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Effects of maternal body mass index on pregnancy outcome and newborn weight

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First giving honor to God, for all the blessing in my life.

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Abstract

Introduction:

Higher pre-pregnancy body mass index (BMI). Directly influence splacental and fetal cardiometabolic development ⁽³⁾. In addition, the off springs of mothers with a high pre-pregnancy BMI are at increased long-term risk for obesity and cardiometabolic dysfunction ⁽⁴⁾. Gestational weight gain is also related to the risk of maternal and infant complications .Although gestational weight gain is necessary to ensure a healthy fetus, inappropriate weight gain is associated with adverse outcomes, including gestational diabetes mellitus (GDM), preeclampsia, peripartum depressive symptom, cesarean delivery, preterm birth, low birth weight, and macrosomia

Materials and Methods:

Study population: The study was performed on(105) pregnant women

Type of study: cross-section study.

Sampling method: convenience

Place:. Bint AL-Huda hospital in Thi-Qar governorate- Iraq

Work time : work is done during the period from 1st Feb 2022until the end of Apr 2022.

Data Analysis and Presentation: All data management and analyses were done by using the programmed statistical methods. Data have been represented by a suitable tables and figures.

Results:

Our study found that common adverse pregnancy outcome such as anemia(51.42%) ,cesarean section(42.85%) ,preeclampsia (33.33%) ,wound infection(10.46%) ,DVT, gestational diabetes 8.50% ,induction of labor(15%) Similarly found that common adverse fetal pregnancy outcome such as lagre for gestational age (20%), small for gestational age (9.5%) and (56%) of neonate need for admission to neonatal care units

Conclusion:

Based on this study, we conclude that majority of antenatal patients being catered in our hospital have normal and over weight BMI. Adverse maternal and perinatal outcomes are associated with extremes of BMI.

This research demonstrates that maternal BMI is an important risk factor of pre-eclampsia. An increased BMI increases the incidence of induction of labour, caesarean section, anemia , gestational diabetes , DVT and wound infection ,large and small for gestational age ,need for admission to neonatal care unit also increased.

Recommendation

we advise pregnant woman to gain normal BMI of 20-24, before and during pregnancy, for instance by consulting their physician or a dietitian prior to getting pregnant which is essentially required for better pregnancy outcomes.

List of Tables and Figures

Figure	Figure Title	Page
Figure(1)	frequency of common maternal adverse pregnancy outcome	5
Figure(2)	frequency of common fetal adverse pregnancy outcome	6
Figure(3)	frequency of Pre-eclampsia according to pregnancy categorized BMI	7
Figure(4)	frequency of anemia according to pregnancy categorized BMI	8
Figure(5)	frequency of Cesarean Section according to pregnancy categorized BMI	9
Figure(6)	frequency of induction of labor according to pregnancy categorized BMI.	10
Figure(7)	frequency of wound infection according to pregnancy categorized BMI	11

Table	Table Title	Page
Table(1)	BMI categories by pregnancy outcome of birth weight	11

List of contents

Subject	Page
Acknowledgement	I
Abstract	II
List of Tables and Figures	IV
List of contents	V
Introduction	1
The Objectives	3
Subject and methods	4
Results	5
Discussion	12
Conclusions	14
Recommendation	14
References	15
Appendix	15

Introduction

The increasing prevalence of obesity has become one of the most important public health concerns worldwide ⁽¹⁾. Obesity has negative effects on almost all physiological functions of the body and has a large impact on morbidity and mortality throughout the life course ⁽²⁾. The prevalence of obesity in reproductive women is increasing globally. Overweight or obese status before pregnancy strongly influences not only metabolic complications but also adverse perinatal consequences.

Higher pre-pregnancy body mass index (BMI) directly influence placental and fetal cardiometabolic development ⁽³⁾. Gestational weight gain is also related to the risk of maternal and infant complications .Although gestational weight gain is necessary to ensure a healthy fetus(normally increase about 15-20kg), inappropriate weight gain is associated with adverse outcomes, including gestational diabetes mellitus (GDM), preeclampsia, cesarean delivery, preterm birth, low birth weight, and macrosomia ⁽⁵⁾.

The developing countries like Iraq are facing a dual burden of nutritional problems, with undernourished and underweight women on one side and overweight and obese women on the other side. We were yet struggling to eradicate undernutrition and anaemia from our country and we are already facing an epidemic of obesity in the 21st century probably due to the transition from traditional diets and lifestyles to western diets.

