https://menj.journals.ekb.eg
Print ISSN: 2735-3974
Online ISSN: 2735-3982
DOI: ----------

MNJ
Menoufia Nursing Journal
Faculty of Nursing
Menoufia University

Progress of Labor among Obese Women

Basma Reda Abou Hassan[1], Fatma Mohamed El-Shobary[2]

and Samah Abd El-Alim El-Homosy [3]

[1]Clinical Instructor of Maternity and Newborn Health Nursing, Faculty of Nursing, Menoufia University

[2]Follow of Maternal Health and Newborn, National Liver Institute, Menoufia University

[3] Assistant Professor of Maternal and Newborn Health Nursing, Faculty of Nursing, Menoufia University

Abstract: Background: Maternal obesity has been associated with multiple comorbidities and a higher risk of obstetric and antepartum complications, such as prolonged labor and increased CS. The purpose of the present study was to assess progress of labor among obese women. **Design:** A descriptive research design was used. **Sample:** A purposive sample of 370 laboring women was divided into two groups: the obese group and the normal-weight women group. Each group had 185 participants. **Settings:** The study was conducted at the obstetric departments of the University Hospital and Shebin El-Kom Teaching Hospital in Menoufia Governorate. **Instruments** of this study were a structured interview questionnaire that included sociodemographic characteristics of women (name, age, education, and occupation), menstrual, obstetric, medical surgical history, weight, height, BMI, etc.) and a partogram to assess the progress of labor. **Results:** There was a lower mean duration of the latent and active phases (first stage), second stage, and total duration of labor in normal-weight women than in obese women. Also, the mean dose of oxytocin during the first stage of labor was lower in the normal-weight women than in the obese women. Nearly half of the obese women had CS delivery, compared to only one-third of the normal-weight women. **Conclusion:** Obese women had prolonged labor duration, slow progress of labor, and a higher rate of CS delivery than normal-weight women. **Recommendations** Provide health education for obese laboring women during their antenatal counseling, including a healthy diet and exercise to reduce their weight.

Keywords: *Maternal Obesity, Progress of labor.*

Introduction

According to Riley et al. (2018), the worldwide prevalence of obesity has increased over the past few decades. They added that economic, technological, and lifestyle changes have created an abundance of unhealthy, high-calorie food coupled with decreased required physical activity.

Also, based upon the World Population Review 2020, Egypt ranked as the 19th highest country in the world and the 7th highest country in the Arab region, with a 32% obesity rate. Additionally, Sedky et al. (2021) stated that obesity is a major public health issue in Egypt, and its repercussions are not only limited to the health dimension but also extend to affecting the productive capacity of the citizens. They also added that according to the "100 million Seha" initiative, 39.8% of Egyptian adults suffer from obesity.

Likewise, Strauss (2021) showed that women are an integral part of this overflowing wave of obesity. Therefore, he revealed that maternal obesity can result in negative outcomes for both women and fetuses. Also, he added that the maternal risks during pregnancy include gestational diabetes and preeclampsia, and the fetus is at risk for stillbirth and congenital anomalies.

Meanwhile, Azaïs et al. (2017) showed that it is important to have knowledge about the effect of obesity on the progress of labor to help obstetricians take measures to avoid complications during childbirth.

Additionally, Zhang & Duan et al. (2018) noticed that progress in labor is determined by assessing the four following components, also known as the four Ps: power, passenger, passage, and psyche. They also added that power refers to uterine contraction, passenger refers to the fetus and placenta, passageway refers to the pathway the fetus takes out of the mother's body (pelvis and related structures), and psyche refers to a woman's emotional state. Also, they concluded that all of these must work together in synchronicity to achieve a successful vaginal birth.

Moreover, Kyozuka et al. (2022) stated that a pre-pregnancy BMI > 30.0 kg/m2 was an independent risk factor for dystocia (an abnormality in the progression of labor). Also, they added that dystocia is one of the most common obstetric complications among nulliparous women, for which medical intervention is justified because dystocia is associated with operative vaginal delivery and cesarean section (CS).

Significance of the study:

There is a remarkable increase in obesity, with more than one-third of the whole population being obese in Egypt. Also, they added that a particular issue is that the prevalence of obesity is more than double among females (46%), as compared to males (22%). Moreover, it was reported that there is no national program to address the problem, and 95% of these females are not taking any measures to change their weight (Shahrir et al 2021).

Moreover, better knowledge of the impact of obesity on labor pathophysiology should strengthen the prevention of obesity complications in women of childbearing age and provide suitable and effective management (Azaïs et al 2017). So, this study aimed to assess progress of labor among obese women.

Definitions of variables

Obesity is the accumulation of an excess of energy stored in the form of excess body fat. This excess results from the fact that the energy obtained from the diet is superior to the energy

used, resulting in energy balance dysregulation, which is due to complex and multifactorial aetiologies (Ghanemi & St-Amand, 2018). In this study, obesity is operationally defined as any pregnant woman having a body mass index of 30 or higher, and this high BMI is acquired before pregnancy. This will be assessed using Instrument I.

The progress of labor is the result of the assessment of four components, including power, passenger, passage, and psyche (Thornton et al., 2020). In this study, the progress of labor is operationally defined as measuring the progress of labor by portogram. This will be assessed using Instrument II, which measures two factors: power (the strength of uterine contraction) and passenger (size and position of the fetus), and the nurse will determine if there is normal progress of labor or if there is any deviation or deterioration and will take timely intervention.

Purpose of the study

The present study's purpose is to assess progress of labor among obese women.

Research Questions

1) What is the progress of labor among obese and normal-weight women?
2) Are there differences between obese and normal-weight women in the occurrence of complications during labor?
3) What is the correlation between body mass index and cervical dilation?
4) What is the correlation between body mass index and oxytocin requirement?

Method

Research design:

A descriptive design was used to carry out this study.

Research Settings:

The study was conducted in two settings: the obstetric departments at the University Hospital and Shebin El-Kom Teaching Hospital in Menoufia Governorate.

