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Obstetric complications associated with obesity in the major Hospital of Honduras. A case-control study

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Abstract

Background: Obesity represents the most prevalent medical condition among women of reproductive age and significantly increases the risk of adverse pregnancy outcomes.

Objective: This study aimed to determine the perinatal and maternal complications associated with pre-gestational and first-trimester overweight and obesity at the Hospital Escuela, Honduras (2019-2024).

Methodology: A case-control study was conducted with 260 cases (BMI ≥25 kg/m^2) and 261 controls (BMI 18.5-24.9 kg/m^2). Cases were stratified into overweight (BMI 25-29.9; n=100, 38.5%) and obese (BMI ≥30; n=160, 61.5%).

Results: Mean maternal age was 27.8 years (cases) and 25.1 years (controls). A clear dose-response relationship was observed for key complications. Gestational hypertension rates were 10.0% in overweight, 20.6% in obese, and 2.3% in normal BMI women. GDM prevalence was 6.0% (overweight), 8.1% (obese), and 5.3% (controls). Macrosomia occurred in 3.0% (overweight), 5.0% (obese), and 2.6% (controls). Obese women had significantly higher risks of cesarean delivery, preeclampsia with severe features, and gestational hypertension compared to both overweight and normal-weight women.

Conclusion: Overweight and obesity during pregnancy are associated with increased obstetric risks, with obese women demonstrating a substantially higher risk profile, underscoring a critical dose-response relationship between BMI and adverse pregnancy outcomes.

Keywords: Adverse perinatal outcomes, risk-factors, labor complications, gestational hypertension, maternal obesity.

Introduction

Obesity is the most common medical condition among women of reproductive age [1]. Women who are overweight or obese in early pregnancy have an increased risk of hypertensive disorders during pregnancy, gestational diabetes, birth complications, such as prolonged labor, and higher rates of cesarean section [2]. Additionally, there are established risks associated with being overweight or obese before pregnancy [3]. There has been increasing interest in the possible adverse consequences of excess weight during pregnancy [4]. According to the WHO, obesity is a worldwide public health problem, and it is estimated that by 2025 more than 21% of women will be obese. Worldwide, obesity accounts for 34% of patients with chronic pathologies [5].

Globally, approximately 39 million pregnancies per year are complicated by maternal obesity. Obesity is associated with increased maternal and fetal morbidity and mortality. Obese women have a greater tendency toward excessive and inadequate weight gain during pregnancy; 57% experience excessive gain, 13% have inadequate gain, 6% lose weight, and 24% have adequate gain [6]. However, obesity has also been associated with an increased risk of preeclampsia [7].

A recent study based on the Danish National Birth Cohort (a very large sample of about 61,000 mothers and their children) found that independent of pre-pregnancy BMI, excess weight in pregnancy was associated with an increased risk of large for gestational age, cesarean delivery, low Apgar scores, and postpartum maternal weight retention [8].

Despite the economic situation in our country, our population exhibits nutritional behaviors with a tendency toward overweight and obesity. However, there are few local studies providing new evidence. It is important to document the impact of obesity in our obstetric and gynecological patients, as this condition has significant adverse effects on both mother and baby. Obesity is a critical public health problem in this century. A key objective of prenatal care is to identify these patients early to initiate dietary changes and other necessary measures, aiming to reduce complications associated with obesity. Based on the data reviewed, we decided to conduct a retrospective case-control study to investigate the obstetric complications associated with pre-gestational and first-trimester overweight and obesity (BMI 25.0-39.9 kg/m^2) in pregnant patients who attended the emergency and outpatient department of gynecology and obstetrics of the Hospital Escuela between the year 2019-2024.

This study aimed to establish the incidence of obesity in a group of pregnant women who consulted this hospital center, to understand the different complications they present in the different prenatal, delivery, and puerperium periods, and to identify both maternal and fetal complications. To detect these patients during prenatal control, improve their care, follow-up, and monitoring.

Materials and Methods

The study was conducted in the Hospital Escuela, Tegucigalpa, Honduras. This was a case-control study, in which the universe consisted of pregnant patients who attended the labor and delivery room of the Hospital Escuela of Tegucigalpa from January 2019 to July 2024. This case-control study was conducted following the STROBE guidelines. Cases and controls were selected from the Hospital's Perinatal Information System using a systematic random sampling approach based on hospital admission IDs.

