بسم الله الرحمن الرحيم

كلية نبتة
NAPATA COLLEGE

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Faculty of Medicine

Impact of Obesity on Pregnancy and Neonatal Outcomes among Sudanese Pregnant Women Omdurman Military Hospital Khartoum State 2022

A thesis Submitted in partial fulfillment for requirement of MBBS Degree in Medicine

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قال الله تعالى :

بسم الله الرحمن الرحيم

ٱقۡرَأۡ بِٱسۡمِ رَبِّكَ ٱلَّذِي خَلَقَ (1) خَلَقَ ٱلۡإِنسَٰنَ مِنۡ عَلَقٍ (2) ٱقۡرَأۡ وَرَبُّكَ ٱلۡأَكۡرَمُ (3) ٱلَّذِي عَلَّمَ بِٱلۡقَلَمِ (4) عَلَّمَ ٱلۡإِنسَٰنَ مَا لَمۡ يَعۡلَمۡ (5)

صدق الله العظيم

Dedication

We would like to dedicate to all those following people who contributed to the success of this research work:

To our parents whom we owe a great debt

To our family for giving us love, support and encouragement.

To our dear friends to whom we have a great admiration

Acknowledgments

We start our thesis in the name of almighty God. We thank him for giving us the privilege to learn from such eminent professors and assistant professors in our department.

We express our sincere thanks to DR. Dr. Safa Sayed Ahmed Hassan Nasrfor allowing us to conduct the study using the available facilities.

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Abstract

Background: The rising prevalence of obesity has a significant impact on obstetrics practice regarding maternal and perinatal complications includes recurrent miscarriage, pregnancy-induced hypertension, preeclampsia, gestational diabetes, and prolonged labor.

Objective: To assess the impact of obesity on pregnancy and neonatal outcomes among Sudanese pregnant women.

Methods: The study was conducted at Omdurman maternal hospital-Khartoum Sudan. Design: A cross-sectional hospital based study. The data were collected by a review of the chart records of the labor and delivery department.

Results: The mean age of participants was 27 years old; two-thirds were in obesity class I. There was a significant association between obesity and pre-existing thyroid disease and induced hypertension class III.

Conclusion: This study concludes obesity affects the outcomes of Sudanese pregnant associations between obesity and preeclampsia, and perineal tears variables, and other variables reflect no associations.

Recommendations: Further studies are needed to generalize the results. This study endorses the pregnant women start the antenatal follow-up from 1st trimester

المستخلص:

الخلفية: انتشار السمنة له تأثير كبير على الحامل والولاده فيما يتعلق بمضاعفات الأم والفترة المحيطة بالولادة تشمل الإجهاض المتكرر وارتفاع ضغط الدم وتسمم الحمل وسكري الحمل والولادة لفترات طويلة.

الهدف: تقييم أثر السمنة على الحمل والجنين بين النساء السودانيات الحوامل.

طرق الدراسة: أجريت هذه الدراسة المقطعيه بمستشفى الولادة بأم درمان بالخرطوم السودان. تم جمع البيانات بأثر رجعي من قبل مراجعة سجلات الرسم البياني لقسم العمل والتسليم.

النتائج: كان متوسط عمر النساء المشاركات 27 سنة. كان ثلثاهم في الدرجة الأولى من السمنة. و كان ارتباطًا كبيرًا بين السمنة وأمراض الغدة الدرقية الموجودة مسبقًا و ارتفاع ضغط الدم

الخلاصة: خلصت هذه الدراسة إلى أن السمنة تؤثر على الحوامل السودانيات حيث ان هناك علاقه بين السمنة وتسمم الحمل ، والمتغيرات الأخرى لا تعكس ذات الصلة.

التوصيات: هناك حاجة إلى مزيد من الدراسات لتعميم النتائج. هذه الدراسة تؤيد ان تبدأ النساء الحوامل المتابعة السابقة للولادة اعتبارًا من الثلث الأول من الحمل

Table of Contents

No	Topic	Page No
1	*Quran*	.i
2	*Dedication*	.ii
3	*Acknowledgment*	.iii
4	*Abstract(English)*	.iv
5	*Abstract (Arabic)*	.v
6	*List of contents*	.vi
7	*List of tables*	.vii
8	*List of figures*	.viii
9	*List of Abbreviations*	.ix
Chapter One: Introduction, Rationale &objectives		
1.1 introduction		2
1.2 Problem statement		3
1.3 rationale		4
1.4 objectives		4
Chapter Two :literature Review		
2.1 Obesity Definition		6
2.2 Prevalence of obesity		7
2.3 Health effect of obesity		7
2.4 Obesity and pregnancy		9
2.5 Gestational weight gain		9
2.6 Glucose and lipid metabolism during pregnancy		9
2.7 Obesity and acute pregnancy complications		10
2.8 previous studies		11
Chapter Three: Materials & Methods		
3.1 Study design		13

3.2 Study area	13
3.3 Study duration	13
3.4 Study population	14
3.5 Sample size	14
3.6 Sampling technique	14
3.7 Inclusion Criteria	14
3.8 Exclusion Criteria	14
3.9 Study Variables	15
3.10 Ethical Consideration	15
3.11 Controls	15
3.12 Data Collection	16
3.13 Data Analysis	16
Chapter Four: Results	
4. results	18
Chapter Five: Discussion, conclusion & Recommendations	
5.1 Discussion	27
5.2 conclusion	30
5.3 Recommendations	32
References	34

List of Tables

No	Table	Page No
Table 2.1	*International classification of overweight and obesity in adults according to BMI based on WHO guidelines*	6
Table 2.2	*Examples of diseases related to obesity*	8
Table 2.3	*Recommendations for total weight gain and rate of weight gain during pregnancy according to pre-pregnancy BMI based on IOM guidelines*	9
Table 2.4	*Summary of acute adverse pregnancy outcomes related to maternal obesity*	11
Table 4.1.	*Distribution of Pregnant subjects by Socio-Demographical Characteristics (N=130)*	19
Table 4.2.	*Association between Obesity and obstetrics co-factors (N=130)*	24
Table 4.3.	*Association between Obesity and Neonatal outcomes (N=130)*	25

List of Figures

No	Figure	Page No
Figure 4.1	Distribution of Pregnant subjects according to gravdia (N=130)	**20**
Figure 4.2	Distribution of Pregnant subjects according to Mode of the previous delivery (N=130)	**21**
Figure 4.3	Distribution of Pregnant subjects according to Obesity (N=130)	**22**
Figure 4.4	Distribution of Pregnant subjects according to risk factors (N=130)	**23**