Sample size estimation:

Based on the review of past literature (Valente et al., 2020), who found that obese women had a few cases of normal vaginal delivery (28.9 versus 32.9%), (P = 0.03). The sample was calculated using the following equation: {N= r+1(P) (1-P) (Zβ+Zα/2)2 / r (P1-P2)2} where r is the ratio between cases and controls, P: proportion in cases and controls, P1-P2 is effect size, Zα/2 is the standard normal variate at 5% type I error, and Zβ is the standard normal variate at power 80%; it equals 0.84. The sample was calculated at a power of 80% and a confidence level of 95%. The calculated sample was N=1+1(0.175) (0.82(0.84+1.96)2 \1 (28.9-32,9)2 = 0.287×7.84\0.0121 =185 per group, for a total sample of 370 laboring women divided into two groups of 185 each: the obese group and the control group, each with 185 participants.

Sample type:

A purposive sample of 370 laboring women was divided into two groups: the obese group and the normal-weight women group. Each group has 185 participants.

The inclusion criteria for the sample are as follows:

1) Primiparous women (Obese and normal-weight women).
2) Age 20-40 years.
3) Cephalic occipital-anterior position in the first stage of labor

The exclusion criteria for the sample are as follows:

1) Multiparous women.
2) High-risk pregnancy (Malpresentation, chronic disease).

Instruments for data collection consisted of:

Instrument I: A structured interview questionnaire:

This questionnaire was developed by the researchers based on pertinent literature and the guidance of the supervisors. It consisted of socio-demographic and medical characteristics of women (age, education, occupation, menstrual, obstetric, medical-surgical history, etc.) and other data such as weight and height to calculate BMI.

Table 1: BMI classification

Classification	BMI (kg/m2)
Obese	≥30.0
Overweight	25-29,9
Normal weight	<25
Underweight	<18.5

Adopted from Khalifa et al. (2021). Effect of maternal BMI on labor outcomes in primigravida pregnant women. BMC pregnancy and childbirth, volume 21, article number: 753 (2021), page 2.

Instrument II: Partogram to assess the progress of labor:

A partogram is a pictorial or graphical record of key maternal and fetal events in labor plotted against time on a single sheet of paper (Sara & Lack, 2022). The UK National Institute for Health and Care Excellence (NICE) recommends a system to record the key events of labor, and the latest World Health Organization (WHO) modified partogram has been incorporated as an essential birthing record tool in many maternity hospitals.

According to WHO (2007) and Mitchell (2010), most partograms contained fetal and maternal records in addition to cervical dilation. The fetal record might track the fetal heart rate, the descent of the fetal presenting part, the condition of amniotic fluid, and the moulding of the fetal skull. The maternal record includes temperature, heart rate, blood pressure, urine (for protein and ketones), uterine contraction, and the use of medications (such as oxytocin). This form allowed health care providers to record, interpret, analyze, and use data to make decisions on labor management. Alerts and action lines were printed on the partogram for the active phase of labor. An alert line started at 4 cm of cervical dilation and extended to the point of expected full dilation at the rate of 1 cm/h. In the active phase of labor, the plotting of cervical dilation normally remained on or to the left of the alert line. When dilation crossed to the right of the alert line, it was a warning that labor may be prolonged. The action line is parallel and four hours to the right of the alert line. When cervical dilation crosses this line, action must be taken immediately.

Validity of the Instrument:

For validity purposes, the researchers developed this instrument after reviewing the current national and international related literature using books, articles, and scientific journals. The instrument was cross-checked for face validity by five experts (three professors in maternal and newborn health nursing (and two assistant professors from the obstetrics and gynecology departments). The modifications needed were made according to the experts' suggestions.

Reliability of the instrument:

The researchers would use reliability to test the instrument's internal consistency by administering the same instrument to the same respondents under identical conditions on two or more occasions.

Pilot Study:

A pilot study was implemented to test the applicability of the instruments, the feasibility of the study, and the time needed for data collection. It was performed on 10% of the total participants, which are 37.

Ethical considerations

The protocol was approved by the Ethical and Research Committee of Menoufia University's Faculty of Nursing on May 18, 2022. Informed consent was obtained from maternity nurses regarding their approval to share in the study. They were assured of the confidentiality and anonymity of the collected data.

Procedure:-

- At the study's beginning, the researchers introduced themselves and explained its purpose and nature to the participants.
- Written consent from the participants who participated in the study was obtained.
- Women who fulfilled the inclusion criteria and came to the previously stated hospital during the first stage of labor were included in the study. They were recruited and monitored from the first stage of labor until the end of labor. The researchers presented to the obstetric department from 9 a.m. to 3 p.m. and interviewed about 1-2 women in the presenting days. The researchers introduced themselves to them, provided a verbal explanation of the study, and answered all questions. Then they were to complete the socio-demographic characteristics, BMI (the study focused on pre-pregnancy weight that had been recorded in the first antenatal visit record), data about current pregnancy, and current labor.
- Initial assessment and examination of the woman
  The researchers started to collect data through general, abdominal, and vaginal examinations, which were obtained from the woman's records.
- General physical examination
  The researchers assessed the general condition by taking vital signs (temperature, pulse, respiration, and blood pressure), assessed the degree of labor pain by NRS, and assessed the patient's response to cope with pain.
- Abdominal examination
  An abdominal examination was performed to determine the fundal level, lie, presentation, position, and attitude of the fetus, as well as the fetal heart sound.
- Vaginal examination
  The vaginal examination was performed for all participants upon admission, then every hour to determine cervical dilation, effacement, station, and the presenting part by the physician.

- Continuous assessment and monitoring of labor progress using a partograph

The researchers used the partograph to assess the following:

a) Fetal condition: the fetus was monitored by regular observation of the fetal heart rate using sonicaid. This was repeated and recorded every 30 minutes. Liquor and the moulding of the fetal skull bones were assessed through a vaginal examination.

b) The progress of labor was assessed through uterine contractions for intensity, duration, frequency, and descent of the fetal head via abdominal examination and cervical dilation via vaginal examination.

c) Maternal condition: regular assessment of the woman's condition was achieved by recording the woman's vital signs (temperature, pulse, respiration, and blood pressure) and by charting the administration of drugs, fluids, oxytocin, and urine output. Then the researchers observed and monitored the women during the second and third stages of labor and observed if any complications occurred to the mother or the fetus during the stages of labor for both obese and normal-weight women to be able to assess the effect of obesity on the progress of labor.

