Zagazig University Medical Journal
www.zumj.journals.ekb.eg
https://dx.doi.org/10.21608/zumj.2020.21824.1670 Volume 28, Issue 6, November 2022(171-176) Supplement Issue

Manuscript ID ZUMJ-2001-1670 (R2)
DOI **10.21608/zumj.2020.21824.1670**

ORIGINAL ARTICLE

Effect of Maternal Obesity on Duration of Labor and Mode of Delivery in Primigravida

Yousef Abo Elwan Elsayed [(1)], Ali ElShabrawy Ali [(1)], Mustafa Taha Abdulfattah [(2)], and Mona Khalil Egwaila [(3)]

1) Professor of Obstetrics and Gynecology, Faculty of Medicine - Zagazig University
(2) Lecturer of Obstetrics and Gynecology, Faculty of Medicine - Zagazig University
(3) M.B.B.Ch, Obstetrics and Gynecology department, faculty of medicine, Almargeb University – Libya

Corresponding author
Mona Khalil Egwaila
E.mail :
monakhalill213@gmail.com

Submit Date 2020-01-12
Revise Date 2020-04-27
Accept Date 2020-05-05

ABSTRACT

Background: Obesity was related with high risks for maternal morbidity and mortality, Pregravid obesity is distinct potentially modifiable risk factors with differing associated adverse complications.

Objectives: This study aimed to evaluate the effect of BMI on labor duration and determine the obesity effect on delivery mode in primigravida at term whether C/S rates are increased in overweight and obese women.

Patients & Methods: This case control study was done in Gynecology department, Faculty of Medicine, Zagazig University Hospitals during the period from January to June 2019. It included 100 women (50 laboring primpgravidae Overweight and obese pregnant women, with (BMI≥25 kg/m^2) at ≥ 37 weeks in the Obstetrics and 50 Healthy, primigravidae women (BMI 18.5- 24.9 kg/m^2) with a singleton vertex cephalic pregnancy of a gestational age 37-42 weeks as a control group).

Results: The results of the study revealed that the duration of 1st stage of labor are differing significantly among obese, overweight, and normal weight primigravidae. There is directly proportional association between maternal BMI and the length of the 2nd stage in primigravidae. The C/S rate was significantly different between obese and normal-weight women, it was (54%) in overweight and obese group and (18%) in normal-weight group, there was no statistical significant difference between the bo th groups regarding postpartum complications.

Conclusion: Labor progress in obese is more slowly with significantly longer labor duration especially first and second stages in comparison to average weight concerning BMI. Obese primigravida has more chance for induction failure and risk for C/S and its complication.

Keywords: Obesity, Primigravida, labor duration, cesarean section.

INTRODUCTION

The body mass index (BMI) was increased during the last 30 years and obesity has become an international health matter. women with high BMI index had many complications during pregnancy like preeclampsia, gestational diabetes, dystocia and macrosomia [1].

Furthermore, increasing BMI is associated with an increased rate of induction of labour, and caesarean delivery (C/S) due in part to failure of labor progression [2].

Obese women delivered by CS had increased rates of morbidity and mortality compared with normal BMI women in addition to the increased use of healthcare resources [3].

Obese women had a longer labor according due insufficient contractions during the first stage of labor, with a high rate of induction and augmentation [4]. In addition, obese women had a longer labor in second stage; and need more stimulation by oxytocin. Compared with newborns of normal weight women, the risk to receive low Apgar scores (4-6) is increased in newborns of

obese and morbidly obese mothers and that admission rates for newborn intensive care units are higher in these babies [5].

The maternal obesity is associated with adverse outcomes for mothers and babies such as longer duration of hospital stay, intensive care with the limited health services in the undeveloped countries [6]**.**

This study aimed to evaluate the effect of BMI on labor duration and determine the obesity effect on delivery mode in primigravida at term whether C/S rates are increased in overweight and obese women.

PATIENTS AND METHODS

This case control study was done in Gynecology department, Faculty of Medicine, Zagazig University Hospitals during the period from January to June 2019. It included 100 women (50 laboring primpgravidae Overweight and obese pregnant women, with (BMI≥25 kg/m^2) at ≥ 37 weeks in the Obstetrics and 50 Healthy, primigravidae women (BMI 18.5- 24.9 kg/m^2) with a singleton vertex cephalic pregnancy of a gestational age 37-42 weeks as a control group) comparing them about duration, induction, augmentation, and mode of delivery.