List of Abbreviations

AGA	Appropriate for gestational age
BMI	Body mass index
CS	Caesarean section
CVD	cardiovascular disease
DALYs	disability-adjusted life-years
GWG	gestational weight gain
GDM	gestational diabetes mellitus
HDP	hypertensive disorders of pregnancy
HRQoL	health-related quality of life
IOM	Institute of Medicine
IUFD	Intra-uterine fetal death
IUGR	Intrauterine growth restriction
LGA	Large for gestational age
SGA	Small for gestational age
SVD	Spontaneous vaginal delivery
WHO	World Health Organization

Chapter One

Introduction, Rationale & Objectives

1. Introduction, Rationale & Objectives

1.1 Introduction

Obesity is a worldwide epidemic. Prevalence is higher in wealthy countries, but increasing in developing countries with severe consequences [1]. It is Obesity is a condition of abnormal and excessive fat accumulation in adipose tissue, leading to adverse health effects. The significant contributors to weight gain, which may eventually lead to obesity, are decreased physical activity, increased dietary fat intake, and genetic factors. The rise in obesity is associated with advanced age, which becomes apparent when considering the decrease in older adults' physical activity and metabolic processes. Marital status, high educational level, alcohol use, and high socioeconomic status are other factors associated with obesity [2]. There is considerable evidence that maternal obesity during gestation increases the incidence of complications such as childhood obesity, diabetes, cardiovascular diseases, several types of cancer, and metabolic syndrome at multiple life stages in the offspring. In contrast, maternal underweight has a protective effect on these pregnancy complications except for the slightly increased risks of having a baby with low birth weight and intrauterine growth restriction. As many of the physiological changes of pregnancy associated with maternal obesity are present from early pregnancy onward, reducing maternal obesity before conception is probably the best strategy to decrease the health burden of adverse fetal and birth outcomes [3].

Maternal obesity is one of the central risk factors for adverse pregnancy outcomes, including gestational diabetes mellitus (GDM), operative delivery, and stillbirth [4]. Maternal obesity increases perinatal mortality, which increases the risk of perinatal death and preterm birth, macrosomia, congenital anomaly, child hood obesity, and still birth. Also, maternal obesity is related to a higher risk of cesarean deliveries and a higher incidence of anesthetic and postoperative complications. Another major complication is preeclampsia, a specific syndrome characterized by new onset of hypertension with proteinuria that occurs after 20 weeks gestation. The actual cause of preeclampsia is unknown, but it is estimated to affect 2 to 8% of all pregnancies [5]. The impact of obesity on pregnant women extends to the method of delivery. Previous studies reported two-thirds of 63.6% of obese women delivered by cesarean section, and there was no association between obesity or overweight and episiotomy. Obesity may be protective against the risk of third- and fourth-degree tears [6,7].

1.2 Problem statement

- Obesity is considered one of the largest global health problems of the 21st century. The World Health Organization (WHO) estimated that in 2008, 205 million men and 297 million women over the age of 20 were obese–a total of more than half a billion adult's worldwide.
- Maternal obesity is a problem more frequently encountered in pregnancies of women of advanced age.
- Obese women tend to have a higher likelihood of urinary tract and lower genital tract infections; induced deliveries; severe bleeding in the puerperium period; puerperal infections; birth defects; fetal death; fetal macrosomia; and maternal death during pregnancy or at childbirth. Children born to mothers who are obese or have diabetes mellitus are at a greater risk for developing metabolic disease

1.3 Justification

- Several studies in world have reiterated the fact that obesity puts mother and foetus at the risk of several complications such as gestational diabetes mellitus (GDM), hypertensive disorders of pregnancy (HDP), preterm labor, dysfunctional labor, caesarean sections, postpartum infections and deep vein thrombosis. Also, neonates of obese women were large for gestational age, macrosomic and had high incidences of birth injuries, shoulder dystocia, prematurity, late fetal deaths and congenital malformations.
- Rates of obesity in Sudan have significantly increased in recent years; these rates are particularly alarming among women of childbearing age.
- No published data in Sudan assessing the impact of obesity on pregnancy and neonatal outcomes among Sudanese pregnant women.

1.4 Objectives

1.4.1 General Objective

- To assess the impact of obesity on pregnancy and neonatal outcomes among Sudanese pregnant women.

1.4.2 Specific Objectives

- To describe characteristics of the mothers (Maternal BMI, Maternal age at delivery, gravdia, Current Smoking, Pre-existing thyroid disease & recurrent miscarriages).
- To identify maternal for obese pregnant women
- To determine child outcome according to maternal body mass index
- To compare the maternal and neonatal outcomes of obese pregnant women in different obesity classes.

Chapter Two

Literature Review

2. Literature Review

2.1 Obesity Definition

World Health Organization (WHO) defines overweight and obesity as abnormal or excess fat accumulation of adipose tissue that may impair health [8]. Anthropometric measurements of obesity are used in clinical practice and epidemiological studies because they are non-invasive, easy to perform and inexpensive. Body mass index (BMI) is the most commonly used anthropometric measurement for overweight and obesity. The formula for calculating BMI is weight in kilograms divided by the square of height in meters (kg/m2). WHO defines normal weight in adults as BMI 18.5-24.9 kg/m2, overweight as BMI ≥25 kg/m2 and obesity as BMI ≥30 kg/m2. Obesity can be further divided into three classes: class I (BMI 30.0-34.9 kg/m2), class II (BMI 35.0-39.9 kg/m2) and class III (BMI ≥40.0 kg/m2) [8]. However, lower BMI cutoffs for overweight and obesity have been proposed for Asian populations, which have a high risk of type 2 diabetes and CVD at lower BMI levels [9]

Table 1 International classification of overweight and obesity in adults according to BMI based on WHO guidelines [8].

Classification	BMI, kg/m2
Underweight	<18.5
Normal weight	18.5-24.9
Overweight	≥25.0
Obese	≥30.0
Obese class I	30.0-34.9
Obese class II	35.0-39.9
Obese class III	≥40.00

Although BMI is widely used for identifying overweight and obesity, there are limitations to this classification. By using current BMI cutoffs, the specificity for diagnosing excess body fat percentage (BF%) is high, while the sensitivity is low, leaving half of persons with an excess BF% undiagnosed [10]. A major restriction to BMI is the lack of ability to distinguish lean and fat

body mass [11]. In men, BMI correlates better with lean body mass than with BF%, while BMI in women, especially young women, correlates better with BF% than lean body mass [12].