Statistical Analysis:

Data was collected, entered, tabulated, and statistically analyzed using an IBM personal computer with Statistical Package for Social Science (SPSS) version 25 (SPSS, Inc., Chicago, Illinois, USA). Graphics were done using Excel programs.

Quantitative data were presented as the mean (X) and standard deviation (SD). It was analyzed using the student t-test for comparison between two means and the ANOVA (F) test for comparison between more than two means.

Qualitative data were presented in the form of frequency distribution tables, numbers, and percentages. It was analyzed using a chi-square ($\chi 2$) test to study the association between the two qualitative variables. However, if the expected value of any cell in the table was less than 5, the Fisher exact test was used (if the table was 4 cells) or the likelihood ratio (LR) test (if the table was more than 4 cells). The level of significance was set at a P value of <0.05 for all significant tests. Pearson's correlation (r) test to measure the association between quantitative variables.

- A P value > 0.05 was considered statistically nonsignificant.
- A P value < 0.05 was considered statistically significant.
- A P value < 0.001 was considered statistically highly significant.

Limitations of the study

- The size of the study population.
- BMI was recorded in early pregnancy, and this study cannot therefore account for the effect of gestational weight gain on labor duration or outcome.
- The gestational age at the first prenatal visit was not recorded; however, most women attended visits early in their pregnancy, as is standard practice.

Results

Table 1 shows the demographic data and medical history of the studied women. As evident from the table, there were no statistically significant differences between the normal-weight women group and the obese group regarding the demographic data and medical history in terms of age, educational level, occupation, monthly

income, marriage duration, and the presence of any chronic diseases.

Table 2 reflects the mean and standard deviation of the studied women according to their physical measurements. It showed that there were statistically significant differences between the normal-weight group and the obese group regarding all physical measurements. Furthermore, the mean current weight, the mean weight before pregnancy, the weight gain during pregnancy, and the body mass index were lower in the normal-weight group than in the obese group.

Table 3 illustrates that there were statistically significant differences among the studied women regarding the progress of labor at a P-value of 0.0001. Meanwhile, there were lower mean durations of the latent and active phases, first stage, second stage, third stage, total duration of labor, and the mean dose of oxytocin during the first stage of labor in the normal-weight group than in the obese group.

Table 4 illustrates that all studied women had a show on admission, and there were statistically significant differences among the obese and normal-weight women regarding the occurrence of complications during childbirth. Prolonged first stage and arrest of cervical dilation were higher in the obese group (40.7% and 59.3%, respectively) than in the normal weight group (12.9% and 20.6%, respectively). In addition, obstructed labor was higher in the obese group (15.1%) than the normal weight group (4.9%). Also, perineal tear, macrosomia, shoulder dystocia, and fetal distress were higher in the obese group (5.9%, 5.4%, 5.4%, and 2.5%, respectively) than in the normal weight group (2.7%, 0.5%, 0.5%, and 1.6%, respectively).

Figure 1 depicts the relationship between BMI and cervical dilatation rate. There was a highly significant negative correlation between the body mass index and the cervical dilatation rate. It means that as the body mass index increases, the rate of cervical dilatation decreases.

Figure 2 depicts the relationship between BMI and the total duration of labor. There was a highly significant positive correlation between the body mass index and the total duration of labor. It means that as the body mass index increases, the total duration of labor increases.

Table 5 shows the correlation between body mass index and gestational age. There was a positive correlation between body mass index and gestational age ($P = 0.000$).

Table 6 shows the correlation between body mass index and oxytocin dose. There was a positive correlation between body mass index and oxytocin dose ($P > 0.05$).

Table 1: Demographic Data and Medical History of the Studied Women (N = 370)

Variables	The studied women				X2	P value
	Normal-weight women group (N = 185)		Obese group (N = 185)			
	No.	%	No.	%		
Age (years)						
≤30	73	39.5	86	46.5	1.864	.172
31-40	112	60.5	99	53.5		
Mean ± SD	31.86±4.21		29.27 ± 4.41		t.565	.453
Educational level						
Illiterate	21	11.4	18	9.7	2.14	.709
Read and write.	11	5.9	18	9.7		
Preparatory school	9	4.9	9	4.9		
Secondary education	60	32.4	55	29.7		
University	84	45.4	85	45.9		
Occupation						
Housewife	122	65.9	115	62.2	.575	.448
Employee	63	34.1	70	37.8		
Monthly income						
Enough	151	81.6	163	88.1	3.03	.08
Not enough	34	18.4	22	11.9		
Marriage duration						
Less than a year	34	18.4	19	10.3	4.99	.172
1–2 years	87	47.0	97	52.4		
2–3 years	57	30.8	61	33.0		
4 years or more	7	3.8	8	4.3		
Do you have any chronic diseases?						
No	185	100.0	185	100	-	-

Table 2: Mean and Standard Deviation of the Studied Women According to Their Physical Measurements (N = 370)

Variables	The studied women		t. Test	P value
	Normal-weight women group (N = 185)	Obese group (N = 185)		
	Mean ± SD	Mean ± SD		
Current weight (kg)	75.94 ± 5.42	99.67 ± 4.77	44.682	.000
Weight before pregnancy (kg)	63.87 ± 4.22	82.21 ± 3.87	43.528	.000
Weight gain during pregnancy (kg)	11.87 ± 2.60	17.49 ± 2.20	22.415	.000
Height (cm)	161.66 ± 3.77	161.58 ± 1.53	- .271	.787
Body mass index: weight (kg)/height (m) 2	24.36 ± 0.61	31.54 ± 1.72	53.382	.000

Table 4: Progress of Labor among the Studied Women (N = 370)