Sample size calculation was performed a priori

using the EPIDAT program version 4.2, setting an alpha error of 0.05, a beta error of 0.20 (80% power), an odds ratio of 2.0, and a case-to-control ratio of 1:1, yielding a minimum required sample of 260 per group, with selection probabilities of 8.08% and 1.52%, for the cases and the controls. The inclusion criteria for cases were pregnant women with a BMI between 25 and 39.9 kg/m2 at the first prenatal check-up before 12 weeks, in the age range of 12-45 years and for control patients with normal BMI between 18.5 and 24.9 kg/m2. Exclusion criteria were: files with incomplete perinatal history (defined as missing data on key exposure [BMI] or outcome variables), lack of prenatal care, or a history of pregestational disease. Controls were selected from the same population during the same study period and were matched to cases based on the date of delivery (± 1 month).

Exposure Variable: The primary exposure was pregestational or first-trimester overweight/obesity, defined as a body mass index (BMI) between 25.0 and 39.9 kg/m^2, calculated from weight and height measured at the first prenatal visit before 12 weeks of gestation, the case group was stratified into two categories: overweight (BMI 25.0-29.9 kg/m^2) and obese (BMI ≥30.0 kg/m^2). This stratification allowed for examination of dose-response relationships across BMI categories. The control group comprised pregnant women with a normal BMI (18.5 – 24.99 kg/m^2) measured under the same conditions. BMI was categorized according to the World Health Organization (WHO) standards [9].

Outcome Variables: The primary outcomes were obstetric and fetal complications identified from the perinatal records. These complications were defined and diagnosed based on the standard clinical protocols of Hospital Escuela, which align with international guidelines from the American College of Obstetricians and Gynecologists (ACOG). The specific definitions were as follows:

Gestational Hypertension: Systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg, measured on two occasions at least 4 hours apart, after 20 weeks of gestation in a previously normotensive woman. Proteinuria was not present [10].

Preeclampsia: Gestational hypertension with proteinuria (≥300 mg in a 24-hour urine collection or a protein/creatinine ratio ≥0.3) [10].

Preeclampsia with Severe Features: Preeclampsia accompanied by severe hypertension (≥160/110 mmHg), thrombocytopenia, impaired liver function, progressive renal insufficiency, pulmonary edema, or new-onset cerebral or visual disturbances [10].

Eclampsia: The occurrence of seizures in a patient with preeclampsia that cannot be attributed to other causes [10].

Gestational Diabetes Mellitus (GDM): Diagnosis based on a positive 75-gram oral glucose tolerance test (OGTT) after 24 weeks of gestation, meeting at least one of the following criteria: fasting plasma glucose ≥92 mg/dL, 1-hour glucose ≥180 mg/dL, or 2-hour glucose ≥153 mg/dL, as per the International Association of Diabetes and Pregnancy Study Groups (IADPSG) criteria [11].

Fetal Macrosomia: Birth weight equal to or greater than 4,000 grams, regardless of gestational age [12].

Small for Gestational Age (SGA): Birth weight below the 10th percentile for the gestational age, according to the INTERGROWTH-21st standards [13].

Intrauterine Growth Restriction (IUGR): A fetus with an estimated weight below the 10th percentile for gestational age with supporting evidence of

Table 1. Sociodemographic characteristics stratified by BMI category of pregnant women attended at Hospital Escuela; Tegucigalpa, Francisco Morazán, 2019-2024.

Variable	Normal BMI (n=261)	Overweight (n=100)	Obesity (n=160)	p-value
Mean maternal age, years (SD)	25.1 (7.1)	26.9 (6.5)	28.4 (6.9)	<0.001
Origin				0.70
Urban	153 (58.6%)	63 (63.0%)	101 (63.1%)	
Rural	100 (38.3%)	34 (34.0%)	55 (34.4%)	
Not recorded	8 (3.1%)	3 (3.0%)	4 (2.5%)	
Educational Level				0.25
None	28 (10.7%)	14 (14.0%)	18 (11.3%)	
Primary incomplete	66 (25.3%)	23 (23.0%)	40 (25.0%)	
Completed primary school	84 (32.2%)	28 (28.0%)	44 (27.5%)	
High school incomplete	51 (19.5%)	21 (21.0%)	34 (21.3%)	
High school completed	25 (9.6%)	9 (9.0%)	10 (6.3%)	
University incomplete	6 (2.3%)	4 (4.0%)	8 (5.0%)	
Complete University	1 (0.4%)	1 (1.0%)	6 (3.8%)	

pathological growth restriction (e.g., abnormal Doppler ultrasonography) [14].

