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**Keywords:** obesity, morbid obesity, pregnancy complications, maternal outcomes, perinatal outcomes.

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# Pregnant Women with Morbid Obesity: Pregnancy and Perinatal Outcomes

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**Abstract-** The aim of this study is to evaluate obstetric complications and perinatal outcomes in pregnant women with morbid obesity (BMI  $\geq 40.0$  kg/m<sup>2</sup>) compared to pregnant women with normal weight (BMI 18.5-24.9 kg/m<sup>2</sup>). It is a retrospective case-control study undertaken by the Department of Obstetrics at Hospital Universitario Doctor Peset, Valencia (Spain) between May 2008 and July 2016. A total of 50 patients were included in each study group. Morbidly obese pregnant patients had a higher rate of nulliparity ( $P = 0.03$ ), chronic hypertension ( $P = 0.008$ ), preeclampsia ( $P = 0.03$ ), gestational diabetes ( $P = 0.013$ ) and delivery by caesarean section ( $P = 0.04$ ) compared to control patients with normal weight. A closer monitoring of morbidly obese pregnant women is recommended to prevent, reduce and properly handle the complications that may arise during pregnancy, both for the mother and the fetus.

**Keywords:** obesity, morbid obesity, pregnancy complications, maternal outcomes, perinatal outcomes.

## 1. INTRODUCTION

There is an increase in obesity in developed countries, multifactorial in origin, which combines the lack of physical exercise, changes in diet composition and increased caloric intake. Although overweight is an increasingly important global health problem, the lack of motivation to face it more decisively in daily clinical practice is worrying.

The World Health Organization defines normal weight, overweight, obesity and morbid obesity as body mass index (BMI) of 18.5 to 24.9; 25 to 29.9; 30 to 39.9 and 40 or higher, respectively.

Spain is not an exception in this trend, but rather the opposite. Obesity in our country is reaching more worrying figures and comparative studies with other countries around place us at the forefront, with overall prevalence figures, both in children and adults, of around 25% (Finucane et al. 1980). According to the latest National Health Survey of Spain published in 2012, the main results highlight the continuous rise in obesity, affecting 17% of the adult population (INE 2013).

The prevalence of obesity in women of reproductive age and pregnant women varies widely depending on the definition, the year and the characteristics of the study population, but it has

increased in line with an increased prevalence of obesity in the general population. This alarming increase has made that more than a fifth of the European women who become pregnant in developed countries enter the clinical category of obesity (WHO 2014; Basterra-Gortari et al. 2011).

Obesity in women can negatively affect the course of pregnancy, with complications for both the mother and the fetus. The associated risks for obese pregnant women include: gestational diabetes (Sebie et al. 2001), gestational hypertension or preeclampsia (Bhattacharya et al. 2007), thromboembolism (Larsena et al. 2006), back pain, sciatic pain, increased fatigue (Agha et al. 2014), slower labour progression (Vahratian et al 2004), higher rate of instrumental or caesarean deliveries, surgical wound infection, postpartum hemorrhage (Sebie et al. 2001) and maternal death (Drife et al. 2005). Fetal risks associated with obese pregnant women include: spontaneous abortions, congenital anomalies (Stothard et al. 2009), macrosomia (Bianco et al. 1998), shoulder dystocia, stillbirth (Chu et al. 2007) and neonatal death (Kristensen et al. 2005).