Variables	The studied women		t. Test	P value
	Normal-weight women group (N = 185)	Obese group (N = 185)		
Cervical dilatation on admission (cm)				
Mean ± SD	4.36 ± 0.37	4.45 ± 0.50	1.978	.049
Duration of the latent phase (hours)				
Mean ± SD	9.46 ± 1.69	11.25 ± 1.46	10.814	.000
Duration of the active phase (hours)				
Mean ± SD	6.85 ± 2.29	6.73 ± 8.37	21.30	.000
Duration of the first stage of labor (hours)				
Mean ± SD	14.72 ± 3.13	16.85 ± 5.45	4.595	.000
Duration of the second stage of labor (hours)				
Mean ± SD	1.04 ± 0.94	1.46 ± 3.76	12.57	.000
Duration of the third stage of labor (min)				
Mean ± SD	6.32 ± 4.90	5.83 ± 6.87	2.217	.027
Total duration of labor (hours)				
Mean ± SD	9.76 ± 6.98	10.43± 9.47	48.46	.000
What is the dose of oxytocin during the first stage of labor? (IU)				
Mean ± SD	6.24 ± 2.16	8.10 ± 2.43	7.788	.000

Table 5: The Occurrence of Complications during Childbirth among the Studied Women (N = 370)

Variables	The studied women				X2	P - value
	Normal-weight women group (N = 185)		Obese group (N = 185)			
	No.	%	No.	%		
Are there any complications related to the progress of labor during the first stage?						
Yes	62	33.5	145	78.4	77.47	.000
No	123	66.5	40	21.6		
If the answer is yes, what are they?						
Prolonged first stage	8	12.9	59	40.7	2.570	.109
Arrest of cervical dilatation	54	20.6	86	59.3		
Are there any complications (maternal or fetal) during the second stage?						
Yes	37	20.0	131	70.8	96.338	.000
No	148	80.0	54	29.2		
If yes, what are they?						
Obstructed labor	9	4.9	28	15.1	13.207	.000
Perineal tear	2	1.1	19	10.3		
Vaginal tear	5	2.7	11	5.9		
Postpartum hemorrhage	10	5.4	17	9.2		
Macrosomia	1	0.5	10	5.4		
Shoulder dystocia	1	0.5	10	5.4		
Fetal distress	3	1.6	10	2.5		
Cervical dystocia	5	2.7	9	4.9		
Stillbirth	0	0.0	9	4.9		
NICU admission	1	0.5	8	4.3		
Type of delivery						
Vaginal	125	67.6	95	51.4	10.091	.001
Cesarean section	60	32.4	90	48.6		

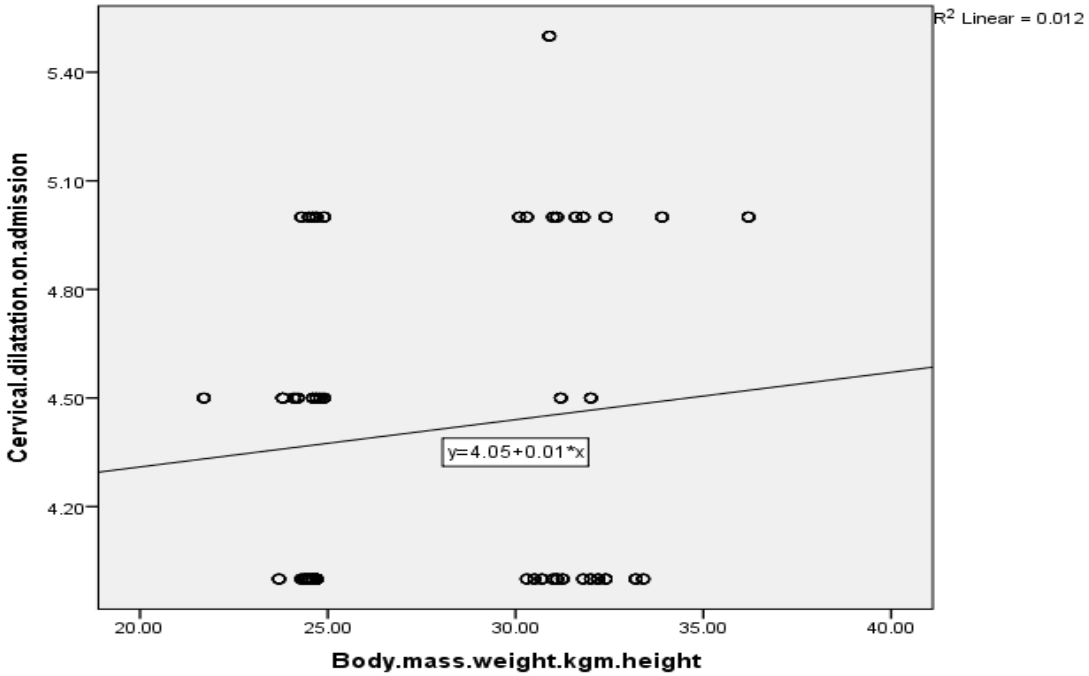

Figure 1: Correlation between Body Mass Index and Cervical Dilatation Rate.

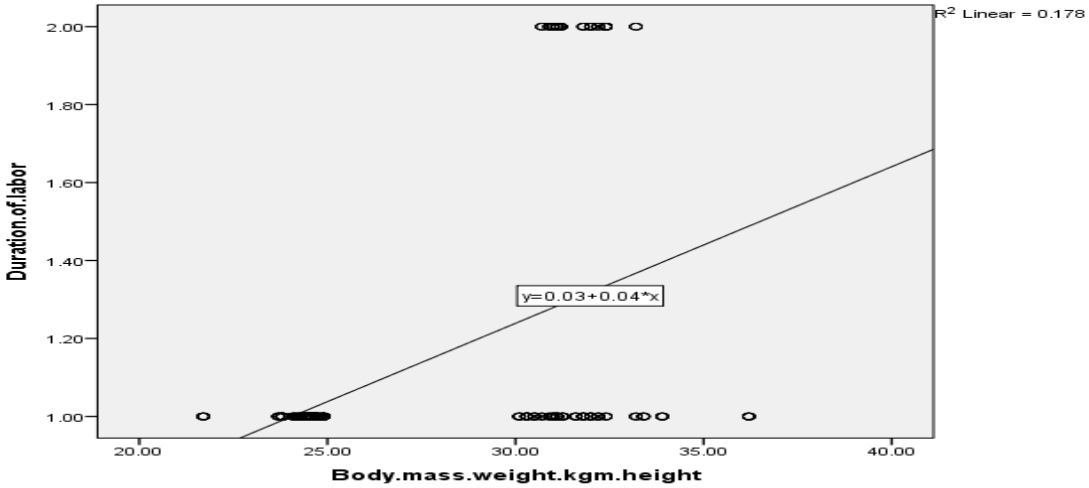

Figure2: Correlation between Body Mass Index and the Total Duration of Labor

Table 5: Correlation between Body Mass Index and Gestational Age (N = 185).

