Atallah AN, Moron AF, et al. Pre-pregnancy BMI and the risk of gestational diabetes: a systematic review of the literature with meta-analysis. Obes Rev 2009; 10(2):194-203. doi: 10.1111/j.1467-789X.2008.00541. x.

14. Marchi J, Berg M, Dencker A, Olander EK, Begley C. Risks associated with obesity in pregnancy, for the mother and baby: a systematic review of reviews. Obes Rev 2015;16(8):621-38. doi: 10.1111/obr.12288.

15. McDonald SD, Han Z, Mulla S, Beyene J. Overweight and obesity in mothers and risk of preterm birth and low birth weight infants: systematic review and meta-analyses. BMJ. 2010; 341:c3428. doi: 10.1136/bmj.c3428.

16. Lynch CM, Sexton DJ, Hession M, Morrison JJ. Obesity and mode of delivery in primigravid and multigravid women. Am J Perinatol. 2008; 25(3): 163-7.doi: 10.1055/s-2008-1061496.

17. Wang Z, Wang P, Liu H, He X, Zhang J, Yan H, et al. Maternal adiposity as an independent risk factor for pre-eclampsia: a meta-analysis of prospective cohort studies. Obes Rev 2013; 14(6):508-21. doi: 10.1111/obr.12025.

18. Chu SY, Kim SY, Schmid CH, Dietz PM, et al. Maternal obesity and risk of cesarean delivery: a meta-analysis. Obes Rev 2007; 8(5): 385-94.doi: 10.1111/j.1467-789X.2007.00397. x.

19. Aune D, Saugstad OD, Henriksen T, Tonstad S. Maternal body mass index and the risk of fetal death, stillbirth, and infant mortality: a systematic review and meta-analysis. J Am Med Assoc 2014; 311(15):1536-46. doi: 10.1001/jama.2014.2269.

20. Gaudet L, Ferraro ZM, Wen SW, Walker M. Maternal obesity and occurrence of fetal macrosomia: a systematic review and meta-analysis. Biomed Res Int 2014;2014: 640291.doi: 10.1155/2014/640291

21. World Health Organisation. ICD-10 Version: 2015. International Statistical Classification of Diseases and Related Health Problems 10th Revision.

22. Davis AM. Pandemic of Pregnant Obese Women: Is It Time to Re-Evaluate Antenatal Weight Loss? Healthcare (Basel). 2015;3(3):733-49. doi:10.3390/healthcare3030733

23. Williams CB, Mackenzie KC, Gahagan S. The effect of maternal obesity on the offspring. Clin Obstet Gynecol. 2014;57(3):508-15. doi:10.1097/GRF.0000000000000043.

24. Gaillard R, Durmuş B, Hofman A, Mackenbach JP, Steegers EAP, Jaddoe VWV. Risk factors and outcomes of maternal obesity and excessive weight gain during pregnancy. 2013;21(5): 1046-55.doi: 10.1002/oby.20088.

25. Portela DS, Vieira TO, Matos SM, et al. Maternal obesity, environmental factors, cesarean delivery and breastfeeding as determinants of overweight and obesity in children: results from a cohort. BMC Pregnancy Childbirth.2015; 15: 94. https://doi.org/10.1186/s12884-015-0518-z.

26. Cai QY, Yin Y, Yong-Heng W, Han-Lin C, et. al. Home Quarantine: A Double-Edged Sword During COVID-19 Pandemic for Hypertensive Disorders of Pregnancy and the Related Complications. Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy. 2022;15: 2405-15. https://www.dovepress.com/ on 22-Sep-2022

27. Mattioli AV, Sciomer S, Cocchi C, Maffei S, Gallina S. Quarantine during COVID-19 outbreak: changes in diet and physical activity increase the risk of cardiovascular disease. Nutr Metab Cardiovasc Dis. 2020;30(9):1409-17. doi: 10.1016/j.numecd.2020.05.020

28. Boudet-Berquier J, Salanavea B, de Launaya C, Desenclos JC, Castetbonc K. Sociodemographic factors and pregnancy outcomes associated with maternal obesity before pregnancy in a French national birth cohort: effect modification of parity. Abstracts / European Journal of Obstetrics & Gynecology and Reproductive Biology.2016; 206:e137–e138. DOI: https://doi.org/10.1016/j.ejogrb.2016.07.350.

29. O'Brien EC, Alberdi G, McAuliffe FM. The influence of socioeconomic status on gestational weight gain: a systematic review. J Public Health (Oxf). 2018;40(1):41-55. Epub 2017/04/12. PubMed PMID: 28398550. 10.1093/PubMed/fdx038.