Written informed consent was taken from all participants and this study was approved by the research ethical committee of Faculty of Medicine, Zagazig University according the Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

Inclusion criteria: Overweight and obese pregnant women (BMI index ≥25 kg/m^2) at ≥ 37 weeks

Pregnant women (BMI 18.5- 24.9 kg/m^2) with a singleton vertex cephalic pregnancy of a gestational age 37 -72 weeks

Exclusion criteria: Patients unable or unwilling to give informed consent, BMI less than 18.5 kg/m^2, multiparous women, women with any systemic disease (diabetes, heart and kidney disease), multiple pregnancy, preterm labor.

The women enrolled in the study were classified into 2 groups:

Group I (case group): 50 women with BMI equal to or more than 25 kg/m^2 , also sub divided to overweight and obese according to BMI index.

Group II (control group): 50 women were with BMI ranging between 18.5 – 24.9 kg/m^2.

All patients were subjected to the following:

Full history taking: (personal history, menstrual history, medical and surgical history). Gestational age determined by the last menstrual period and confirmed by early scan, gestational hypertension, fetal movement reduction).

Examination: Vital signs records **(**temperature, blood pressure, pulse**).** Abdominal examination: Including, fundal level, uterine contraction, fetal heart sound, uterine tenderness**.** Pelvic examination: Pervaginal examination is done to determine cervical dilatation, effacement and to diagnose the active stage of labor when cervix reaches 4cm dilatation and also to exclude cephalopelvic disproportion.

Calculation of Body Mass Index: Maternal height (meters) and weight (kilogram) were measured to calculate the body mass index (BMI) by the formula: BMI = Weight (kg)/ Height^2 (m).

Women were grouped into normal weight (BMI between 18.5 and 24.9), overweight (BMI between 25.0 and 29.9) and obese (BMI ≥ 30.0) [7].

The height and weight of the women in the first trimester was measured in the first antenatal consultation. BMI index of Early pregnancy was measured and they grouped in BMI categories of <25 kg/m2, 25 –29.9 kg/m2, and ≥ 30 kg/m^2.

Gestational age was evaluated from history of 1st day of last normal menstrual period, or with a dating U/S scan. According to current guidelines of the American College of Radiology (ACR) and American Institute of Ultrasound in Medicine (AIUM) for the performance of first-trimester obstetric U/S examination, assessment of gestational age either by measurement of mean sac diameter (before visualization of embryonic pole) or by embryonic/fetal pole crown-rump length [8].

Partogram provided information on cervical dilatation in centimetres against duration of labour in hours, , intensity, frequency, and duration of uterine contractions and maternal condition (temperature, pulse rate and blood pressure), condition of the fetal (heart rate and amniotic fluid state), descent of the fetal head, cardiotocography (CTG) and augmentation using oxytocin.

The study definitions were

The length of first stage labor: it is the time from onset of active phase of labor until full cervical dilatation. After admission, women was monitored from the start of uterine contractions. The optimum rate of uterine contractions considered will be 3-4/10 min. Amniotomy was performed when the cervix reached 4 cm dilatation. When augmentation will be needed, no prostaglandins will be used. Oxytocin was given by intravenous drip infusion an initial dose of 0.5 mU/min to 2 mU/min and incremental increase of 1 mU/min to 2 mU/min every 15 minutes to 40 minutes.

Length of the second stage of labor: defined from full cervical dilatation until expulsion of the fetus. Full cervical dilatation was confirmed by local vaginal examination and when the subjects will start to bear down involuntarily.

The length of third stage labor: defined from delivery of fetus up to complete delivery of placenta.

Statistical analysis: Data were collected, tabulated and analyzed by SPSS 20 software. Qualitative data were represented as number and percentage, quantitative data were represented by mean ± SD, the following tests were used to test differences for significance;. difference and association of qualitative variable by Chi square test (X^2) . Differences between quantitative independent groups by t test. The level significance was considered at ($p<0.05$) and high significance at ($P<0.001$).