BMI is widely accepted as a better measure of under or overweight than weight alone. It is an index of weight- for- height and is calculated by dividing a person's weight in kilograms by square of height in meters (kg/m²). The pregnant women were categorized to be non-obese when their body mass index (BMI) was 19.8-24.9 kg/m² , overweight when their BMI was 25-29.9 kg/m² and obese when their BMI was 30 kg/m² or more.

Increased BMI in pregnancy is related to increasing incidence of preeclampsia, gestational diabetes, postdatism, macrosomia, induction of labour and increased operative interferences; while low BMI is associated with preterm delivery, low birth weight babies, anemia etc.

The need for present study was to assess the distribution of antenatal women being catered in our hospital in four categories of BMI and to evaluate whether BMI significantly affects pregnancy outcome. The objectives of the present study were to study distribution of antenatal patients in underweight, normal, overweight and obese categories according to booking BMI, to find out average weight gain in each of the four categories of BMI, to examine the association of BMI with obstetric and perinatal outcomes in singleton pregnancies ⁽⁶⁾.

Diabetes mellitus is the most common medical complication of pregnancy and it carries a significant risk to the foetus and the mother. Congenital malformations and perinatal morbidity remain common compared with the offspring of non diabetic pregnancies. Diabetic mothers are at risk of progression of microvascular diabetic complications as well as early pregnancy loss, pre-eclampsia, polyhydramnios and premature labour. Glycaemic control before and during pregnancy is critical and the benefit may result in a viable, healthy off spring. Gestational diabetes mellitus (GDM) which manifests for the first time during pregnancy is common and on the increase, its proper management will reduce the risk of neonatal macrosomia and hypoglycaemia. Post-partum evaluation of glucose tolerance and appropriate counselling in women with GDM may help decrease the high risk of subsequent type 2 diabetes in the longterm.

Hypertensive disorders of pregnancy rank as the second most common cause of direct maternal death in the developed world. Hypertension is also the most common medical complication encountered during pregnancy. There is significant maternal and neonatal mor bidity associated with hypertension in

pregnancy, with increased rates of intracerebral hemorrhage, placental abruption, intrauterine growth retardation, prematurity, and intrauterine death for expectant mothers with high blood pressure. Preeclampsia can result in fetal growth restriction and preterm delivery. Hypertensive disease during pregnancy increases the risk of hypertension and cardiovascular diseases later in the woman's life.

Obesity has been linked as a risk factor for wound complications and is becoming a more common occurrence. Wound complication was defined as a composite of wound disruption (hematoma or seroma) or infection diagnosed up to 6 weeks postpartum. Variables collected include age, parity, prior CDs, prior abdominal surgeries, incision type, chorioamnionitis, maternal comorbidities (hypertension, diabetes) and gestational age.

Fetal macrosomia, defined as an estimated fetal weight of more than 4000 g, is associated with a significant risk of maternal and neonatal complications. There are several studies reporting the maternal complications associated with macrosomia, including emergency Cesarean section (CS) for fetal distress or failure to progress, postpartum hemorrhage and anal sphincter injury, as well as neonatal complications such as shoulder dystocia and associated sequelae, e.g. brachial plexus injury, fractured clavicle or humerus and birth asphyxia.

There is a growing body of evidence that maternal obesity might represent an independent risk factor for an instrumental delivery. Between 5 and 20% of infants are delivered by instrumental (operative vaginal) delivery in developed countries. Overall, approximately 5–10% of attempted instrumental deliveries will fail. Unsuccessful attempts are associated with a

higher risk of adverse maternal outcomes than proceeding directly to cesarean delivery, including increased rates of general anesthetic and wound infection , as well as psychological trauma. Women who have had a previous failed attempt are likely to opt for an elective repeat cesarean delivery rather than another attempted vaginal birth. Where instrumental delivery is indicated due to fetal distress, Established risk factors for requiring instrumental delivery include advanced maternal age , high body mass index (BMI), epidural analgesia, and high birth weight .

The aim of this study was to investigate the impact of pre-pregnancy BMI and gestational weight gain on the risk of maternal and infant pregnancy complications in pregnant women.

The Objectives

The objectives that we prospect to fulfillment by the end of this project are:

- 1-Identify the effect of maternal BMI on pregnancy outcome .
- 2- Identify the effect of maternal BMI on newborn weight .
- 3- clarify the common adverse maternal pregnancy out come
- 4- determine the common adverse fetal pregnancy outcome .