2.2 Prevalence of obesity

In earlier historical periods obesity was rare, and achievable only by a small elite, although already recognised as a problem for health. But as prosperity increased in the Early Modern period, it affected increasingly larger groups of the population.[9] Prior to the 1970s, obesity was a relatively rare condition even in the wealthiest of nations, and when it did exist it tended to occur among the wealthy. Then, a confluence of events started to change the human condition. The average BMI of populations in first-world countries started to increase and, consequently, there was a rapid increase in the proportion of people overweight and obese [10]. In 1997, the WHO formally recognized obesity as a global epidemic. As of 2008, the WHO estimates that at least 500 million adults (greater than 10%) are obese, with higher rates among women than men [11]. The global prevalence of obesity more than doubled between 1980 and 2014. In 2014, more than 600 million adults were obese, equal to about 13 percent of the world's adult population [12]. The percentage of adults affected in the United States as of 2015–2016 is about 39.6% overall (37.9% of males and 41.1% of females) [13].

The rate of obesity also increases with age at least up to 50 or 60 years old and severe obesity in the United States, Australia, and Canada is increasing faster than the overall rate of obesity [14] The OECD has projected an increase in obesity rates until at least 2030, especially in the United States, Mexico and England with rates reaching 47%, 39% and 35%, respectively [12]. Once considered a problem only of high-income countries, obesity rates are rising worldwide and affecting both the developed and developing world. These increases have been felt most dramatically in urban settings. The only remaining region of the world where obesity is not common is sub-Saharan Africa.[14]

2.3 Health effect of obesity

The obesity epidemic poses a major threat to global health. According to GBD 2015 Obesity Collaborators, overweight or obesity contributed to 4.0 million deaths, 7.1% of all-cause deaths, and 120 million disability-adjusted life-years (DALYs), 4.9% of all-cause DALYs, among adults in 2015 worldwide [15]. Obesity is major risk factor for non-communicable diseases such as type

2 diabetes, cardiovascular disease (CVD) and most types of cancer [16]. Obesity increases CVD both independently and by way of comorbidities, such as hypertension, dyslipidemia, and glucose intolerance, all of which are risk factors for CVD [17]. Obesity is also associated with musculoskeletal diseases, such as hip and knee osteoarthritis. Furthermore, obesity has an adverse effect on respiratory function, and it plays an important role in the development of obstructive sleep apnea and obesity hypoventilation syndrome. Asthma is also more common and more difficult to treat in people with obesity [18]. Obesity also correlates with several mental health outcomes. A longitudinal meta-analysis showed that obesity increased the risk of developing depression by 55%, while depression increased risk of developing obesity by 58% over time. There also seems to be an association between obesity and anxiety disorders. The association to specific phobia has been found in several studies, while a few studies have reported a connection between obesity and panic disorders, post-traumatic stress syndrome and social phobia. Additionally, obesity is related with a considerable decline in health-related quality of life (HRQoL), especially in the physical aspects of functioning [19].

Table 2 Examples of diseases related to obesity

Diseases related to obesity	
Type 2 diabetes	
Cardiovascular disease and related comorbidities	Ischemic heart disease, hypertensive heart disease, stroke, hypertension, dyslipidemia
Osteoarthritis	In knee and hip
Cancer Site or type	Colon and rectum, esophagus (adenocarcinoma), gastric cardia, gallbladder, pancreas, liver, breast (postmenopausal), ovary, uterus, kidney (renal cell), meningioma, thyroid, multiple myeloma
Respiratory diseases	Asthma, obesity hypoventilation syndrome, obstructive sleep apnea, chronic obstructive pulmonary disease, pulmonary embolism, aspiration pneumonia
Psychiatric diseases	Depression, anxiety disorders, alcohol use disorders, personality disorders

2.4 Obesity and pregnancy

During pregnancy, weight status is most often assessed by using the woman's pre-pregnancy BMI or BMI in early pregnancy. Pre-pregnancy BMI is classified according to general BMI cutoffs for adults; overweight is defined as BMI ≥25 kg/m2 and obesity as BMI ≥30 kg/m2 [9]. In addition to pre-pregnancy BMI, weight status in pregnant women is monitored by observing gestational weight gain (GWG) [20].

2.5 Gestational weight gain

The Institute of Medicine (IOM) guidelines define optimal GWG according to pre-pregnancy BMI. The cutoffs have been established based on observational studies that have evaluated the associations of GWG on maternal and offspring health. For women with normal pre-pregnancy BMI, recommended GWG is 11.5-16.0 kg, for women with overweight prior to conception, recommended GWG is 7,5-11.5 kg and for women with pre-pregnancy obesity, recommended GWG is 5.0-9.0 kg [20].

Table 3 Recommendations for total weight gain and rate of weight gain during pregnancy according to pre-pregnancy BMI based on IOM guidelines [20]

Pre-pregnancy BMI	Total Weight Gain (kg)	Rates of Weight Gain during 2nd and 3rd Trimester (Mean (range) in kg/week)
Underweight (<18.5 kg/m2)	12.5-18.0	0.51 (0.44-0.58)
Normal weight (18.524.9 kg/m2)	11.5-16.0	0.42 (0.35-0.50)
Overweight (25.0-29.9 kg/m2)	7,5-11.5	0.28 (0.23-0.33)
Obese (≥ 30.0 kg/m2)	5.0-9.0	0.22 (0.17-0.27)

In the U.S. in 2012-2013, fewer than a third of pregnant women met the IOM recommendations of GWG and 50-60% of women with pre-pregnancy overweight or obesity had excess GWG [21].

2.6 Glucose and lipid metabolism during pregnancy

Maternal glucose and lipid metabolism adapt during pregnancy in order to enable fetal growth and development. During the first and second trimester, maternal energy metabolism is characterized by an anabolic stage. An increase in energy intake and insulin secretion result in maternal body fat accumulation [22,23]. During the last trimester, maternal energy metabolism

shifts to a catabolic stage and increased insulin resistance, enabling transportation of energy more efficiently to the rapidly growing fetus [24]. Glucose is the primary source of energy for the fetus. In healthy conditions, the fetus depends on maternal glucose supply and there is little fetal gluconeogenesis [25]. Blood glucose travels across the placenta mainly by facilitated diffusion by glucose transporters [26]. Throughout pregnancy, maternal fasting glucose concentration declines, in part because of increased fetal glucose utilization [27]. Maternal fat accumulation in early pregnancy is due to hyperphagia and increased lipogenesis. In late pregnancy, lipolysis increases and the intake of circulating triglycerides to peripheral tissues is reduced [28]. Triglycerides mainly stays in maternal blood circulation and functions as an easily available energy reserve in the case of fasting [66]. Obesity in pregnancy modifies the metabolic adaptations in pregnancy. Obese women have a greater energy supply and a faster metabolic rate than women of normal weight and obesity enhances the physiological insulin resistance in late pregnancy [29]. These circumstances may expose the fetus to excess levels of energy [30].