RESULTS

The research population consisted of 100 participants in total, distributed on 50 cases (abnormal BMI), in which 39% were overweight and 11% obese were compared with 50 cases of average weight primigravidae**_(Table 1).** There was a statistical significant difference between both groups as regard duration of rupture of membrane (ROM) at admission and the need for labor augmentation; however, there was no statistical significant difference between them as regard labor onset or mode of rupture of membrane (ROM) **(Table 2)**. There was a statistical significant difference between both groups as regard mode of delivery (higher percentage of case group underwent C/S). There was no statistical significant difference between them as regard indication of C/S **(Table 3)**. There was high statistical significant difference between both groups as regard time of C/S in 1st stage of labor, no difference between groups regards C/S in 2nd stage of labor **(Table 4)**. There was a statistical significant relation between BMI and duration of first labor stage, with the difference is significant between normal and overweight group ($p=0.014$), normal and obese group ($p<0.001$). There was a statistical significant relation between BMI and duration of second labor stage, where the difference was significant between normal and overweight group ($p=0.013$), normal and obese group ($p<0.001$). However, there was no statistical significant difference between them regarding length of first or third stage **(Table 5)**. There was no statistical significant difference between the studied groups as regard occurrence or type of postpartum complications **(Table 6)**.

Table (1) Distribution of the studied patients according to BMI:

BMI	N=100	%
Normal weight (18.5 - 24.9)	**50**	**50**
Overweight (25.0 - 29.9	**39**	**39**
Obese (BMI ≥ 30.0)	**11**	**11**

BMI: body mass index.

Table (2): Comparison between the studied groups regarding labour onset, augmentation, and rupture of membrane:

	Groups		p
	Case group (50) N (%)	**Control group (50) N (%)**	
Labor onset:			
Induced	**17 (34)**	**14 (28)**	
Spontaneous	**33 (66)**	**36 (72)**	**0.517**
Mode of ROM			
Artificial	**28 (56)**	**36 (72)**	**0.096**
Spontaneous	**22 (44)**	**14 (28)**	
Augmentation of labor:			
No	**22 (44)**	**32 (64)**	**0.045***
Yes	**28 (56)**	**18 (36)**	
	Case group (50)	**Control group (50)**	**P**
Duration of ROM at admission:			**0.033***
Mean ± SD	**11.64 ± 4.93**	**8.36 ± 4.62**	
Range	**5 - 24**	**3 - 12**	

Table (3) Comparison between the studied groups regarding mode of delivery and indication of C/S:

	Groups		Groups
	Case group (50) N (%)	**Control group (50) N (%)**	
Mode of delivery:			
CS	**27 (54)**	**9 (18)**	**<0.001****
VD	**23 (46)**	**41 (82)**	
Indication of CS:			
No progress	**8 (29.6)**	**2 (22.2)**	**0.218**
Arrested 2nd stage	**1 (3.7)**	**2 (22.2)**	
Fetal distress	**18 (66.7)**	**5 (55.6)**	

**** highly significant**

C/S: cesarean section; VD: vaginal delivery.

Table (4) Comparison between the studied groups regarding time of C/S:

	Groups		Test	
	Case group	**Control group**	**X2**	**P**
Time of C/S	**N=27 (%)**	**N=9 (%)**		
First stage	**23 (85.2)**	**7 (77.8)**	**Fisher**	**<0.001****
Second stage	**4 (14.8)**	**2 (22.2)**		**0.627**

Table (5) Comparison between BMI category of the studied patients regarding length of labor stages:

Length of	BMI						p
	Average		**Overweight**		**Obese**		
	Mean ± SD	**Range**	**Mean ± SD**	**Range**	**Mean ± SD**	**Range**	
1st stage (hour)	**6 ± 0.89**	**4.5-8**	**6.61 ± 1.02**	**5 - 8**	**7.9 ± 0.74**	**7 - 9**	**<0.001****
2nd stage (minute)	**55.64 ± 14.15**	**30 - 90**	**66.05±16.29**	**30 - 90**	**86.2 ± 7.5**	**75 - 90**	**<0.001****
3rd stage (minute)	**9.36± 2.76**	**5 - 15**	**10 ± 2.26**	**7 - 15**	**13.75 ± 7.68**	**8 - 25**	**0.35**

Table (6) Comparison between the studied groups regarding postpartum complications:

