

## The Effect of Body Mass Index on the Outcome of Pregnancy

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### ABSTRACT

Obesity is one of the most common nutritional problems of complicating pregnancy.

Compared with normal-weight women, obese women have a greater risk of developing complications during pregnancy

Objective: The aim of this study is to compare maternal outcome of pregnancy in relation to body mass index

.Study design: Prospective study

.Setting: Kirkuk General Hospital, from 1st of January 2017 to the end of June 2017

Patients and methods: A total number of 150 pregnant women are included in this study. The studied women are divided into three groups according to their BMI of; first group with BMI from (18.5kg/m<sup>2</sup>-24.9kg/m<sup>2</sup>), the second group (25 kg/m<sup>2</sup> to 29.9kg/m<sup>2</sup>), and the third group from 30kg/m<sup>2</sup> and above. Each group consists of 50 pregnant women. Singleton pregnancy, both primigravida and multigravida of completed 37 weeks-42 weeks are included in this study. Women with previous caesarean section, women with history of severe hyperemesis gravidarum, pregnant women with heart diseases and thyroid disorders, generalized oedema, blood diseases and autoimmune diseases are excluded from this study

Results: In this study highly significant relation is found between hypertension and increase BMI (p=0.000). Equal number of diabetes mellitus is found in all groups 2% (p=1.000). It is noticed that history of infertility and intrauterine death rose with increasing BMI. The results shows that most of women with normal BMI delivered vaginally compared with overweight and obese women. While delivery by Cesarean section is more frequent in both over weight (and obese pregnant women, the relation is highly significant (p= 0.000

:Conclusions: Regarding the results of this study, the following can be concluded

.High BMI significantly increases the risk of delivery by cesarean section

Obesity is associated with increased incidence of hypertension, infertility, and IUD.

**Keywords: BMI, pregnancy, maternal outcome.**

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## تأثير مؤشر كتلة الجسم على نتائج الحمل

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### المخلص

السمنة هي واحدة من اكثر مشاكل التغذية شيوعا والتي تسبب مضاعفات مع الحمل. بالمقارنة مع النساء ذوات الوزن الطبيعي، النساء البدينات لديهن خطورة عالية في حدوث المضاعفات خلال فترة الحمل. الهدف: الغرض من هذه الدراسة هو مقارنة نتائج الحمل بالنسبة إلى مؤشر كتلة الجسم.

تصميم الدراسة: مقارنة مستقبلية.

مكان الدراسة: مستشفى كركوك العام ، من كانون الثاني 2017 إلى نهاية حزيران 2017.

طريقة العمل: شملت الدراسة ١٥٠ امرأة حامل تم اختيارهم بشكل عشوائي .النساء الاتي تمت دراستهن قسموا الى ثلاث مجاميع نسبة الى مؤشر كتلة الجسم، كل مجموعة تتكون من ٥٠ امرأة. المجموعة الاولى بمؤشر كتلة الجسم من (١٨،٥- ٩،٢٤كغم/م<sup>٢</sup>) المجموعة الثانية(٥ ٢ - ٩،٢٩ كغم/م<sup>٢</sup>)، والمجموعة الثالثة (٣٠ كغم/م<sup>٢</sup>) واكثر وتشمل الدراسة النساء الحوامل البكر والمتعددات الانجاب ممن اكملوا ٣٧ اسبوع وحتى 42 اسبوع احادي الجنين. النساء ممن لديهم عملية قيصرية، تقى الحمل الشديد ، امراض القلب والغدة الدرقية ،امراض الدم وامراض متعلقة بالمناعة استبعدوا من الدراسة.

النتائج:

ازدياد ملحوظ في الاصابة بارتفاع ضغط الدم مع زيادة مؤشر كتلة الجسم. ان الاصابة بداء السكري كان متساويا بين

المجاميع الثلاثة 2 % (  $p=1.000$  ). لقد وجد ازدياد نسبة العقم ووفاة الجنين داخل الرحم مع زيادة مؤشر كتلة الجسم . معظم النساء ذوات الوزن الطبيعي انجبوا بالولادة الطبيعية مقارنة بالنساء ذوات الوزن اكثر من الطبيعي والنساء البدينات, بينما الولادة بالعملية القيصرية اكثر حدوثا بين النساء البدينات بالمقارنة مع النساء ذوات الوزن اكثر من الطبيعي و النساء ذوات الوزن الطبيعي وان العلاقة ملحوظة احصائيا (  $p=0,000$  ).