Items	Body Mass Index	
	R	P. value
Gestational age	.178**	0.000

Table 6: Correlation between Body Mass Index and Oxytocin Dose (N = 185).

Oxytocin dose	Body Mass Index	
	R	P. value
Oxytocin dose	0.076	0.013

Discussion

Regarding the demographic data and medical history, the findings of the current study showed that there were no statistically significant differences between the two studied groups regarding their demographic data and medical history in terms of age, educational level, occupation, monthly income, marriage duration, and presence of chronic diseases. These findings mean that both study groups were homogenous and comparable in age, educational level, income, marriage duration, and the presence of chronic disease.

These current findings were compatible with those of El-Sayed et al. (2021), who conducted their study entitled “Impact of Maternal Body Mass Index on Progress and Outcome of Labor in Nulliparous Females" at Al-Hussein and Sayed Galal Hospitals, Al-Azhar University, Egypt. They revealed that the study and control groups were comparable in age, educational level, income, marriage duration, and the presence of chronic disease.

Also, these current findings were in line with those of Egwaila et al. (2022), who conducted their study entitled “Effect of Maternal Obesity on Duration of Labor and Mode of Delivery in Primigravida" at Zagazig, Egypt. They showed that there was no significant difference in terms of age between the studied women. Additionally, they added that none of the studied women complained about any chronic diseases.

Regarding the duration of labor during childbirth among the studied women, there were statistically significant differences among the studied women regarding the progress of labor. However, both the latent and active phases lasted longer in obese women than in normal-weight women. Furthermore, women in the obese group had significantly longer first and second stages of labor than women in the normal weight group, with no difference in third stage duration between the two groups.

These findings were in line with Carlhäll (2018), who investigated their study about "maternal obesity, the duration of labor, and the role of leptin in Sweden” and showed that nulliparous obese women have a higher risk for a prolonged duration of latent and active phases of labor; however, the differences between the BMI categories were more pronounced in the latent phase than the active phase. Additionally, obese women have a higher risk for prolonged spontaneous and induced labor. Furthermore, these study findings were in accordance with El-Sayed et al. (2021) in Egypt, which showed that the duration of the latent phase is prolonged in obese women.

Also, these findings were in agreement with Bjork Lund et al.’s (2022) study entitled “Is there an Increased Risk of Cesarean Section in Obese Women after Induction of Labor?” in Stockholm and Lundborg et al.’s (2021) study entitled “Association of body mass index and maternal age with first stage duration of labor” in Stockholm-Gotland, Sweden, as well as Salman et al.’s (2022) studies on the “Effect of Body Mass Index on Mode of Delivery and Maternal and Neonatal Complications in Nulliparous Women" in Ain Shams, Egypt, which showed that obese women had a longer time to enter the active phase due to primary dystocia, resulting in a higher rate of Cs in obese women. Also, all previous related studies stated that obesity is associated with a longer duration of the first stage of labor.

Additionally, these findings agreed with Sadiq & Mohsin’s (2018) study on “the Effect of Maternal Obesity on

Mode of Delivery and Duration of Labor in Kuwait" and Khalifa et al.'s (2021) study entitled "Effect of Maternal BMI on Labor Outcomes in Primigravida Women in Minia University Teaching Hospital and Two Private Hospitals in Cairo," which showed that obese women had slow progress and a longer duration of both the first and second stages of labor.

Parallel to the present study findings, the study that was conducted by Frolova et al. (2021) about "Obesity, Second Stage Duration, and Labor Outcomes in Nulliparous Women at Washington University Medical Center" found that obesity was associated with prolonged duration of the second stage of labor and a higher rate of second stage cesarean.

According to the researcher's point of view, prolonged duration of the first and second stages of labor among obese women could be explained, according to Carvajal & Oporto's medical justification (2021) in their study about "The myometrium in pregnant women with obesity," that obese women are known to exhibit higher concentrations of adipokines, which may reduce muscle contractility by inhibiting the RhoA/ROCK pathway in the muscle layer. Also, they added that high cholesterol levels in obese pregnant women are known to alter the myometrial membranes, especially the pits, thus inhibiting the functionality of oxytocin receptors and increasing the activity of K+ channels. Changes in myometrial cells and their local environment may reduce myometrial contractility; this could explain the delayed labor and increased rates of CS delivery in obese pregnant women.

Regarding the third stage of labor, the present study revealed no difference in its duration in both groups. This is due to obese women receiving higher doses of oxytocin and more frequent uterine messages.

On the other hand, the previous study findings were inconsistent with Ellekjaer et al.'s (2017) study at the Department of Gynaecology and Obstetrics, Nordsjlands Hospital, University of Copenhagen, Denmark, entitled "The Effect of Maternal Obesity and its Effect on Labor Duration in Nulliparous Women," which showed that BMI didn't have a big effect on the total length of active labor. Also, the current study findings disagreed with Abdo et al.'s (2018) study entitled "Maternal Obesity and Its Effect in Late Pregnancy and Labor" at Etay El-Baroud General Hospital, Egypt, which showed that BMI did not affect the total duration of the second stage of labor. Also, the study results disagreed with Cummings et al.'s (2018) study about "The Third Stage of Labor in the Extremely Obese Parturient in Canada," which showed that women who are in the "extremely obese" category had a longer third stage of labor.