Subject and methods

A prospective case-control study was conducted in Bint AL-Huda hospital in Thi-Qar governorate- Iraq, from . 1st Feb 2022 until the end of Apr 2022.

Exclusions criteria were: abnormal fetal presentation, placenta pre- via, medical disorders such as diabetes mellitus, chronic hypertension, cardiac or endocrine disorders and surgical conditions and unknown maternal weight.

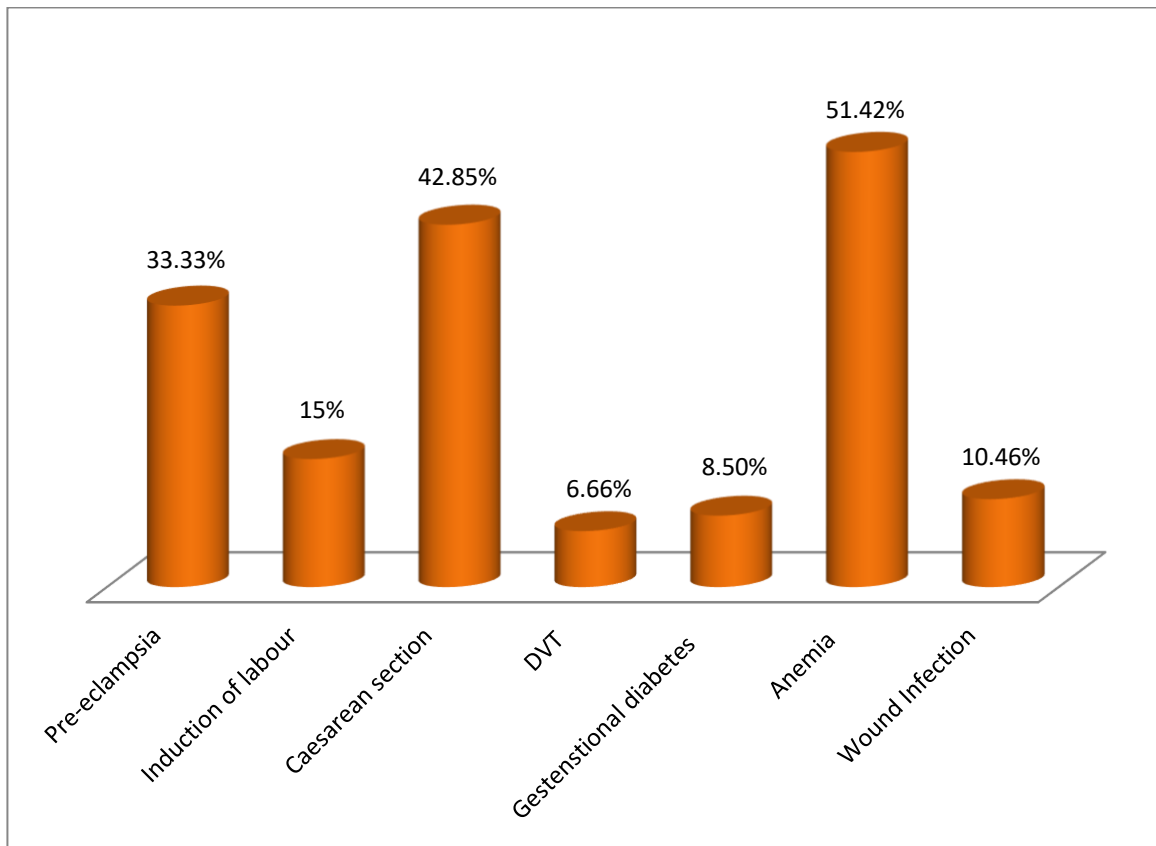
The pregnant women were categorized to be non-obese when their body mass index (BMI) was 19.8-24.9 kg/m² , overweight when their BMI was 25-29.9 kg/m² and obese when their BMI was 30 kg/m² or more.

In our study we grouped female by Quetelet index <20 as (8) ,20-24.9 as (34), 25-29.9 as (45), 30-34.9 as (15) and > 35 as (3) women respectively

The study was approved by the ethical committee of health directorate of Thi-Qar governorate and the ethical board of the College of Medicine – Thi qar university-Iraq. After measuring BMI, all data was taken by questionnaire included (Maternal: age, gestational hypertension, gestational diabetes, anemia ,preterm delivery, induction of labor, Caesarean delivery; Fetal and neonatal complications: macrosomia LGA, SGA, neonatal admission in NICU, fetal death. The significance of the results were assessed using Chi square test.