A 2010 publication of the Royal College of Obstetricians and Gynaecologists (RCOG) gathers the rate of complications associated with obesity during pregnancy and includes: hypertensive disorders (OR 3.3, 95% CI 2.7-3.9), venous thromboembolism (OR 9.7, 95% CI 3.1-30.8), gestational diabetes (OR 2.4, 95% CI 2.2-2.7), elective caesarean section (OR 2.1, 95% CI 1.9-2.3), emergency caesarean section (OR 2.0, 95% CI 1.2-3.5), postpartum hemorrhage (OR 2.3, 95% CI 2.1-2.6), surgical wound infection (OR 2.2, 95% CI 1.0-2.6), congenital malformations (OR 1.6, 95% CI 1.0-2.5), prematurity (OR 1.2, 95% CI 1.1-1.4), macrosomia (OR 2.4, 95% CI 2.2-2.5), shoulder dystocia (OR 2.9, 95% CI 1.4-5.8), neonatal admission (OR 1.5, 95% CI 1.1-2.3), stillbirth (OR 2.1, 95% CI 1.5-2.7) and neonatal death (OR 2.6, 95% CI 1.2-5.8) (RCOG 2010).

The main aim of our study is to evaluate obstetric complications and perinatal outcomes in patients with morbid obesity (BMI  $\geq 40.0$  kg/m<sup>2</sup>) controlled in the Obstetric Unit of Hospital Universitario Dr. Peset in Valencia, Spain.

Its secondary objective is to compare the results obtained in morbidly obese patients with a control group of pregnant women with normal weight

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(BMI 18.5-24.9 kg/m<sup>2</sup>) controlled in the same Hospital Unit.

## II. MATERIALS AND METHODS

This is an observational and retrospective case-control study in which obstetrical complications and perinatal outcomes in patients with morbid obesity (BMI  $\geq$  40.0 kg/m<sup>2</sup>) were evaluated and compared with those in patients with normal weight (BMI 18.5 to 24.9 kg/m<sup>2</sup>) in the time period between May 2008 and July 2016.

In the case group, patients with singleton pregnancies, controlled in our High Risk Obstetric Unit and who met the criteria for morbid obesity - defined as BMI  $\geq$  40 kg/m<sup>2</sup> according to the World Health Organization (WHO) - were included.

The control group was made of patients with singleton pregnancies and normal weight (BMI 18.5-24.9 kg/m<sup>2</sup>) controlled in the same Hospital Unit during the same period.

The maternal characteristics included and compared between the two groups were: age, parity, BMI, pregestational diabetes and chronic hypertension. The analyzed maternal outcomes included preeclampsia, gestational diabetes, spontaneous onset of labour versus induced labour, mode of delivery, postpartum hemorrhage and venous thromboembolism. As neonatal outcomes, gestational age at birth, prematurity (defined as gestational age less than 37 weeks), weight at birth, Apgar score at one minute and

five minutes after birth and umbilical cord blood pH were included.

The analysis of the data and the results were obtained by using the statistical software SPSS version 20 and Microsoft Excel 2007. For both groups descriptive statistics were used. The variables are expressed in percentages and means  $\pm$  standard error. The statistical significance tests used were the Chi-square and Fisher's exact test for dichotomous qualitative variables and the Student t for continuous variables. For quantitative variables, multiple regression models were used. In all cases, statistically significant differences were considered when  $p < 0.05$ .

The study was approved by the Ethics Committee for Ethics in Clinical Research of the hospital. Informed consent was obtained from all the participants and the confidentiality of all of them was maintained.

## III. RESULTS

A total of 50 patients were included in both study groups.

The demographic characteristics of both groups are shown in Table 1. Within the group of morbidly obese patients, the mean age was 30.95 years (22-45) and the mean BMI 43.36 kg/m<sup>2</sup> (40-58). In the group of patients with normal weight, the average age was 29.76 years (22-41) and the average BMI 22.27 kg/m<sup>2</sup> (20-24.9).

Table 1: Demographic characteristics of the patients.<sup>a</sup>

Characteristics	Pregnant women with normal weight (n=50) <sup>b</sup>	Pregnant women with morbid obesity (n=50) <sup>c</sup>	Pvalue
Age (years)	29.76	30.95	-
BMI (kg/m <sup>2</sup> )	22.27	43.36	-
Parity	Nulliparous 23 (46) Prev. caesarean section 16 (32) Prev. vaginal delivery 10 (20)	Nulliparous 20 (40) Prev. caesarean section 19 (38) Prev. vaginal delivery 11 (22)	0.03 NS NS
Pregestational diabetes	1 (2)	5 (10)	NS
Chronic hypertension	1 (2)	10 (20)	0.008

Abbreviations: BMI, Body Mass Index; NS, Not Significant.