2.7 Obesity and acute pregnancy complications

Overweight and obesity affect reproductive health in women already before conception. Women with obesity have an increased risk of infertility. Obesity is a risk factor particularly, although not exclusively, for infertility caused by ovulation disorders [31]. Maternal obesity is a risk factor for miscarriage. Fetal congenital anomalies are more common in pregnancies complicated by maternal obesity and the risk increases progressively according to severity of obesity [32]. Maternal obesity and excess GWG increase the risk of macrosomia. Moreover, maternal overweight and obesity are risk factors for both preterm and post-term birth. Maternal overweight and obesity increase the risk of gestational diabetes mellitus (GDM). GDM is defined as a varying degree of glucose intolerance with onset or first recognition in pregnancy. GDM has increased considerably in prevalence during the past few decades [33]. In Finland, 19.2% of pregnant women had GDM in 2018 GDM is an independent risk factor for a number of adverse pregnancy outcomes and for maternal type 2 diabetes. Furthermore, essential hypertension, gestational hypertension and preeclampsia are more common in pregnant women with overweight and obesity compared to women with normal weight in pregnancy [34]. Gestational hypertension also increases with excess GWG. Both maternal obesity and excess GWG increase the risk of caesarean sections. At the same time, obesity increases the risk of post-surgical wound

infections and other complications related to cesarean sections. Maternal obesity also increases the risk of venous thromboembolism in pregnancy and during the postpartum period. Excess GWG is associated with maternal postpartum weight retention, independently of pre-pregnancy BMI. Most severe outcomes of maternal obesity for the child include an increased risk of asphyxia-related complications, cerebral palsy, stillbirths and infant deaths [35]. As for the mother, maternal obesity, particularly severe obesity, increases the risk of maternal life-threatening conditions and mortality during childbirth. In a nationwide study in Sweden, maternal weight gain between the first and second pregnancy increased the risk of pre-eclampsia, gestational hypertension, gestational diabetes, caesarean delivery, stillbirth and macrosomia. These findings support the causality between maternal obesity and adverse pregnancy outcomes. Resources to reduce maternal obesity should be particularly targeted on weight control prior to conception, since lifestyle interventions during pregnancy have limited effect on pregnancy complications [36].

Table 4 Summary of acute adverse pregnancy outcomes related to maternal obesity

Pregnancy complications related to maternal obesity	
Maternal outcomes	GDM Gestational hypertension and pre-eclampsia. Caesarean sections. Venous thromboembolism. Miscarriage. Mortality during childbirth. Urinary infections Preterm birth Assisted vaginal delivery Wound infection/breakdown Postpartum bleeding Postpartum thromboembolism Anesthetic complications Longer hospitalization Intrauterine fetal demise (stillbirth
Fetal and offspring outcomes	Fetal congenital anomalies. Preterm and post-term birth. Macrosomia. Asphyxia-related complications, such as cerebral palsy. Stillbirths and infant deaths.
Postnatal	Type 2 diabetes Cardiovascular diseases Osteoporosis Cancer Metabolic syndrome Neurodevelopmental delay Aging

2.8 previous studies

Maternal obesity is a risk factor for miscarriage. Fetal congenital anomalies are more common in pregnancies complicated by maternal obesity and the risk increases progressively according to severity of obesity study reported by Brite et al , 2014 [32]

Regarding the association between obesity and preeclampsia, a previous study by Kahr et al, 2016 [39] conducted in Tabuk City found a higher risk of preeclampsia in obese non-GDM women.

Likewise, demonstrated in the retrospective cohort study done by Zayed et al, 2018 that women with pre-pregnancy obesity are more likely to develop preeclampsia, which reported a statistically significant association between obesity and preeclampsia [40].

According to Young et al, 2016 in a review that aimed to summarize the findings of published systematic reviews regarding the possible risks for pregnant women with obesity and their infants. The review demonstrates an association between obesity and gestational hypertension and preeclampsia, identified as a risk factor [41].

A cohort study was done by Marchi et al, 2015 where data was collected from three large urban academic centers; the result revealed a positive association between obesity and preeclampsia [42].

Moreover, a study by Paré et al, 2014 reported in the systematic literature review of two decades (1992–2011) that obesity is associated with preeclampsia or hypertension during pregnancy [43].

Salihu et al, 2012 in a prospective cohort study, the result shows that higher gestational weight gain was associated with a higher risk of pregnancy-induced hypertension but not with preeclampsia [44].

Chapter Three

Materials & Methods

3. Materials & Methods

3.1 Study design

This study was cross-sectional hospital based study.

3.2 Study duration

Study was done from Jun to Dec 2022.

3.3 Study population

This study was included all obese pregnant women of primigravida and multigravida, aged from 18 to 44 years old, and the BMI for those pregnant women was 30 or more attending at Omdurman Military hospital- Khartoum, Sudan.

3.4 Study area

The study was done in Omdurman Military hospital- Khartoum, Sudan

3.5 Sampling techniques

It was conducted through a probability sampling

3.6 Sample size

130 Obese pregnant women admitted to Omdurman Military hospital

3.7 Inclusion criteria

Obese pregnant women was included in the sample based of the following criteria:

- BMI up to 30
- Obesity class include I,II,III
- Spontaneous vaginal delivery

3.8 Exclusion criteria

Obese pregnant women was excluded from the study based of the following criteria:.