الاستنتاج : فيما يتعلق بنتائج الدراسة يمكننا ان نستنتج الاتي:

1. ارتفاع مؤشر كتلة الجسم بشكل كبير يزيد من مخاطر الولادة القيصرية.
- 2 . النساء البدينات لهن تأثير كبير في حدوث مضاعفات للاطفال حديثي الولادة المتعلقة بالوزن الزائد، انخفاض نتيجة الابكار، دخول وحدة الخدج ووفاة الاطفال حديثي الولادة.

3 . البدانة مرتبطة بزيادة حالات ارتفاع ضغط الدم ،العقم و وفاة الجنين داخل الرحم

**الكلمات الدالة** مؤشر كتلة الجسم , الحمل , نتائج الحمل للام.

## 1.Introduction

As a measure, BMI became popular during the early 1950s and 60s. The current value settings are as follows: a BMI of 18.5 to 25 kg/m<sup>2</sup> may indicate optimal weight; a BMI below 17.5 kg/m<sup>2</sup> may indicate that the person has anorexia nervosa or related disorder ; a BMI lower than 18.5kg/m<sup>2</sup> suggests the person is underweight while a number above 25 kg/m<sup>2</sup> may indicate that the person is overweight; ; a number of 30 kg/m<sup>2</sup> and above suggests that the person is obese (over 40, morbidly obese) BMI=weight (kg) /Height (m<sup>2</sup>) [1].

Obesity is associated with many diseases, particularly heart disease, type 2 diabetes, breathing difficulties during sleep, certain types of cancer, and osteoarthritis [2]. Obesity complicates the course of pregnancy by increasing incidence of gestational diabetes, hypertension, pre-eclampsia, urinary tract infections, birth trauma, and post-partum haemorrhage. This will result in an increase in interventions, such as monitoring, induction of labour, caesarean sections, prolonged admissions [3]. Obesity also poses a challenge in gynecology. Obese women have an increased risk of miscarriages, terminations, menstrual

disorders, anovulatory infertility [4] . Morbid obesity in pregnancy is a growing problem and is having an impact on morbidity, mortality as well as significantly increasing antenatal and intra-partum costs of pregnancy care. It also led to increased costs because of multidisciplinary management of the pregnancies, increased investigations and hospital stay when compared with normal weight pregnant women [5].

## 2. Aim of the study

The aim of this study is to compare maternal outcome of pregnancy in relation to body mass index.

## 3. Patients and Methods:

Setting:

This prospective study was conducted in Kirkuk General Hospital, during the period from the 1st of January /2017 to the end of June /2017.

Sample size:

A total number of 150 pregnant women were included in this study. The studied women were divided into three groups according to their BMI; first group with BMI from (18.5kg/m<sup>2</sup>-24.9kg/m<sup>2</sup>), the second group with BMI (25 kg/m<sup>2</sup> to 29.9kg/m<sup>2</sup> ), and the third group with BMI from 30kg/m<sup>2</sup> and above. Each group consists of 50 pregnant women [1.]

Inclusion criteria:

Criteria for selection included singleton pregnancy, both Primigravida and multigravida of completed 37 weeks -42 weeks .

Exclusion criteria:

Women with previous caesarean section, women with history of severe hyperemesis gravidarum, pregnant women with heart diseases and thyroid disorders, generalized oedema, blood diseases and autoimmune diseases were excluded from this study.

Tools:

An interview questionnaire is designed and used to collect the relevant data. For every woman, the following variables are taken:

Age of the patient, gravidity, parity, previous IUD, hypertension and diabetes, history of infertility, gestational age at birth (the gestational age was calculated from the last menstrual

period and confirmed by early ultrasound report before 20 weeks). The BMI calculated from the women's weight and height in the antenatal cards at booking in early pregnancy (till 12 weeks). In this study we compare the pregnancy outcome among these groups including: Maternal outcome: medical diseases (hypertension, DM), mode of delivery (vaginal delivery, caesarean section).

#### Statistical analysis:

The obtained data were coded, analyzed and tabulated. Descriptive statistics as frequency and percentages are calculated using computer. Data analysis was performed by SPSS statistical program using ANOVA to calculate the relations within the groups, any P value less than 0.05 was considered statistically significant .

#### Ethical consideration:

Ethical consideration for study has been obtained from Kirkuk general hospital. A verbal consent was taken from all participants in this study.