The contrast between our study and those studies may be due to the ethnically heterogeneous population and the large study population, and the data included an ethnically heterogeneous population. Also, there was a difference in socioeconomic status, as Copenhagen was an urban area where people with a higher level of socioeconomic status lived, while the setting of the current study was a rural area where people with a lower level of socioeconomic status lived.

Also, the current study results documented that the dose of oxytocin during the first stage of labor was higher in the obese women group than the normal-weight group. These findings agree with Isgren et al.'s (2021) study on "Maternal Body Mass Index and Oxytocin in Augmentation of Labor in Nulliparous Women: A

Prospective Observational Study in Sweden." They found that during the first stage of labor, women with a higher BMI who had their labor sped up got a higher total dose of oxytocin and a higher maximum rate of oxytocin infusion. Also, they said that the guidelines for using oxytocin infusions to speed up labor could be rethought and changed based on the woman's BMI.

Regarding the researcher's point of view, obese women were given a high dose of oxytocin to accelerate labor progress, as prolonged duration of the first stage and slow progress of labor were common among them.

Moreover, the results of the current study illustrated that there were higher complications during childbirth in obese women than in normal-weight women. Where prolonged first stage, arrest of cervical dilation, and obstructed labor were higher in the obese group than in the normal weight group, perineal tear, macrosomia, shoulder dystocia, and fetal distress were higher in the obese group than in the normal weight group.

These findings were in line with Hautakangas et al.'s (2018) study entitled" Impact of Obesity and Other Risk Factors on Labor Dystocia in Term Primiparous Women at Tampere University Hospital and Rubens et al.'s (2022) study entitled "Obstetric Outcomes during Delivery Hospitalizations among Obese Pregnant Women in the United States." Also, these findings agreed with Andele et al.'s (2023) study entitled "Epidemiological and Prognostic Aspects of Obesity and Pregnancy in the Gynecology-Obstetrics Department at the Sylvan Olympio University Hospital Center in Lomé, Togo, in West Africa."

All previous studies showed that labor was less common in an active phase and that the cervix was not as well ripened on arrival at the birth unit. Also, they added that a rising maternal pre-pregnancy BMI had a strong association with dystocia risk. Also, they found that obese women were more likely to have bad outcomes for their fetuses, like excessive fetal growth and fetal distress. Otherwise, they reported that cesarean section was the way of delivery for most obese women, and those who gave birth vaginally presented a tear in the soft tissues.

Additionally, these study findings were in line with Ikedionwu et al.'s (2020) study about" Pre-pregnancy maternal obesity, macrosomia, and risk of stillbirth: a population-based study" in the USA and Espitia et al.'s (2019) study about" Factors associated with fetal macrosomia" in Antioquia, Colombia. They showed that with increasing maternal BMI, the severity of macrosomia and the rates of stillbirth increased.

According to the researcher's point of view, obese women suffered a high occurrence of complications, which could be attributed to the fact that obese women are more likely to have excessive gestational weight gain (GWG). This further increases the risk of antepartum, intrapartum, and postpartum complications. Also, this can be attributed to not receiving enough needed medical and nursing care.

Meanwhile, these study findings disagreed with Dalbye et al.'s (2021) study about "Maternal Body Mass Index and Risk of Obstetric, Maternal, and Neonatal Outcomes: A Cohort Sudy of Nulliparous Women with Spontaneous Onset of Labor in Norwegian," which reported that no associations between maternal BMI and neonatal outcomes were observed. Also, these study findings disagreed with Durnea et al.'s (2018) study about "the Effect of Body Mass Index on the

Incidence of Perineal Trauma in the UK Tertiary Maternity Unit." Which showed that increased BMI at the booking visit was associated with a reduced incidence of minor perineal trauma at delivery.

Regarding the researcher's point of view, this difference may be due to the studied women of the previous studies having a higher level of education than the studied women of the current study. Women with high educational status may have an elevated level of birth preparedness and complications readiness. Also, it may enhance the likelihood of maternal health service utilization.

Furthermore, the current study findings illustrate that obese women had a higher rate of cesarean section and a lower rate of vaginal delivery than normal-weight women.

These results were in line with Valente et al.'s (2019) study entitled" Effect of Obesity on Labor Duration among Nulliparous Women with Epidural Analgesia at the Department of Obstetrics and Gynecology of Centro Hospitalar, São João, Portugal and Angeliki et al.'s (2018) study entitled "Maternal obesity and its association with the mode of delivery and the neonatal outcome in induced labor: implications for midwifery practice."

They showed that obese women had a significantly higher rate of cesarean deliveries and fewer normal vaginal deliveries. They also said that a higher BMI was linked to a higher risk of having to start labor early or have a C-section. Also, women who were overweight and had already had a cesarean section were more likely to have another one this time around.

Additionally, the current study findings agreed with Brizan & Amabebe's (2022) study entitled "Maternal Obesity as a Risk Factor for Cesarean Delivery in Sub-Saharan Africa" and Rubens et al.'s (2022) study in the United States. Also, this study's findings were in line with Lauth et al.'s (2022) study entitled "Maternal Obesity in Prolonged Pregnancy: Labor, Mode of Delivery, Maternal and Fetal Outcomes in the Caen University Hospital Center as well as Carlhäll's (2018) study in Sweden.

They found that a higher rate of cesarean deliveries was associated with a higher body mass index.

Regarding the researcher's point of view, an increase in CS in obese women is due to the fact that obese pregnant women are at increased risk of having macrosomic neonates. Also, the progress of labor and the higher occurrence of complications during vaginal delivery may be factors in the increase in CS. As the physician sought CS to prevent further complications and save the lives of mother and fetus.

In addition, the current study findings showed that there was a highly significant negative correlation between the body mass index and the cervical dilatation rate. It means that as the body mass index increases, the rate of cervical dilatation decreases.

These findings were in accordance with Shenouda et al.'s (2020) study entitled "Labor progression in obese women: are women increased with body mass index having unnecessary cesarean sections? At Victoria Hospital in London, Ontario,"

They revealed that labor progresses more slowly as the maternal BMI increases. They added that obese primiparous women required an additional hour to reach full dilation of the cervix compared with their normal-weight counterparts.