- Multiple pregnancies
- Pre-pregnant DM, hypertension and cardiac disease

- Abnormal fetus ill
- Elective C.S regarding other causes

3.9 Study variables

Table 3.1 study variables

Dependent variables	Independent variables
Maternal outcomes of obese pregnant women	sociodemographic characteristics (Maternal BMI, Maternal age at delivery)
Neonatal outcomes of obese pregnant women	health-related characteristics (gravdia, Current Smoking, Pre-existing thyroid disease & recurrent miscarriages)

3.10 Data collection

The data was obtained through records of the labor and delivery department. The study included all obese women who delivered in the select six months. Then compared the outcomes of pregnancy through the different obesity' classes

3.11 Study instrumentation

The study questionnaire assesses the effect of obesity on pregnancy and fetal outcome was developed after extensive searching of the literature [21, 22]. The most common complication for obese pregnant women during the antenatal period, intrapartum period, and the neonatal outcome at the time of delivery was listed. Then the sociodemographic and health-related characteristics was added and categorized with the maternal and neonatal outcomes.

Then the final form of the checklist was formulate and de-sign into three main categories:

- The first category is sociodemographic and health-related characteristics which include eight subcategories: BMI, maternal age, primigravida, multigravida, mode of the previous delivery, smoking in the current pregnancy, pre-existing thyroid disease, and recurrent miscarriages.
- The second category is the maternal outcomes which will divide into two sections:

A. The antenatal complication includes four subcategories: Pregnancy-induced hypertension (preeclampsia or eclampsia), gestational diabetes, venous thromboembolism, and urinary tract infection.

B. The intra-natal outcomes include twelve subcategories: Gestational age at delivery, preterm labor, induction of labor, augmentation of labor, mode of current delivery, perineal tears (first-degree second degree and third-degree), perineal episiotomy, placental complete or incomplete, duration of 3ed stage of labor, emergency cesarean delivery, postpartum hemorrhage, and prolonged labor.

- ❖ The third category is the neonatal outcomes, which includes ten subcategories: Intrauterine growth restriction IUGR, intra-uterine fetal death IUFD, congenital anomalies, preterm baby, shoulder dystocia, stillbirth, APGAR score, neonatal mortality, birth weight (appropriate for gestational age [AGA]-small for gestational age [SGA]large for gestational age [LGA]) and admission to NICU

3.12 Ethical Considerations

An approval from Institutional Ethics Committee, NAPTA College. The objective of the study was explained to all participants, and their consent was taken. Participants who fulfilled the above criteria was included in the study after taking consent.

3.13 Data analysis

The data was analyzed using the Statistical Package of Social Sciences (SPSS, IBM, and Armonk, NY) version 23. Proper statistical tests was used to describe the finding of the study and to achieve the objectives of the study, with appropriate statistical measures and tests. The ordinal and nominal variables was presented in the form of frequencies and percentages. Chi-square, which is a statistical test, was used to examine the association between two quantitative variables. P-value of less than 0.05 was considered statistically significant, and it can be concluded that there is a relationship between the two variables

Chapter Four

Results

4. Results

Table 4.1. Distribution of obese Pregnant women in Omdurman Military hospital- Khartoum, Sudan 2022 by Socio-Demographical Characteristics (n=130)

Socio-Demographical Characteristics		Number (n=130)	%
Age	Less 24	11	8.1
	25–29	37	28.5
	30–34	35	26.9
	35–39	31	24.2
	40–45	16	12.3
Residence	Khartoum	38	29
	Omdurman	62	48
	Bahri	17	13
	Other	13	10
Education status	Primary school and below	57	43.5
	Middle School	22	17.2
	High school	42	31.7
	University	9	7.49
Working status	Working	13	10.1
	Not working	117	89.9
Family income status	High	9	6.91
	Middle	79	60.5
	Low	42	32.5

A total of 130 pregnant women were included in the study. The mean age of the pregnant women in the study group was 27.50±5.08 .The majority are 28.5% of women aged between 25 to 29 years, and only 12.4% for the age group between 40 to 45 years. 43.5% of the participants had primary education or below, 89.9% did not work in any income-generating job, and 60.5% described their income as medium (Table 4.1).

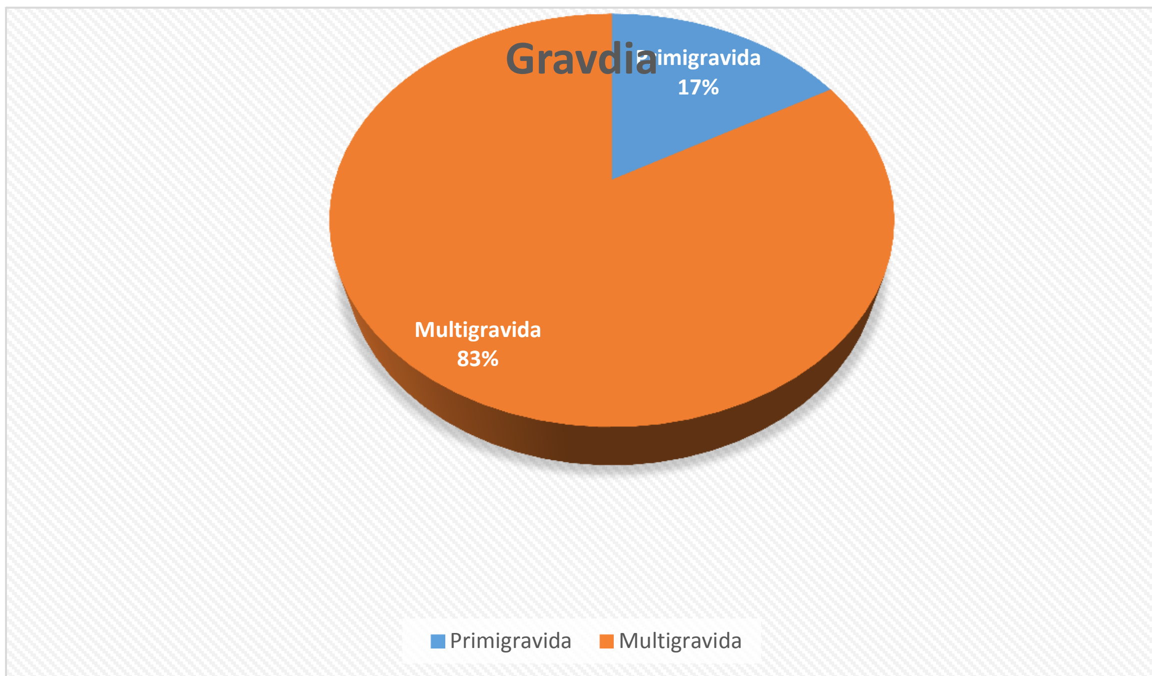

Figure 4.1. Distribution of obese Pregnant women in Omdurman Military hospital- Khartoum, Sudan 2022 according to gravdia (n=130)