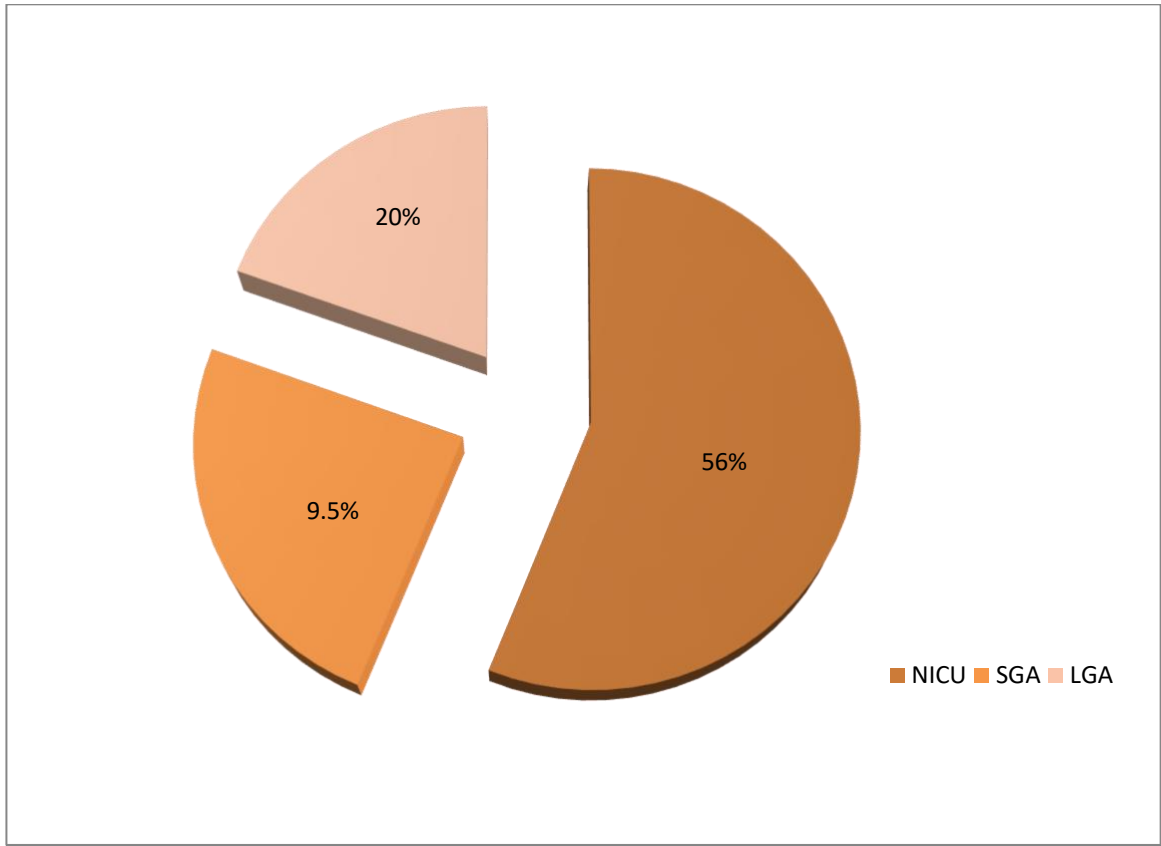
Results

Figure(1); frequency of common maternal adverse pregnancy outcome



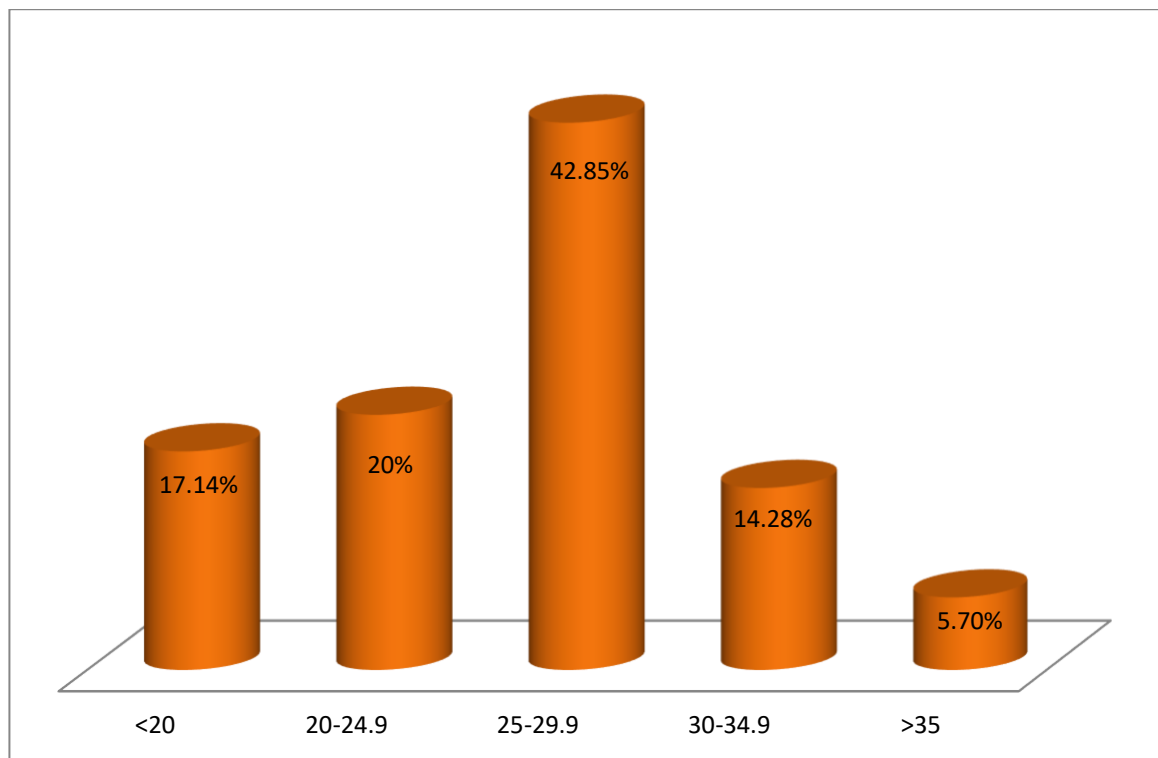
This figure show frequency of common adverse pregnancy outcome according to our collected data