<sup>a</sup> Mean values  $\pm$  standard deviations or percentage (%).

<sup>b</sup> BMI 20.0-24.9 kg/m<sup>2</sup>.

<sup>c</sup> BMI  $\geq$  40 kg/m<sup>2</sup>.

The morbidly obese patients had a higher rate of nulliparity ( $P = 0.03$ ) and chronic hypertension ( $P = 0.008$ ) than patients with normal weight. Neither statistically significant differences in the previous mode of delivery (caesarean section or vaginal) nor a history of pregestational diabetes were found.

Maternal outcomes were obtained by univariate analysis and are shown in Table 2. In the group of morbidly obese patients, higher rates of preeclampsia ( $P = 0.03$ ), gestational diabetes ( $P = 0.013$ ) and delivery by caesarean section ( $P = 0.04$ ) were recorded

compared to control patients with normal weight. There were no differences in the onset of labour and in the occurrence of postpartum venous thromboembolism between the two study groups. However, there were more cases of postpartum hemorrhage in obese patients than in the group of patients with normal weight (14% vs 4%), but this difference did not reach statistical significance.

Table 2: Maternal outcomes.<sup>a</sup>

Results	Pregnant women with normal weight (n=50) <sup>b</sup>	Pregnant women with morbid obesity (n=50) <sup>c</sup>	Pvalue
Preeclampsia	2 (4)	10 (20)	0.03
Gestational diabetes	3 (6)	12 (24)	0.013
Onset of labour	Spontaneous 27 (54) Induced 23 (46)	Spontaneous 14 (28) Induced 36 (72)	NS NS
Delivery	Vaginal 36 (72) Caesarean section 14 (28)	Vaginal 28 (56) Caesarean section 22 (44)	NS 0.04
Postpartum hemorrhage	2 (4)	7 (14)	NS
Venous thromboembolism	0	0	NS

Abbreviations: BMI, Body Mass Index; NS, Not Significant.

<sup>a</sup> Mean values  $\pm$  standard deviations or percentage (%).

<sup>b</sup> BMI 20.0-24.9 kg/m<sup>2</sup>.

<sup>c</sup> BMI  $\geq$ 40 kg/m<sup>2</sup>.

Perinatal outcomes of the study are shown in Table 3. In our study, no statistically significant differences in terms of perinatal outcomes were found compared to those obtained in the group of patients with normal weight.

Table 3: Perinatal results.<sup>a</sup>

Results	Pregnant women with normal weight (n=50) <sup>b</sup>	Pregnant women with morbid obesity (n=50) <sup>c</sup>	Pvalue
Gestational age > 37 weeks	49 (98)	48 (96)	NS
Gestational age < 37 weeks	1 (2)	2 (4)	NS
Weight after birth (g)	3668 $\pm$ 158	3880 $\pm$ 191	NS
Weight after birth > 4000g	4 (8)	8 (16)	NS
Weight after birth < 2500g	2 (4)	4 (8)	NS
Apgar < 7 (1 minut)	1 (2)	7 (14)	NS
Apgar < 7 (5 minuts)	1 (2)	0	NS
Umbilical cord blood pH < 7,20	5 (10)	9 (18)	NS

Abbreviations: NS, Not Significant.

<sup>a</sup> Mean values  $\pm$  standard deviations or percentage (%).

<sup>b</sup> BMI 20.0-24.9 kg/m<sup>2</sup>.

<sup>c</sup> BMI  $\geq$ 40 kg/m<sup>2</sup>.

#### IV. DISCUSSION

Overweight and obesity among pregnant women have recently become a worldwide problem.