Regarding the obstetric characteristics, results revealed that primigravida was only 16.7%, while the majority were multigravida' 83.3%. Figure 4.1

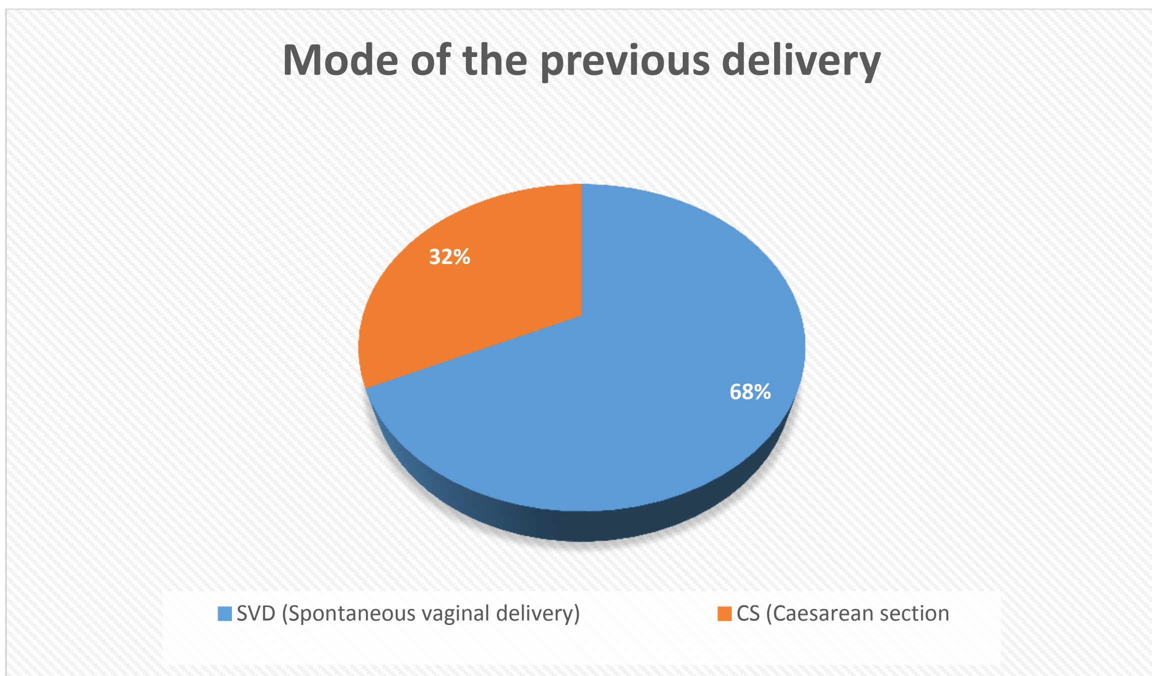

Figure 4.2. Distribution of obese Pregnant women in Omdurman Military hospital- Khartoum, Sudan 2022 according to Mode of the previous delivery (n=130)

Figure 4.2 shows the mode of previous delivery 67.7% were delivered through SVD and 14.0% paid by CS.

Figure 4.3. Distribution of obese Pregnant women in Omdurman Military hospital- Khartoum, Sudan 2022 according to Obesity (n=130)

Figure 4.3 Shows Two-thirds of women were in class I obese (BMI 30–34), while 7.5% of them in obesity class III (BMI more than 40).

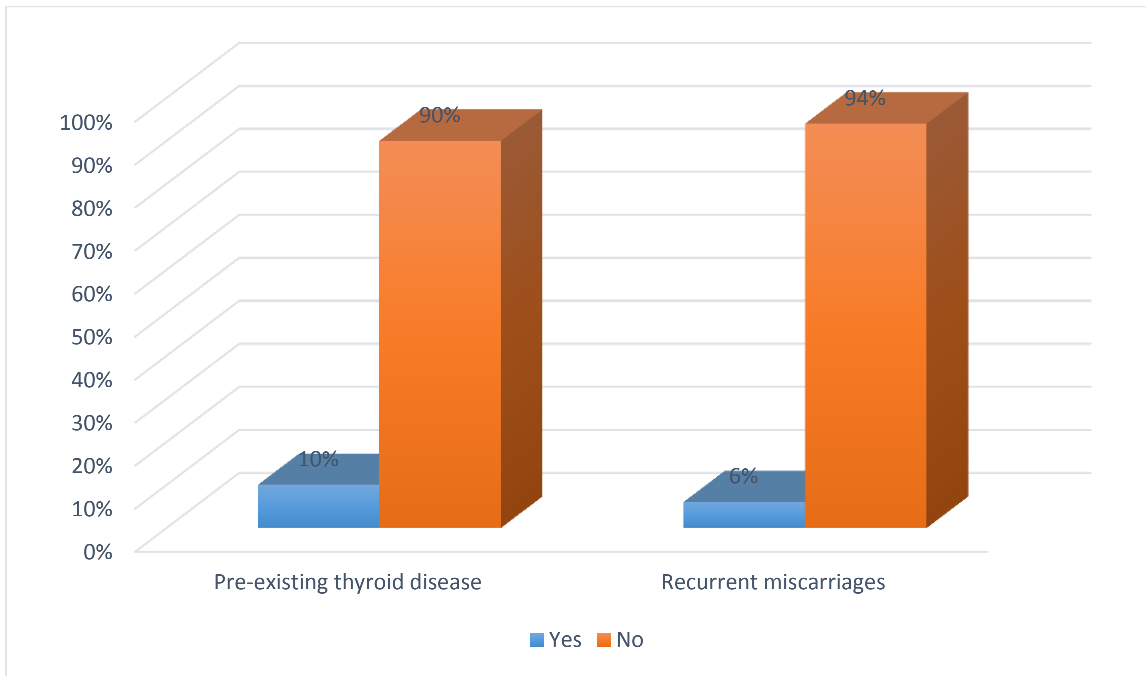

Figure 4.4. Distribution of obese Pregnant women in Omdurman Military hospital- Khartoum, Sudan 2022 according to risk factors (n=130)

Figure 4.4 regarding the risk factors, 10% have pre-existing thyroid disease, and 6% had recurrent miscarriages.