Figure(2); frequency of common fetal adverse pregnancy outcome



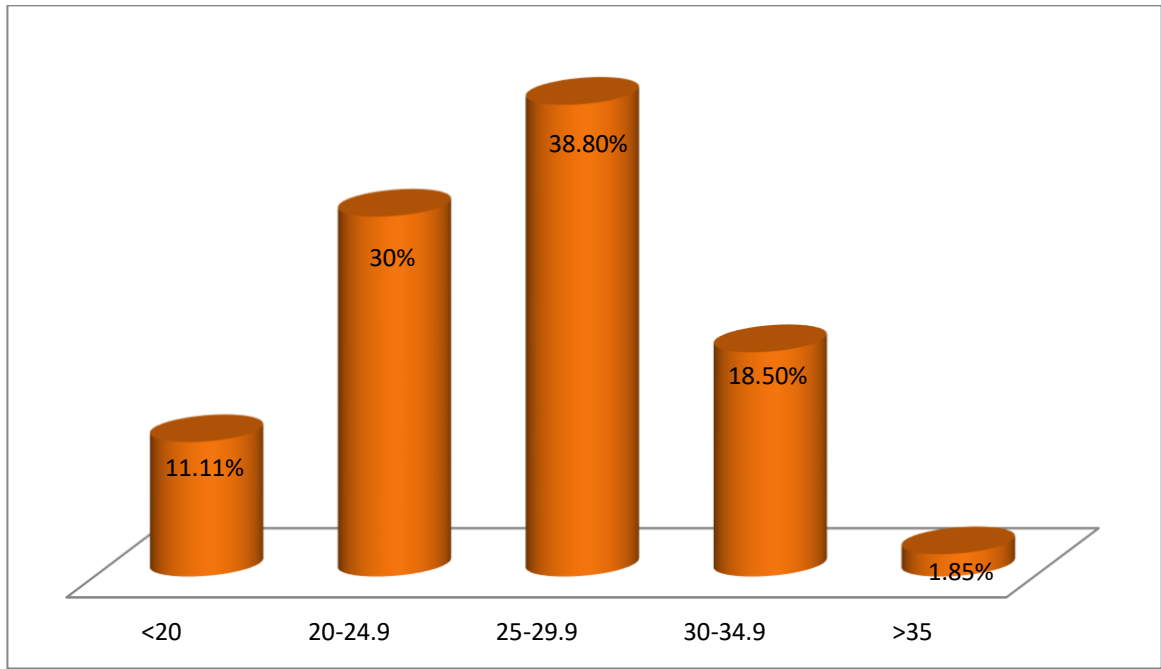
This figure show frequency of common fetal adverse pregnancy outcome according to our collected data

Figure(3); frequency of Pre-eclampsia according to pregnancy categorized BMI.