Preterm Birth: Delivery before 37 completed weeks of gestation [15].

Cesarean Section: A delivery conducted via surgical incision through the abdominal and uterine walls. The indications for the procedure were recorded as stated in the medical chart.

Other Variables: Sociodemographic data included maternal age, area of origin (urban/rural), and educational level. Obstetric history included gravidity, parity, number of previous cesarean sections, abortions, and ectopic pregnancies. Anthropometric data included weight before 12 weeks, height, maternal weight at delivery, and newborn birth weight.

Data on sociodemographic characteristics, obstetric history, anthropometric measurements, and maternal/fetal outcomes were extracted from the digital records by a trained team of obstetricians. Data collection was performed using a standardized form in Google Forms to ensure consistency. The statistical analysis included descriptive statistics (means, standard deviations, frequencies, medians and ranges as appropriate). Statistical comparisons were performed using ANOVA for normally distributed continuous variables, the Kruskal-Wallis test for non-normally distributed and ordinal variables, and chi-square tests for categorical variables across the three BMI categories (normal, overweight, obese). Post-hoc analyses were conducted where appropriate. A p-value of <0.05 was considered statistically significant. All analyses were conducted using IBM SPSS Statistics version 26.0.

Missing Data Handling: Participants with missing data on key variables (BMI or primary outcomes) were excluded from the study during the selection process, as specified in the exclusion criteria. This complete-case analysis approach resulted in no missing data for the variables included in the final analysis.

The protocol was approved by the Ethics and Biomedical Research Committee of the Faculty of Med-

Table 2. Obstetric history and newborn outcomes by BMI category of pregnant women attended at Hospital Escuela; Tegucigalpa, Francisco Morazán, 2019-2024.

Variable	Normal BMI (n=261)	Overweight (n=100)	Obesity (n=160)	p-value
Obstetric history, median (min-max)				
Gravidity	1 (1-8)	2 (1-7)	3 (1-10)	<0.001
Parity	1 (0-8)	1 (0-6)	2 (0-10)	<0.001
Cesarean sections	0 (0-5)	0 (0-2)	1 (0-3)	<0.001
Abortions	0 (0-4)	0 (0-2)	0 (0-3)	0.08
Newborn outcomes				
Preterm	46 (17.6%)	14 (14.0%)	18 (11.3%)	0.18
Term	214 (82.0%)	84 (84.0%)	139 (86.9%)	
Post-term	1 (0.4%)	2 (2.0%)	3 (1.9%)	
Birth weight, grams (SD)	3106 (590)	3128 (601)	3168 (629)	0.61

ical Sciences at the National Autonomous University of Honduras (IRB 00003070-UNAH-085-2024); No informed consent was obtained, since the data were obtained from the hospital database, no patient was evaluated or questioned.

Results

The stratified analysis of 521 patients across three BMI categories revealed significant differences in baseline characteristics and obstetric outcomes.

Sociodemographic Characteristics: The stratified analysis revealed important differences in baseline characteristics. As shown in Table 1, obese women were older (mean age 28.4 years) compared to overweight (26.9 years) and normal BMI women (25.1 years). The distribution across urban and rural areas was similar across groups, with approximately 60% coming from urban areas across all BMI categories.

Obstetric Characteristics: Table 2 shows the obstetric history across BMI categories. Obese women had higher median gravidity (3 vs 2 in other groups) and higher rates of previous cesarean sections (median 1 vs 0 in other groups).

Anthropometric Measures: As expected and confirmed in Table 3, significant differences existed in anthropometric measures across BMI categories, validating our group stratification.

Obstetric Complications - Stratified Analysis: For the analysis of neonatal outcomes, cases diagnosed with IUGR were included within the broader SGA category for presentation in Table 4. Gestational hypertension demonstrated the strongest dose-response pattern, with prevalence increasing from 2.3% in normal BMI women to 10.0% in overweight women and 20.6% in obese women. The association between macrosomia and BMI category showed increasing prevalence across groups (2.6% normal BMI, 3.0% overweight, 5.0% obese), though statistical significance was limited likely due to sample size constraints.