Complications	Groups		p
	Case group N (%)	**Control group N (%)**	
No	**39 (78)**	**45 (86)**	**0.538**
Yes	**11 (22)**	**7 (14)**	
Cervical tear	**2(18)**	**1 (14)**	
Vaginal and perineal tear	**4(36)**	**3 (42)**	
PET	**3 (27)**	**1 (14)**	**0.489**
PPH	**2 (18)**	**1 (14)**	
Hypotension	**0 (0)**	**1 (14)**	

PET = Preeclampsia, PPH = postpartum hemorrhage

DISCUSSION

The BMI index is a good indicator for the degree of obesity. Obesity and a stable lifestyle during pregnancy can reduce the abdominal muscles contractility, leading to suboptimal use of abdominal pressure during labor and lack of productive force, which may cause a prolonged labor [9]

The current study that showed that the labour was induced in 34% of cases and 28% of control

groups, but no significant difference, which in agreement with the study of **Çalik et al., [10]** who studied the effects of body mass index and gestational weight gain on obstetric outcomes and reported that the induction rate of pregnancies of mild obesity and obesity were higher than the normal weight patients.

The present study showed that there was a statistical significant difference between the studied groups regarding labor augmentation, which in agreement with the study of **Walsh et al. [11]** In their study for correlation between body mass index and dystocia in spontaneous and induced primigravidae labors, in spontaneous labor group oxytocin augmentation was required significantly more when the BMI is increased.

The current study showed that there was a high statistical significant longer 1st stage of labour for obese than average weight, which agreed with the study of **Carlhäll et al. [12]** who reported in their study of primigravidae women with a spontaneous onset of labor that an association between maternal obesity and increased duration of the active phase of labor.

Rogers et al. [13] in a review of conceptual basis for the effect of obesity on the cesarean delivery risks, they reported that in the first stage of labor, obese women progress slowly and take long time to reach the active labor and the second stage of labor, that support the result of current study.

Rodríguez-Mesa et al. [14], demonstrated no differences were found in the expulsion time depending on BMI between both obese and average weight primiparous ladies. That is against the current study in which reported that there was a high statistical significant difference in 2nd stage concerning average, overweight, and obese deliveries.

The current study which reported increased of labor duration, oxytocin requirements, among higher body mass index women in which there is statistically highly significant difference between the studied groups regarding mode of delivery (higher percentage of case group underwent C/S), these results were in agreement with the study of **Pevzner et al. [15]** who showed that the obesity was associated with the high risks for failed medical labor induction, oxytocin requirements, and cesarean delivery rates were significantly higher in women with a greater BMI.

Fyfe et al. [16] studied the first and second-stage cesarean delivery risks due to increased body mass index among primigravida women, they showed that the cesarean section in the first stage of labor was higher in obese women, it was 31% compared with 13% in normal weight women, while the cesarean section rate in the second stage was similar comparing obese, overweight, and normal weight women, that is advocate the result of current study about rate of cesarean section in 1st stage more in case group, but conflict the result about the rate of cesarean section in 2nd stage that is more among case group too.

Ellekjaer et al. [1] reported that there was a significant increase in caesarean deliveries due to increased BMI, and showed that there was an independent effect of obesity on the caesarean delivery risk. So caesarean deliveries must be performed sooner in obese women after the onset of active labour than in normal-weight women in caesarean deliveries, and shortening the duration of active labour in obese women, which support the current study about the rate of caesarean deliveries more among case group than controls, and their time are more in 1st stage of labour.

The current study showed that the vaginal delivery was 82% in control group, and C/S was 18% in the same group, while in case group vaginal delivery was 46%, and C/S was 54%, which agreed with the study of **Sadiq and Mohsin [6]** concluded that in average weight primigravida, vaginal delivery took place in 71.7% and LSCS cases were 28.3%. In obese cases vaginal delivery was in 45.9% and LSCS which comes out to be 54.1%,

Polnaszek et al. [16] was documented from a prospective cohort study of 4,653 obese (BMI ≥30 kg/m 2) women underwent an IOL with singleton deliveries from 2010-2014 at ≥37 weeks, 1,344 (29%) had a failed IOL with primigravida 1,022/1,344 (44%), Over 40% of obese primigravida women had a failed IOL, While in present study about 58.8% of cases had a failed IOL.

CONCLUSION

Labor progress in obese is more slowly with significantly longer labor duration especially first and second stages in comparison to average weight concerning BMI. Obese primigravida has more chance for induction failure and risk for C/S and its complication.