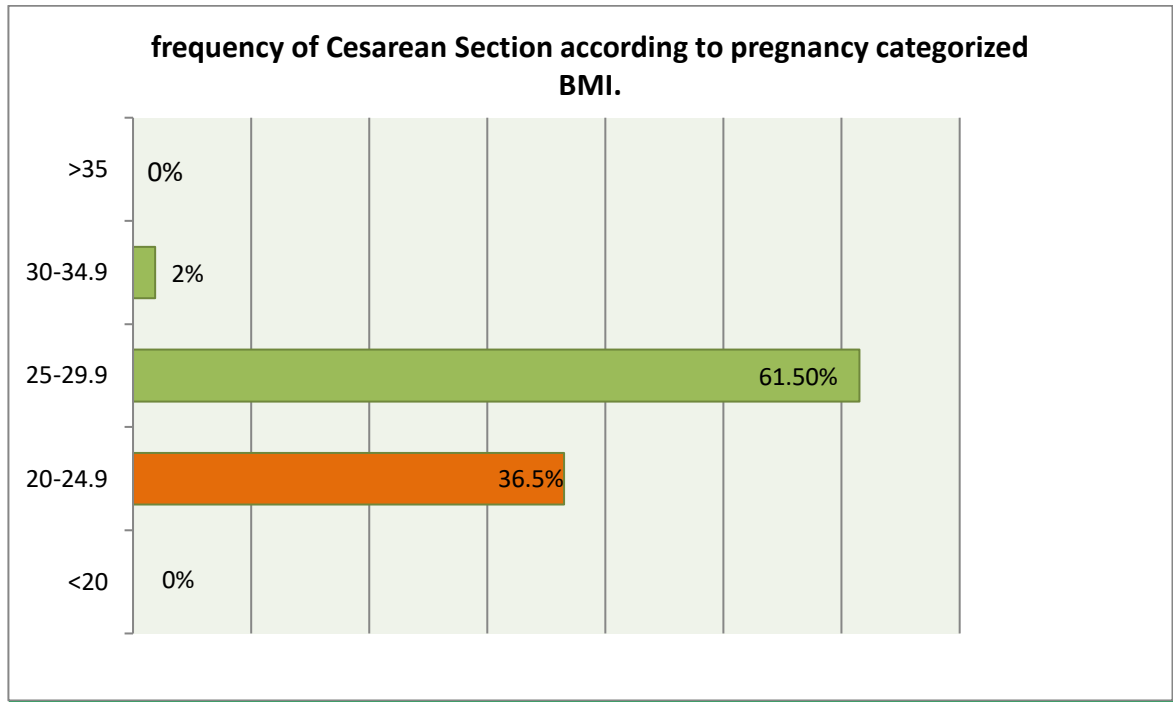
This figure show the Pre-eclampsia commonly among over weight pregnant women (42.85%)according to our collected data

Figure(4); frequency of anemia according to pregnancy categorized BMI.