Table 4.2. Association between Obesity and obstetrics co-factors (N=130)

		Obesity			P value
		Class I (BMI 3–34 kg/m2) n = 88 (%	Class II (BMI 35–39.9kg/m2) n = 32 (%)	Class III (BMI > 40.0 kg/m2) n = 10 (%)	
Maternal outcomes: A. The antenatal complication					
Pre-existing thyroid disease	Yes	11 (13%)	0(0%)	0(0%)	0.015
	No	76(87%)	32(100%)	10(100%)	
Pregnancy induced hypertension	Yes	0(0%)	0(0%)	1(10%)	0.015
	No	88(100%)	32(100%)	9(90%)	
Gestational diabetes	Yes	20(23%)	8(27%)	2(20%)	0.62
	No	68(77%)	24(73%)	8(80%)	
Urinary tract infection	Yes	8(1%)	10(3%)	0(0%)	0.52
	No	80(99%)	22(97%)	10(100%)	
venous thromboembolism	Yes	4(4%)	2(7%)	2(20%)	0.037
	No	84(96%)	30(93%)	8(80%)	
B. The intra-natal outcomes					
Gestational age at delivery	Preterm	7(8%)	2(7%)	0%)	032
	Full term	81(91%)	30(93	9(90%)	
	Post date	9(1%)	0(0%)	1(10%)	
Induction of Labor:	Yes	23(26%)	8(25%)	4(40%)	0.73
	No	65(74%)	24(75%)	6(60%)	
Augmentation of labor	Yes	18(20	7(21%)	4(40%)	0.16
	No	70(80%)	25(79%)	6(60%)	
Mode of current delivery	SVD (Spontaneous vaginal delivery	67(76%)	23(71%)	6(60%)	0.50
	CS(Caesarean section)	12(14%)	9(29%)	4(40%)	
Perianal tears	first-degree	31(35%)	10(30	1(10%)	0.020
	second degree	16(18%)	3(9%)	3(30%)	
	third-degree	4(4%)	2(6%)	2(20%)	
	intact	38(43%)	18(55%)	4(40%)	
Labor complications	Postpartum hemorrhage	26(3	6(2%)	1(10%)	0.339

Table 4.2 shows the frequency and result of fisher's exact test that examined the relationship between obesity classes and co-factors. The pre-existing thyroid disease shows that (13%) cases were found in obesity class I. There was a significant association between obesity and pre-existing thyroid disease p = 0.015. Only one case (7%) and (93%) were found in class III obesity for preeclampsia. The association between obesity and preeclampsia no statistically significant at p = 0.075. Similarly, there is no statistically significant difference between (GDM) and UTI with obesity. For perineal tears, intact perineal at delivery was (43.0%) cases, while (35%) (19%) had first and second-degree tears, respectively. For obesity class II, 55% women deliver with an intact perineum, (30%) and (10%) cases had 1st and second-degree tears, respectively. In obesity class III, the highest percentage, (42.0%) deliver with intact perineal, while tears were (29%), and (7.1%) cases had first and second-degree tears, respectively. There is a significant association between obesity and perineal tears p = 0.020.

Table 4.3. Association between Obesity and Neonatal outcomes (N=130)

		Obesity			**P value**
		Class I (BMI 3–34 kg/m2) n = 88 (%	Class II (BMI 35–39.9kg/m2) n = 32 (%)	Class III (BMI > 40.0 kg/m2) n = 10 (%)	
neonatal outcomes					
Intrauterine growth restriction IUGR	Yes	0(0%)	6(2%)	0(0%)	0.31
	No	88(100%)	26(98%)	10(100%)	
Intra-uterine fetal death IUFD:	Yes	0(0%)	6(2%)	1(10%)	0.89
	No	88(100%)	26(98	9(90%)	
Congenital anomalies	Yes	8(9%)	0(0%)	0(0%)	0.13
	No	80(91%)	32(100	10(100	
preterm baby:	Yes	7(8%)	2(7%)	0(0%)	0.54
	No	81(92%)	30(93%)	10(100%)	
Birth weight	Appropriate for gestational age [AGA]	75(85	28(86	9(90%)	1.0
	Small for gestational age [SGA]	8(9%)	3(9%)	1(10	
	Large for gestational age [LGA])	5(6%)	1(5%)	0(0%)	
Admission to NICU:	Yes	3(3%)	6(2%)	0(0%)	0.9
	No	85(97	26(98%)	10(100	
Neonatal mortality	Yes	0(0%)	6(2%)	0(0%)	0.32
	No	88(100%)	26(98%)	10(100%)	

Table 4.3 shows the frequency and result of fisher's exact test that examined the relationship between obesity classes and neonatal outcomes. All other co-factors regarding neonatal outcomes of IUFD, Preterm babies, Apgar score, birth weight, admission to NICU, and neonatal mortality in relation to obesity classes reflected no statistical significant relationship at ($p < 0.751$, $p < 1.000$, $p < 0.90$, and $p < 0.312$) respectively

Chapter Five

Discussion, Conclusion & Recommendations

5. Discussion, conclusion & Recommendations

5.1 Discussion

Our study aimed to assess the impact of obesity on pregnancy and neonatal outcomes among Sudanese women. This study's first objective was to describe the pregnancy and the neonatal outcomes for obese pregnant women. The present study revealed a significant association between obesity and pre-existing thyroid disease, pregnancy-induced hypertension (preeclampsia), and perineal tears. Regarding the association between obesity and pre-existing thyroid disease, our result shows a statistically significant association between obesity and pre-existing thyroid disease. Similarly, in a prospective cohort study [38] conducted at Rotterdam, the Netherlands. The result showed no significant difference in gestational age and weight gain [39].

Regarding the association between obesity and preeclampsia, our result shows a statistically significant association between obesity and preeclampsia, similarly, in prospective cohort research conducted in Jeddah Maternity and Children Hospital (MCH). The study revealed a positive association between obesity and increased risk of pregnancy induced hypertension and preeclampsia compared with the normal-weight women. A previous study by [39] conducted in Tabuk City found a higher risk of preeclampsia in obese non-GDM women. Likewise, [40] demonstrated in the retrospective cohort study that women with prepregnancy obesity are more likely to develop preeclampsia, which reported a statistically significant association between obesity and preeclampsia. According to [41], in a review that aimed to summarize the findings of published systematic reviews regarding the possible risks for pregnant women with obesity and their infants. The review demonstrates an association between obesity and gestational hypertension and preeclampsia, identified as a risk factor in 54 studies. A cohort study was done by [42], where data was collected from three large urban academic centers; the result revealed a positive association between obesity and preeclampsia. Moreover, a study by [43] reported in the systematic literature review of two decades (1992–2011) that obesity is associated with preeclampsia or hypertension during pregnancy. On the other hand, the findings reported by [44] in a prospective cohort study, the result shows that higher gestational weight gain was associated with a higher risk of pregnancy-induced hypertension but not with preeclampsia. Additionally, higher pre-pregnancy BMI is associated with high blood pressure, both systolic and diastolic, in all trimesters.