Obesity during pregnancy is associated with many maternal and perinatal risks. The appearance of these risks is proportional to the degree of obesity presented by the patient (Torloni et al. 2009; Scott-Pillai et al. 2013; Blomberg et al. 2013). Managing these problems and potentially reduce their risks is currently a challenge for specialists in Obstetrics (Gunatilake et al. 2011).

In our review, morbidly obese patients (BMI  $\geq$  40.0 kg/m<sup>2</sup>) had higher nulliparity (40%) and chronic hypertension (20%) rates than control patients with normal weight. However no significant data regarding pregestational diabetes were found. These data are consistent with the study published by Crane et al (Crane et al. 2013), where pregnant women with extreme obesity (BMI  $\geq$  50 kg /m<sup>2</sup>) presented higher nulliparity (59.2%), chronic hypertension (7%) and pregestational diabetes (5.6%) rates than the control patients with normal weight.

According to our figures, from the total of our obese pregnant patients, 10 (20%) had preeclampsia, 12 (24%) gestational diabetes and 22 (44%) delivered by caesarean section. 4 (8%) out of the obese pregnant women who developed preeclampsia during pregnancy, suffered already from chronic hypertension at the beginning of the study. These data are similar to those obtained in other studies (Crane et al. 2013; Weisset et al. 2004). According to the literature reviewed, pregnant women with obesity (BMI  $\geq$  30.0 kg/m<sup>2</sup>) have a higher prevalence of gestational diabetes (Ehrenberg et al. 2002, Gross et al.1980), higher rates of hypertensive disorders of pregnancy (Robinson et al. 2005; O'Brien et al. 2003; Gaillard et al. 2011) and a higher rate of induction and failure of labour induction (Denison et al.2008; Wolfe et al. 2011) than the general obstetric population.

In our study, a total of 7 patients (14%) had postpartum hemorrhage, all managed by conservative measures. With regard to venous thromboembolism, no cases were found in any of our both study groups. This result can be explained because all the morbidly obese

pregnant patients in our Obstetrics Unit are treated with low molecular weight heparins in prophylactic doses administered daily during pregnancy. According to the latest Uptodate 2016 on obesity and pregnancy, there is a clear association between maternal obesity and the risk of postpartum hemorrhage (Sebie et al. 2001) and venous thromboembolism (Nuthalapaty et al. 2016).

In our review, the average weight of the babies of morbidly obese mothers was 3880 g. 4% of fetuses were premature compared to 8.5% in other studies (). The percentage of macrosomes was 16% in contrast to 38% in Crane et al (Crane et al. 2013) or 12.3% in Wahhabi et al (Wahabi et al. 2014). Total newborns weighing <2500 g. was 4 (8%), a figure that contrasts with other studies where the percentage is around 4% (Crane et al. 2013; Wahabi et al. 2014). This data is justified by the percentage of chronic hypertensive patients among the obese patients included in the study. According to similar studies published, pregnant women with morbid obesity present higher risk of congenital malformations (Wahabi et al. 2014), prematurity, macrosomic fetuses, shoulder dystocia (RCOG 2010) as well as neonatal admissions, stilldeath and neonatal death (Aune et al. 2014).

We are aware of the limitations of our study. On the one hand, because of the retrospective nature of our research; on the other hand, because of the small sample size of the study group (N=50). This could explain the lack of statistical significance in most of the variables studied.

## V. CONCLUSION

Pregnant women with morbid obesity (BMI  $\geq$  40.0 kg/m<sup>2</sup>) present a higher risk of maternal and perinatal complications. Therefore, further development and the elaboration of programs from the preconception period are recommended. This should be done in specialized units that value individual needs and the risk factors of each patient in order to prevent, reduce and properly handle the complications that may arise for both mother and fetus.

### *Declaration of Interest*

The authors declare no conflict of interest. The authors are the only responsible for the content and the writing of the paper.

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