30. Heslehurst N, Rankin J, Wilkinson JR, Summerbell CD. A nationally representative study of maternal obesity in England, UK: trends in incidence and demographic inequalities in 619 323 births, 1989–2007. International Journal of Obesity. 2010; 34(3):420-8. doi: 10.1038/ijo.2009.250.

31. Li H, Nawsherwan, Nabi G, Gul R, Ahmed Z, Fan C. Relationship of maternal factors and obstetric complications with term singleton vs term twin neonatal outcomes: A retrospective study in China. Malawi Med J. 2022;34(2):123-31. DOI: 10.4314/mmj. v34i2.8. PMID: 35991813; PMCID: PMC9356519.

32. Zou X, Yang N, Cai W, et al. Weight Gain Before the Third Trimester and Risk of Hypertensive Disorders of Pregnancy: A Prospective Cohort Study. Med Sci Monit. 2020;26: e927409. Published 2020 Nov 9. doi:10.12659/MSM.927409

33. Abraham T, Romani AMP. The Relationship between Obesity and Pre-Eclampsia: Incidental Risks and Identification of Potential Biomarkers for Pre-Eclampsia. Cells. 2022;11(9):1548. Published 2022 May 5. doi:10.3390/cells11091548

34. Leddy MA, Power ML, Schulkin J. The Impact of Maternal Obesity on Maternal and Fetal Health Reviews in Obstetrics & Gynecology. 2008;1 (4): 170-8.

35. Chu SY, Kim SY, Schmid CH, et al. Maternal obesity and risk of cesarean delivery: a meta-analysis. Obstet Rev. 2007; 8(5):385-94. doi: 10.1111/j.1467-789X.2007.00397. x.

36. Bautista-Castaño I, Henriquez-Sanchez P, Alemán-Perez N, et al. Maternal obesity in early pregnancy and risk of adverse outcomes. PLoS ONE. 2013; 8(11): e80410. doi: 10.1371/journal.pone.0080410.

37. Callaway LK, Prins JB, Chang AM, et al. The prevalence and impact of overweight and obesity in an Australian obstetric population. Med J Aust. 2006;184(2):56–9. DOI:10.5694/j.1326-5377. 2006.tb00115.x

38. McDonald BW, Watson PE. Maternal alcohol intakes before and during pregnancy: Impact on the mother and infant outcome to 18 months. Nordisk Alkohol Nark. 2020;37(2):153-171. doi:10.1177/1455072520905404

39. Heslehurst N, Vieira R, Hayes L, Crowe L, et al. Pediatric Obesity. Maternal body mass index and post-term birth: a systematic review and meta-analysis Obesity Reviews. 2017;18: 293-308. doi: 10.1111/obr.12489.

40. Bhattacharya S, Campbell D, Liston W. Effect of body mass index on pregnancy outcomes in nulliparous women delivering singleton babies. BMC Public Health. 2007; 7 (1): 168. doi: 10.1186/1471-2458-7-168.

41. Minsart AF, Buekens P, De Spiegelaere M, et al. Neonatal outcomes in obese mothers: a population-based analysis. BMC Pregnancy Childbirth.2013;13:36. https://doi.org/10.1186/1471-2393-13-36

42. Heslehurst N, Simpson H, Ells LJ, Rankin J, et al. The impact of maternal BMI status on pregnancy outcomes with immediate short-term obstetric resource implications: a meta-analysis. Obes Rev. 2008; 9 (6): 635-83. 10.1111/j.1467-789X.2008.00511. x.

43. Poobalan AS, Aucott LS, Gurung T, Smith WC, Bhattacharya S: Obesity as an independent risk factor for elective and emergency cesarean delivery in nulliparous women–systematic review and meta-analysis of cohort studies. Obes Rev. 2009;10(1): 28-35. 10.1111/j.1467-789X.2008.00537. x.

44. Badran EF, Libdeh AMA, Kasaleh F, Saleh Sh, et al. Impact of Maternal Overweight and Obesity on Perinatal Outcomes. J Med J. 2014; 48 (2):121-31). http: //journals.ju.edu.jo/jmj.

45. Leung T, Leung T, Sahota D, Chan O, et al. Trends in maternal obesity and associated risks of adverse pregnancy outcomes in a population of Chinese women. BJOG: An International Journal of Obstetrics & Gynaecology. 2008; 115(12):1529-37. doi: 10.1111/j.1471-0528.2008.01931. x.