Recommendations: A large studies are needed to identify ways of reducing the negative influence on labor outcomes and to confirm the effects observed in this study.

REFERENCES

1- **Ellekjaer KL, Bergholt T, Løkkegaard E.** Maternal obesity and its effect on labour duration in nulliparous women: a retrospective observational cohort study. BMC pregnancy and childbirth 2017; 17 (1): 222.

2- **Kansu-Celik H, Kisa Karakaya B, Guzel AI, Tasci Y, Erkaya S.** To evaluate the effect of pre-pregnancy body mass index on maternal

and perinatal outcomes among adolescent pregnant women. The J Matern Fetal Neonatal Med. 2017, 30(13): 1574-78.

3- **Catalano PM, Shankar K.** Obesity and pregnancy: mechanisms of short term and long term adverse consequences for mother and child. BMJ 2017, 356: j1.

4- **Simkin P, Hanson L, Ancheta R.** The labor progress handbook: early interventions to prevent and treat dystocia. John Wiley & Sons, 2017.

5- **Sfandiary M, Parvizi S, Almasi A, Sharifipour F.** Effect of pre-pregnancy maternal body mass index on pregnancy outcomes in nulliparous women in the Islamic Republic of Iran. East Mediterr Health J 2017; 23 (10): 657-61.

6- **Maged AM, El-Semary AM, Marie HM, Belal DS, Hany A, Taymour MA**. Effect of maternal obesity on labor induction in postdate pregnancy. Arch Gynecol Obstetrics 2018; 298 (1): 45-50.

7- **World Health Organization**. Global Health Observatory (GHO) data: obesity. World Health Organization 2016. Available from www. who. int/gho/ncd/risk_factors/overweight/en/Accessed, 17.

8- Levine EM, Fernandez CM, Miller D, Locher S. Clinical Value of 3-Dimensional Ultrasound in Gynecology. J Ultrasound Med. 2018; 37(10): 2445-50.

9- **Zhou L, Yang HX, Zhao RF, Zhang WY.** Association of pre-pregnancy body mass index and gestational weight gain with labor stage. Chin Med J 2019, 132(4): 483-87.

10- **Çalik KY, Yildiz NK, Erkaya R.** Effects of gestational weight gain and body mass index on obstetric outcome. Saudi J Biol Sci. 2018; 25(6): 1085-89.

11- **Walsh J, Foley M, O'Herlihy C.** Dystocia correlates with body mass index in both spontaneous and induced nulliparous labors. J Matern Fetal Neonatal Med. 2011 ; 24:817-21

12- **Carlhäll S, Källén K, Blomberg M.** Maternal body mass index and duration of labor. Eur J Obstet Gynecol Reprod Biol. 2013; 171 (1) : 49-53.

13- **Rogers AJG, Harper LM, Mari G.** A conceptual framework for the impact of obesity on risk of cesarean delivery. Am J Obstet Gynecol 2018; 219 (4): 356-63.

14- **Rodríguez-Mesa N, Robles-Benayas P, Rodríguez-López Y, Pérez-Fernández EM, Cobo-Cuenca AI.** Influence of Body Mass Index on Gestation and Delivery in Nulliparous Women: A Cohort Study. Int J Environ Res Public Health 2019; 16 (11): 2015.

15- **Pevzner L, Powers BL, Rayburn WF, Rumney P, Wing DA.** Effects of maternal obesity on duration and outcomes of prostaglandin cervical ripening and labor induction. Obstet Gynecol 2009; 114 (6): 1315-21.

16- **Fyfe EM, Anderson NH, North RA, Chan EH, Taylor RS, Dekker GA.** Risk of first-stage and second-stage cesarean delivery by maternal body mass index among nulliparous women in labor at term. Obstet Gynecol 2011; 117(6): 1315-22.

17- **Polnaszek B, Rosenbloom J, Woolfolk C, Macones G, Cahill A.** Increasing maternal obesity: Predictor for failed induction of labor?. Am J Obstet Gynecol 2019, 220(1).

How to cite

Egwaila, M., El Sayed, Y., Ali, A., Abdulfattah, M. Effect of Maternal Obesity on Duration of Labor and Mode of Delivery in Primigravida. Zagazig University Medical Journal, 2022; (171-176): -. doi: 10.21608/zumj.2020.21824.1670