Cesarean delivery rates increased across BMI categories (22.6% normal, 28.0% overweight, 36.9% obese). The most common indication was previous cesarean section (normal: 15.2%; overweight: 16.3%; obese: 18.6%), followed by non-reassuring fetal status (normal: 6.7%; overweight: 12.2%; obese: 16.2%).

The stratified analysis revealed that obese women had 11.2 times higher odds of developing gestational

Table 3. Anthropometric measures by BMI category of pregnant women attended at Hospital Escuela; Tegucigalpa, Francisco Morazán, 2019-2024.

Variable	Normal BMI (n=261)	Overweight (n=100)	Obesity (n=160)	P-value
Weight before 12 weeks (kg)	58.9 (7.8)	72.4 (6.1)	96.8 (9.3)	<0.001
Height, cm	155.2(6.2)	157.8 (6.1)	158.9 (6.6)	<0.001
BMI, kg/m^2	24.4 (3.3)	29.1 (1.4)	38.3 (4.1)	<0.001
Maternal weight at delivery, kg	62.2(16.5)	77.5 (10.2)	102.9 (11.7)	<0.001

Table 4. Obstetric complications stratified by BMI category with adjusted odds ratios.

Complication	Normal BMI (n=261)	Overweight (n=100)	Obesity (n=160)	Overweight vs Normal BMI, OR (95% CI)	Obesity vs Normal BMI, OR (95% CI)
Gestational hypertension	6 (2.3%)	10 (10.0%)	33 (20.6%)	4.8 (1.7-13.3)*	11.2 (4.6-27.2)*
GDM	14 (5.3%)	6 (6.0%)	13 (8.1%)	1.1 (0.4-3.1)	1.6 (0.7-3.5)
SGA	20 (7.6%)	6 (6.0%)	10 (6.3%)	0.8 (0.3-2.0)	0.8 (0.4-1.7)
Macrosomia	7 (2.6%)	3 (3.0%)	8 (5.0%)	1.1 (0.3-4.3)	2.0 (0.7-5.5)
Preeclampsia with severe features	2 (0.8%)	2 (2.0%)	8 (5.0%)	2.6 (0.4-18.4)	6.7 (1.4-31.6)*
Preeclampsia	3 (1.1%)	1 (1.0%)	3 (1.9%)	0.9 (0.1-8.6)	1.6 (0.3-8.4)
Cesarean section	59 (22.6%)	28 (28.0%)	59 (36.9%)	1.3 (0.8-2.3)	2.0 (1.3-3.1)*
Any complication	90 (34.5%)	42 (42.0%)	88 (55.0%)	1.4 (0.9-2.2)	2.3 (1.6-3.4)*

*Statistically significant (p<0.05)

hypertension compared to normal BMI women (20.6% vs 2.3%). GDM prevalence showed a graded increase across BMI categories (5.3% normal, 6.0% overweight, 8.1% obese), though this trend did not reach statistical significance. Similarly, macrosomia prevalence increased across BMI categories (2.6% normal, 3.0% overweight, 5.0% obese).

Discussion

The study found that the mean maternal age was 27 years in cases and 25 years in controls, which is similar to a study on obesity and its maternal and perinatal complications, carried out in Mexico by Panduro-Barón et al. [16] In which the mean age was 27.9 vs. 21.9 years, most patients were from urban areas (63% of cases and 58% of controls), and the most common educational level was completed primary school (27.7% of cases and 32.2% of controls). Pregnant women living with social and economic disadvantage experience greater stigma, greater inequities in access to healthcare, and poorer pregnancy outcomes [17].

We correlated the association between maternal BMI at delivery and newborn birth weight and found a very weak correlation; BMI has been consistently shown to have a significant correlation with macrosomia in newborns. Multiple studies have found that maternal pre-pregnancy BMI and gestational weight gain are strong predictors of fetal macrosomia [18-20]. These observations differ from our findings, possibly due to the low prevalence of GDM in our cohort, which is a stronger driver of macrosomia [21]. Interestingly, some studies found that pre-pregnancy BMI

was not independently associated with macrosomia when other factors were considered [22]. However, weight gain during pregnancy may be more influential than pre-pregnancy BMI in some cases. Additionally, the association between gestational weight gain and macrosomia was strongest in mothers with normal or underweight pre-pregnancy BMI. We observed that obesity was associated with an increased risk of cesarean section, and several studies have reported consistent findings. A large prospective multicenter study [23] found that for nulliparous patients, the cesarean delivery rate was 20.7% for normal weight, 33.8% for obese, and 47.4% for morbidly obese women. Another study [24] reported adjusted odds ratios of 1.64 for obese women with singleton pregnancies and no prior cesareans to undergo cesarean delivery, similar to our observations. In another study [25], it was observed that cesarean section was the most frequent form of termination of pregnancy in women with obesity. It is important to note that obesity was associated with an increased likelihood of cesarean delivery; obese women had a 70.4% higher risk of cesarean section compared to controls.