From the researcher's point of view, the decreasing rate of cervical dilatation was associated with a higher early-pregnancy BMI. As high levels of cholesterol, leptin, and apelin in obese women blunt the effect of

oxytocin on stimulating myometrial contractility and lead to immature cervix and delayed natural labor, as indicated by Liu et al. (2023) in their study about "Effects of Labor Induction in Obesity with Delayed Pregnancy: A Retrospective Study Based on Chinese Obese Primipara."

Additionally, the current study findings show that there is a positive correlation between body mass index and oxytocin dose. Parallel to the present study findings, the studies that were conducted by Adams & Drassinower (2018) about "Are higher doses of oxytocin needed for obese women to achieve vaginal delivery at MedStar Washington Hospital Center and MedStar Georgetown University?" and Margarida & Madureira (2020) about "Induction of Labor in Obese Women: Is there evidence of the best method in France?" found that obese women require higher doses of oxytocin to achieve a vaginal delivery.

Regarding the researcher's point of view, when labor dystocia or failure to progress is diagnosed in obese women, augmentation with oxytocin is recommended for the induction of labor. This was indicated according to medical recommendations, as oxytocin is medically indicated to promote the progress of labor and stimulate powerful contractions that help to thin and open (dilate) the cervix.

Conclusion

The results of this study showed that obesity was associated with slow progress of labor and prolonged duration of the first and second stages of labor, while it had no effect on the duration of the third stage of labor. This answered the first research question.

Furthermore, there were statistically significant differences among the obese and normal-weight women regarding the occurrence of complications during childbirth. Arrest of cervical dilation, obstructed labor, perineal tear, macrosomia, and shoulder dystocia were higher in the obese group than in the normal-weight group. This answered the second research question.

The current study also demonstrated that there was a negative correlation between body mass index and cervical dilation, which resulted in the failure of labor and a higher rate of CS. Nearly one-half of the obese group had CS delivery, compared to only one-third in the normal weight group. This answered the third research question.

Additionally, there was a positive correlation between body mass index and oxytocin requirement. The dose of oxytocin during the first stage of labor was higher in the obese group than in the normal-weight group. This answered the fourth research question. Therefore, the current study succeeded in answering all research questions.

Recommendations

Based on the findings of the present study, the following recommendations are suggested:

- Encourage the maternity nurses to advise pregnant women to avoid weight gain beyond what is medically recommended (according to BMI) to avoid complications in pregnancy and labor.
- Encourage the maternity nurses to include health teaching for obese laboring women during antenatal counseling, such as a healthy diet and exercise to reduce their weight.
- Encourage the maternity nurses to use the partogram in the labor units.
- Colorful brochures regarding the negative impact of obesity on pregnancy and labor and its preventive measures are distributed to both nurses and women to increase their awareness.

Further research:

- Several studies can be done to identify ways of reducing the negative influence of obesity on labor outcomes.
- Further research is needed to apply to large samples and in other settings.

REFERENCES

Abdo, M., M., Kamel, H. A. H., & Ibrahim, A. M. (2018). Maternal Obesity and Its Effect in Late Pregnancy and Labor. The Egyptian Journal of Hospital Medicine 71 (4), 2982-2988, 2018.

Adams, A., & Drassinower, D. (2018). Are higher doses of oxytocin needed for obese women to achieve vaginal delivery? American Journal of Obstetrics & Gynecology 218 (1), S95, 2018.

Andele, K. A., Ketevi, A. A., Douaguibe, B., Bassowa, A., Ajavon, D. R. D., & Fiagnon, K. (2023). Epidemiological and Prognostic Aspects of Obesity and Pregnancy in the Gynecology-Obstetrics Department at the Sylvanus Olympio University Hospital Center (CHU SO) in Lomé. Open Journal of Obstetrics and Gynecology 13 (1), 88-96, 2023

Angeliki, A., Dimitrios, P., & Chara, T. (2018). Maternal obesity and its association with the mode of delivery and the neonatal outcome in induced labor: implications for midwifery practice. European Journal of Midwifery 2, 2018.

Azaïs, H., Leroy, A., Ghesquiere, L., Deruelle, P., & Hanssens, S. (2017). Effects of adipokines and obesity on uterine contractility. Cytokine & growth factor reviews 34, 59-66, 2017.

Bjorklund, J., Itzel, E. W., & Wallstrom, T. (2022). Is there an increased risk of cesarean section in obese women after induction of labor? A retrospective cohort studies. PLoS One 17 (2), e0263685, 2022.

Brizan, J. B., & Amabebe, E. (2022). Maternal Obesity as a Risk Factor for Caesarean Delivery in Sub-Saharan Africa: A Systematic Review. Life 12 (6), 906, 2022.

Carlhäll, S., Källén, K., Thorsell, A., & Blomberg, M. (2018). Maternal plasma leptin levels in relation to the duration of the active phase of labor. Acta Obstetrician et Gynecologica Scandinavica 97 (10), 1248-1256, 2018.

Carlhäll, S. (2018). Maternal obesity, duration of labor and the role of leptin. Linköping University Medical Dissertation. No.1626.

Carvajal, J. A., & Oporto, J. I. (2021). The myometrium in pregnant women with obesity. Current Vascular Pharmacology 19 (2), 193-200, 2021.

Cummings, K. F., Helmich, M. S., Ounpraseuth, S. T., Dajani, N. K., & Magann, E. F. (2018). The third stage of labor in the extremely obese parturient. Journal of Obstetrics and Gynaecology Canada 40 (9), 1148-1153.

Dalbye, R., Gunnes, N., Blix, E., Zhang, J., Eggebø, T., & Tokheim, L. N. (2021).

Maternal body mass index and risk of obstetric, maternal and neonatal outcomes: A cohort study of nulliparous women with spontaneous onset of labor. Acta obstetricia et gynecologica Scandinavica 100 (3), 521-530, 2021

Durnea, C. M., Jaffery, A. E., Gauthaman, N., & Doumouchtsis, S, K. (2018). Effect of body mass index on the incidence of perineal trauma. International Journal of Gynecology & Obstetrics 141 (2), 166-170, 2018.