Regarding perineal tears, our result shows a statistically significant association between obesity and perineal tears. The association between these two variables is a significant negative association, which means when the obesity class decreases, the risk for perineal tears increased. Conversely, when the obesity class increased, the risk for perineal tears decreased. Similarly, [45] in the case-control study, revealed significant association between obesity and perineal tears. Likewise, a previous cohort study by Blomberg, 2014[46] which demonstrated that the risk of partial anal sphincter injury or total sphincter injury and fourth-degree perineal tears decreased with maternal obesity. The general risk for any anal sphincter injury among obese women class III was reduced by 25% compared to normal women's weight. Previous studies found that obese women have a lower risk for perineal tears, known as a protective effect of obesity. The negative association between obesity and perineal tears has shown that obesity in pregnancy is not commonly associated with adverse events [47]. A retrospective cohort study [48] conducted in Riyadh, Saudi Arabia, indicated an association between obesity and perineal tears. Furthermore, the prospective cohort study [49] which was carried out in Egypt, reported that obese women had a higher perineal tear rate, mostly second-degree tearing, than those with normal BMI. Besides, there was no significant difference in the incidence of third-degree perineal tear in obese women. In the same line, [50] found that the rate of third- and fourth-degree perineal tears decreased with increasing BMI, whereas the opposite was true for first- and second-degree perineal tears, which increased with increasing BMI. In conclusion, the incongruence between our study and those studies may be due to the large study population, and the data included an ethnically heterogeneous population. Dissimilarly, the case-control study was conducted on pregnant women and reported association between obesity and perineal tear [51]. In the same line, [52] reported in a prospective cohort study conducted at Bingham. That there was increased risk of perineal tear among obese pregnant women. Similarly, a systematic review and meta-analysis were conducted to investigate maternal obesity in Africa[53]and reflected significant relationship between maternal obesity and episiotomy or perineal tear.

The contrast between our study and those studies may be due to the ethnically heterogeneous population. This study's second objective was to compare the pregnancy and the neonatal outcomes of obese pregnant women in different obesity classes. Regarding preeclampsia, our study's findings were in accordance with other findings reported by [41] which stated that preterm preeclampsia is high in women with class III obesity compared to normal-weight women. This

agrees with only one case in our study, which was categorized under obesity class III. Several previous studies [41, 43,53, 54] reflected their result based on a comparison of obesity in general with average weight not like our study the comparison in obesity classes. Obese women have an increased risk of gestational diabetes and giving birth to macrocosmic children regardless of their glycemic status. To limit the pregnancy complications of obesity, it is common obstetric practice to restrict weight gain in obese women with diet/physical exercise. These factors may have influenced the fetal growth, and thus, the consequent risk of perineal tears/episiotomy/cesarean sections. In this study, neither the prevalence rates of gestational diabetes nor the amount of gestational weight gain was addressed [55,56].

5.2 limitation of study

Missing data inpatient led to exclude the patients from the sample. The exclusion criteria decrease the sample size, which affects reversibility. Also, the lack of a normal-weight control group would have provided the baseline rates of obstetrical complications in Sudanese women, which is not included in our study.

5.3 Conclusion

The study sheds light on a significant risk factor among Sudanese pregnant women as obesity is a severe public health problem and harms maternal pregnancy outcomes.

This study reflected several associations between obesity and specific co-factors as preeclampsia, and perineal tears.

5.4 Recommendations

Further studies are needed to conduct a larger sample size and include the elective cesarean section and its relation to obesity, and increases the data collection period to generalize the results.

The study also recommends the pregnant women start the antenatal follow-up from 1st trimester

Chapter Six

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6.1 References

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Questionnaire

NAPTA College

Faculty of medicine

Questionnaire

Section 1: sociodemographic and health-related characteristics

Age: Less 24 years ☐ 25–29 years ☐ 30–34 years ☐

35–39 years ☐ 40–45 years ☐

Residence: Khartoum ☐ Omdurman ☐ Bahri ☐

Educational status: Primary school and below ☐ Middle School ☐

High school ☐ University and above ☐

Working status: Working ☐ not working ☐

Family income status: Low ☐ Middle ☐ High ☐

Gravdia: Primigravida ☐ Multigravida ☐

Mode of the previous delivery: SVD (Spontaneous vaginal delivery) ☐

CS (Caesarean section) ☐

BMI (kg/m2): Normal weight ☐ Over weight ☐ Obese ☐

Obesity: Class I ☐ Class II ☐ Class III ☐

Pre-existing thyroid disease: Yes ☐ No ☐

Recurrent miscarriages: Yes ☐ No ☐

Section 2: maternal outcomes

A. The antenatal complication:

Pre-existing thyroid disease: Yes ☐ No ☐

Pregnancy-induced hypertension (preeclampsia or eclampsia): Yes ☐ No ☐

Gestational diabetes: Yes ☐ No ☐

venous thromboembolism: Yes ☐ No ☐

Urinary tract infection: Yes ☐ No ☐

B. The intra-natal outcomes:

Gestational age at delivery: Preterm ☐ Full term ☐ Post date ☐

Induction of Labor: Yes ☐ No ☐

Augmentation of labor Urinary tract infection: Yes ☐ No ☐

Mode of current delivery: SVD (Spontaneous vaginal delivery) ☐

CS (Caesarean section) ☐

Perianal tears: first-degree ☐ second degree ☐ third-degree ☐

Emergency cesarean delivery: Yes ☐ No ☐

Prolonged labor: Yes ☐ No ☐

Labor complications:

Postpartum hemorrhage: Yes ☐ No ☐

Section 3: neonatal outcomes

Intrauterine growth restriction IUGR: Yes ☐ No ☐

Intra-uterine fetal death IUFD: Yes ☐ No ☐

Congenital anomalies: Yes ☐ No ☐

preterm baby: Yes ☐ No ☐

Birth weight: Appropriate for gestational age [AGA] ☐

Small for gestational age [SGA] ☐

Large for gestational age [LGA]) ☐

Admission to NICU: Yes ☐ No ☐

Neonatal mortality: Yes ☐ No ☐