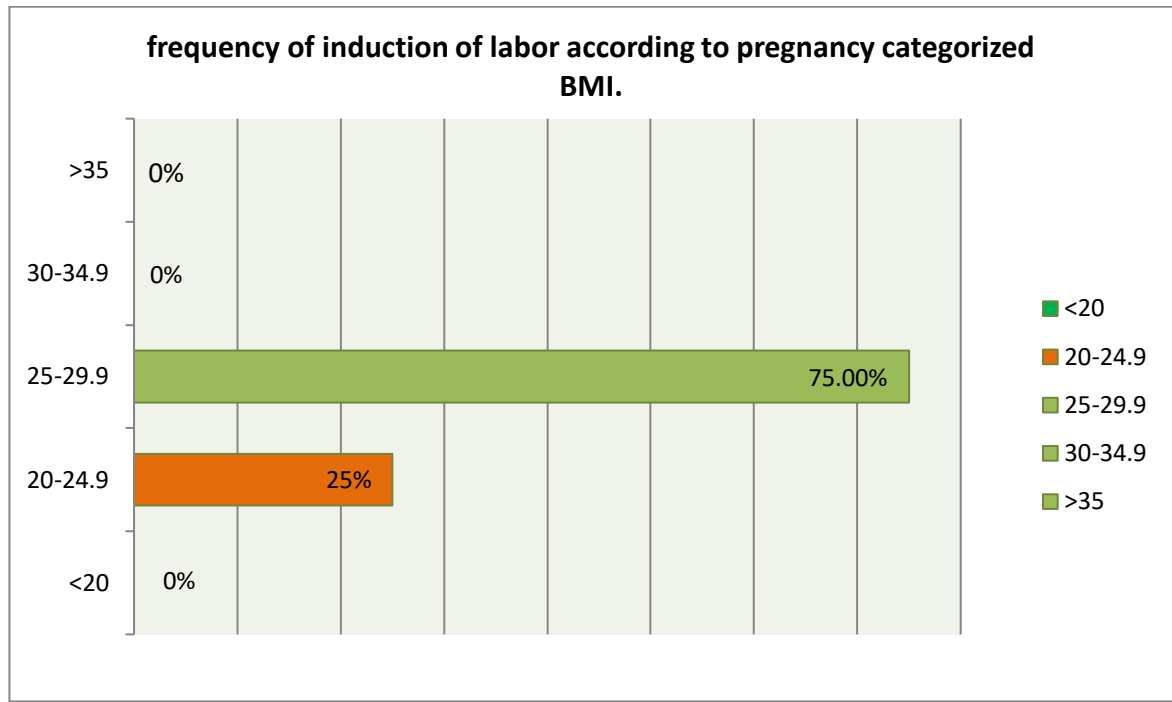
This figure show the anemia commonly among normal (30%) and over weight (38.80%) and obese (18.50%) pregnant women respectively according to our collected data

Figure(5); frequency of Cesarean Section according to pregnancy categorized BMI.



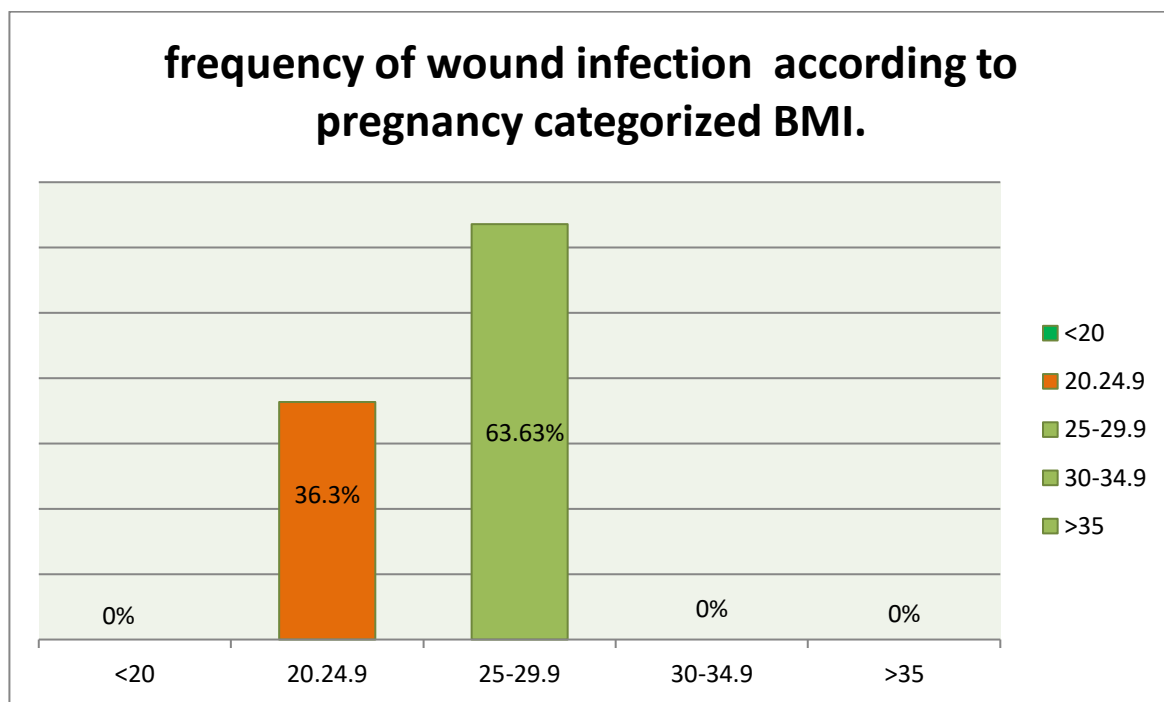
This figure show); frequency of Cesarean Section which is more commonly among over weight (61.5%) and normal women (36.5%) respectively

Figure(6); frequency of induction of labor according to pregnancy categorized BMI.