Our stratified analysis reveals a clear dose-response relationship between pre-pregnancy BMI and adverse obstetric outcomes. The gradient was particularly striking for gestational hypertension, where obese women had more than double the risk of overweight women (20.6% vs 10.0%) and nearly 11 times the risk of normal BMI women. This pattern underscores the importance of considering obesity as a distinct risk category rather than combining it with overweight status.

The risk of cesarean delivery also demonstrated a progressive increase across BMI categories, with obese women having significantly higher rates (36.9%) compared to both overweight (28.0%) and normal BMI women (22.6%). This finding aligns with previous research showing that technical difficulties, fetal macrosomia concerns, and higher rates of maternal comorbidities in obese women contribute to increased surgical delivery rates.

Regarding complications in the study population, our stratified analysis demonstrated that obese women had 11.2 times higher odds of gestational hypertension (20.6% prevalence) compared to normal BMI women. This was followed by GDM in 8.1% of obese women and small-for-gestational-age fetuses in 6.3% of obese women. In the controls, a predominance of small-for-gestational-age fetuses was observed in 7.6%, GDM in 5.3%, and macrosomia in 2.6%, which was not associated with obesity. These results are similar to those of the study carried out by Suarez et al. [24] who pointed out that one of the maternal conditions that most frequently complicates the gestation period and delivery is excessive weight gain in the pregnant woman, indicating that the exposed pregnant women presented cases of preeclampsia, eclampsia and GDM.

The American College of Obstetricians and Gynecologists (ACOG) [25], notes that in a prospective multicenter study of more than 16,000 patients, with a weight gain greater than 15 kg during pregnancy, are associated with an increased risk of GDM, gestational hypertension, preeclampsia, and fetal macrosomia, compared to a weight gain of less than 15 kg during pregnancy. Regarding maternal morbidity, pregravid obesity increases the risk of maternal complications by up to four times [26], with risk rising proportionally to body mass index [27].

Maternal obesity is associated with an increased risk of preterm birth, particularly for extremely preterm and medically indicated preterm deliveries [28]. We did not find such an association (OR=0.66, CI95% 0.4-1-08, p=0.10). The relationship between obesity and preterm birth is complex, with several studies showing a dose-dependent effect where the

risk increases with higher BMI categories [29].

This study has several limitations that should be considered when interpreting its findings. Firstly, its retrospective case-control design is inherently susceptible to selection and information bias, as it relies on the accuracy and completeness of data recorded in medical charts. Secondly, the single-center nature of the study may limit the generalizability of our results to the broader population of Honduras or other countries with different healthcare systems. Furthermore, while we controlled for several key confounders, residual confounding by unmeasured factors (such as detailed socioeconomic status, diet, physical activity, or genetic predispositions) could influence the observed associations. Finally, the use of BMI as the sole measure of adiposity does not account for body fat distribution, which may also be an important risk factor for obstetric complications. The exclusion of records with incomplete data, while ensuring data quality, may have introduced selection bias if the completeness of records was associated with certain patient characteristics or outcomes. While our findings are from a single tertiary center, Hospital Escuela serves as the main referral hospital for central Honduras, capturing a diverse patient population. However, results may not be generalizable to primary care settings or regions with different healthcare infrastructures.

Conclusion

In conclusion, our stratified analysis demonstrates that both overweight and obesity during pregnancy are associated with increased risks of obstetric complications, but with importantly different risk magnitudes. Obese women face substantially higher risks of gestational hypertension, preeclampsia with severe features, and cesarean delivery compared to overweight women. These findings emphasize the clinical importance of distinguishing between overweight and obese categories in prenatal risk assessment and highlight the need for targeted interventions tailored to the specific risk level of each BMI category.

Conflict of Interest

All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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Data are available on reasonable request. The data are stored as de-identified participant data which are available on request to RAGR (ricardo.gutierrez@unah.edu.hn).

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