Ellekjaer, K. L., Bergholt, T., & Løkkegaard, E. (2017). Maternal obesity and its effect on labor duration in nulliparous women: a retrospective observational cohort study. BMC pregnancy and childbirth 17 (1), 1-10.

El-Sayed, O. F., El-Garhy, I. M. T., & Saeed, A. M. (2021). Impact of Maternal Body Mass Index on Progress and Outcome of Labor in Nulliparous Females. Al-Azhar International Medical Journal 2 (10), 31-36, 2021.

Espitia, V. A., Sosa, B. E. P., & Mesa, S. L. R. (2019). Factors associated with fetal macrosomia. Revista de saude publica 53, 2019

Frolova, A. I., Raghuraman, N., Stout, M. J., Tuuli, M. G., Macones, G. A., & Cahill, A. G. (2021). Obesity, second stage duration, and labor outcomes in nulliparous women. American journal of perinatology 38 (04).

Hautakangas, T., Palomäki, O., & Uotila, J. (2018). Impact of obesity and other risk factors on labor dystocia in term primiparous women: a case control study. BMC Pregnancy and Childbirth volume 18, Article number: 304.

Ikedionwu, C. A., Dongarwar, D., Yusuf, K. K., Ibrahimi, S., Miranda, A. A. S., & Salihu, H. M. (2020). Pre-pregnancy maternal obesity, macrosomia, and risk of stillbirth: a population-based study. European Journal of Obstetrics & Gynecology and Reproductive Biology 252, 1-6, 2020

Isgren, A. R., Kjölhede, P., Carlhäll, S. & Marie Blomberg. (2021). Maternal body mass index and oxytocin in augmentation of labor in nulliparous women: a prospective observational study. BMJ open 11 (3), e044754, 2021

Khalifa, E., El-Sateh, A., Zeeneldin, M., Abdelghany, A. M., Hosni, M., & Abdallah, A. (2021). Effect of maternal BMI on labor outcomes in primigravida pregnant women. BMC Pregnancy and Childbirth 21, 1-5.

Kyozuka, H., Hiraiwa, T., Murata, T., Sugeno, M., Jin, T., & Ito, F. (2022). Gestational weight gain as a risk factor for dystocia during first delivery: a multicenter retrospective cohort study in Japan. BMC Pregnancy and Childbirth 22 (1), 728, 2022

Lauth, C., Huet, J., Dolley, P., Thibon, P., & Dreyfus, M. (2022). Maternal obesity in prolonged pregnancy: Labor, mode of delivery, maternal and fetal outcomes. Journal of Gynecology Obstetrics and

Human Reproduction 50 (1), 101909, 2021.

Liu, S., Song, B., Liu, D., Zheng, C., Wu, X., & Wei, Z. (2023). Effects of labor induction in obesity with delayed pregnancy: A retrospective study based on Chinese obese primipara. Frontiers in Endocrinology 13, 1055098.

Lundborg, L., Liu, X., Åberg, K., Sandström, A., Ellen, L., Tilden, E. L., & Stephansson, O. (2021). Association of body mass index and maternal age with first stage duration of labor. Scientific reports 11 (1), 13843, 2021.

Margarida, C., & Madureira, M. (2020). Induction of Labor in Obese Women: Is there evidence of the best method? -A Systematic Review. PQDT-Global, 2020

Mitchell, K. (2014). The paperless partogram: The 20-Second Tool for Preventing Prolonged Labor.

Riley, L., Wertz, M., & McDowell, I. (2018). Obesity in pregnancy: risks and management. American family physician 97 (9), 559-561, 2018.

Rubens, M., Ramamoorthy, V., Saxena, A., Granaghan, P. M., Veledar, E., & Hernandez, A. (2022). Obstetric outcomes during delivery hospitalizations among obese pregnant women in the United States. Scientific Reports 12 (1), 6862, 2022

Sadiq, G., & Mohsin, R. (2018). The Effect of Maternal Obesity on Mode of Delivery and Duration of Labor. J. Soc. Obstet. Gynaecol. Pak l8. No.1.

Sara, P., & Lack, N. (2022). Partogram. Quick Hits in Obstetric Anesthesia, 185-191, 2022.

Sedky, A., Gaber, M., Magdy, N., & El Safoury, S. (2021). Combating the High Prevalence of Obesity among Egyptian Households: A Pilot Study: Port-Said Households. American University in Cairo AUC Knowledge Fountain, 2021.

Shahrir, N. F., Jalil, R. A., Jeganathan, J. R. R., Karalasingam, S. D., Nordin, N. M., & Abdullah, M. F. (2021). Maternal obesity and its associated factors and outcomes in Klang Valley, Malaysia: Findings from National Obstetric Registry. Malaysian family physician: the official journal of the Academy of Family Physicians of Malaysia 16 (3), 56, 2021.

Shenouda, C., Wijesooriya, A., Toufeili, A., Miller, M. R., Penava, D., & Vrijer, B. D. (2020). Labor progression in obese women: are women with increased body mass index having unnecessary cesarean sections. Journal of Obstetrics and Gynaecology Canada 42 (3), 293-300, 2020.

Strauss, A. (2021). Obesity in pregnant women: maternal, fetal, and transgenerational consequences. European Journal of Clinical Nutrition 75 (12), 1681-1683, 2021.

Thornton, J. M., Browne, B., & Ramphul, M. (2020): Mechanisms and management of normal labor. Obstetrics, Gynaecology & Reproductive Medicine 30 (3), 84-90, 2020.

Valente, R. P., Santos, P., Ferraz, T., Montenegro, N., & Rodrigues, T. (2020). Effect of obesity on labor duration among nulliparous women with epidural analgesia. The Journal of Maternal-Fetal & Neonatal Medicine 33 (13), 2195-2201, 2020.

World Health Organization (2007). Maternal mortality in 2005.Estimates developed by WHO, UNICEF, UNFPA and the World Bank Geneva.

Zhang, J., & Duan, T. (2018). The physiologic pattern of normal labor progression. BJOG: An International Journal of Obstetrics & Gynecology. 125(8.)