This figure shows a high frequency induction of labor in women with Over weight with BMI (25-29.9)

Figure(7); frequency of wound infection according to pregnancy categorized BMI.



This figure frequency of wound infection more commonly in normal (36.3%) and overweight women (63.63%) respectively

Table(1);BMI categories by pregnancy outcome of birth weight

BMI	Birth weight			Total
	<2500	2500-4000	>4000	
<20	0	0	0	0
20-24.9	6(18.18%)	25(75.75%)	2(6.06%)	33
25-29.9	4(5.71%)	60(85.71%)	6(8.57%)	70
30-34.9	0	1(100%)	0	1
>35	0	1(100%)	0	1
Total	10	87	8	105

Discussion

The Quetelet index or BMI was devised between 1830- 1850. Because BMI is derived from simple measurements like height and weight, it is clearly inexpensive but effective measure to compare pregnancy outcomes with relation to weight gain during pregnancy. This study adds to the increasing body of evidence that suggests that women with low and high BMI are both predisposed to complications in pregnancy regarding the the effects of maternal body mass index on pregnancy outcome and newborn weight

In our study we grouped female by Quetelet index <20 as (8) ,20-24.9 as (34), 25-29.9 as (45), 30-34.9 as (15) and > 35 as (3) women respectively (table1) .

Our study found that common adverse pregnancy outcome such as anemia(51.42%) ,cesarean section(42.85%) ,pre eclampsia(33.33%) ,wound infection(10.46%) ,DVT, gestational diabetes 8.50% ,induction of labor(15%) (figure 1).

Similarly found that common adverse fetal pregnancy outcome such as lagre for gestational age (20%), small for gestational age (9.5%) and (56%) of neonate need for admission to neonatal care units (figure 2).

In the present study, induction of labor was required in 75%% of overweight patients as compared to 0% of UW and 25% of normal BMI patients (figure 6).

These results corroborated with the findings of a study by Meenakshi et al where a significantly higher rate of induction of labour was found in over weight (26.9%) and obese (30.9%) patients than normal BMI patients (6.8%) ⁽⁷⁾.

Our findings further support those of previous studies, including a recent systematic review and meta-analysis ⁽⁸⁾. As in previous studies, we found that although Pre-eclampsia commonly among over weight pregnant women (42.85%)according to our collected data (figure 3).

Similar to some previous studies, we found that obese women was associated with an increased risk of developing GDM ⁽⁹⁾. Pregnant women who have been diagnosed with GDM may receive more counseling about their glucose level and weight control and, thus, may pay more attention to diet and physical activity during the remainder of the pregnancy ⁽¹⁰⁾.

Although for wound infection our study found that normal (36.3%) and overweight women (63.63%) more prone to wound infection as that revealed by The study by Baeten et al quotes increased risk of infection in obese patients (figure 7). ⁽¹¹⁾.

Similar to some previous studies, we found that the normal (30%) and overweight (38.80%) and obese (18.50%) pregnant women more risk for anemia according to our collected data (figure 4).

Although for frequency of Cesarean Section our study found that is more commonly among overweight (61.5%) and normal women (36.5%) respectively (figure 5).

(75%) and (15%) babies born to women in present study under weight(UW) and obese categories respectively needed resuscitation, while 10% in normal category. Unfavourable neonatal outcome and NICU admission were comparable in all categories of BMI. In a study by Tharihalli C, low APGAR score at birth was seen more in obese (24%) and in UW (17.3%) groups ⁽¹¹⁾.

Neonates born with birth weight more than 4kg were found in (6.06%) in normal group as compared to (8.57%) in overweight BMI group and birth weight below 2.5kg were found in(18.18%) in normal group as compared to (5.71%) in overweight women. This result is in accordance with the study by Weiss JL which showed that obese women have an 18-26% increased chance of delivering large for date infants (table2) ⁽¹²⁾.

Conclusions

Based on this study, we conclude that majority of antenatal patients being catered in our hospital have normal and over weight BMI. Adverse maternal and perinatal outcomes are associated with extremes of BMI.

This research demonstrates that maternal BMI is an important risk factor of pre-eclampsia. An increased BMI increases the incidence of induction of labour, caesarean section, anemia , gestational diabetes , DVT and wound infection ,large and small for gestational age ,need for admission to neonatal care unit also increased.

Recommendation

we advise pregnant woman to gain normal BMI of 20-24, before and during pregnancy, for instance by consulting their physician or a dietitian prior to getting pregnant which is essentially required for better pregnancy outcomes.

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