## 4.Results and Calculations

A total number of 150 pregnant women are included in this study. The studied women were divided into three groups according to their BMI; each group consists of (50) pregnant women. First group had normal BMI; ( $18.5\text{kg/m}^2$ - $24.9\text{kg/m}^2$ ), the second group was overweight with BMI from( $25\text{kg/m}^2$ to  $29.9\text{kg/m}^2$ ) and the third group was obese; BMI ( $30\text{ kg/m}^2$  )and above.

#### Characteristics of patients in each group:

Table (1) show mean age of women with normal BMI was ( $24.34 \pm 5.766$ ), in comparison to ( $25.64 \pm 4.848$ ) in overweight, and ( $24.40 \pm 5.131$ ) in obese women. The data shows that mean gestational age at time of delivery in women with normal BMI, over weight group and obese women were accordingly ( $39.14 \pm 1.262$ ,  $39.52 \pm 1.568$ ,  $39.74 \pm 1.664$ ) no state difference among the groups regarding age and gestational age. Regarding to the parity statistical analysis revealed that there was no significant relation among all groups. Since the percent of nullipara in normal BMI, overweight and obese group were (51.2, 50.6, 49.8) respectively while percent of para (1-5) were (48.8, 49.4, 50.2).

**Table (1). the characteristics for patients in relation to BMI**

BMI	Age of the mother(year) Mean $\pm$ S.D	Gestational age (weeks) Mean $\pm$ S.D	Parity (%)
Normal (18.5-24.9)	24.34 $\pm$ 5.766	39.14 $\pm$ 1.262	Nullipara (51.2)
			Para(1-5) (48.8)
Over weight (25-29)	25.64 $\pm$ 4.848	39.52 $\pm$ 1.56	Nullipara (50.6)
			Para (1-5) (49.4)
Obese ( 30 and more)	24.40 $\pm$ 5.131	39.74 $\pm$ 1.664	Nullipara (49.8)
			Para (1-5) (50.2)

Table (2) shows medical complication in each group, highly significant relationship was found between hypertension and increase BMI ( $p=0.000$ ), since (20%) of obese women have hypertension compared to (2%) in over weight and (0%) in normal group.

Equal number of diabetes mellitus was found in all three groups 2 % ( $p=1.000$ ), regarding history of infertility about (2%) of obese women had history of infertility compared to (1%) in normal BMI, and (2%) in over weight ( $p=0.813$ ). It was noticed that intrauterine death raised with increasing BMI as (8%) of obese women have history of intrauterine death compared to (2%) in over weigh and (0%) in normal BMI, but this relation was statistically not significant ( $p=0.067$ ).

**Table (2).** distribution of medical complications in studied groups.

Variables	BMI			P value
	Normal(18.5-24.9) N (%)	Overweight (25-29.9) N (%)	Obese ( 30 and more) N (%)	
<b>Hypertension</b>				
Yes	0	1(2)	10 (20)	0.000
No	50 (100)	49(98)	40 (80)	
<b>Diabetes Mellitus</b>				
Yes	1(2)	1(2)	1(2)	1.000
No	49 (98)	49(98)	49 (98)	
<b>History of infertility</b>				
Yes	1(2)	2(4)	2(4)	0.813
No	49 (98)	48(96)	48 (96)	
<b>History of IUD</b>				
Yes	0	1(2)	4(8)	0.067
No	50 (100)	49 (98)	46 (92)	

**Mode of delivery in all groups:**

The results indicate that most women with normal BMI delivered vaginally compared with overweight and obese women, (96%) of pregnant women with normal BMI delivered vaginally in comparison with (84%) in over weight group, and (58%) in obese. While delivery by Cesarean section is more frequent in both over weight and obese pregnant women compared with women with normal BMI, since (42%) of obese women and (16%) of overweight delivered by Cesarean section, and just about (4%) of women with normal BMI delivered by Cesarean Section. The relation is highly significant (p=0.000) as shown in table (3)

**Table (3):** Mode of delivery in the studied groups

Mode of delivery	BMI			P value
	Normal (18.5-24.9)	Over weight (25-29.9)	Obese (30 and more)	
Vaginal	48(96%)	42( 84%)	29(58%)	0.000
Cesarean section	2(4%)	8(16%)	21(42%)	

## 5. Discussion

Obesity is a global epidemic now and the prevalence of overweight and obesity is increasing worldwide at an alarming rate affecting in developed and developing countries [6]. Many studies evaluated the relation between body mass index and the outcome of pregnancy and found that obesity can contribute too much complication during pregnancy [7].

The study confirmed that complications of pregnancy increased in obese and overweight women compared with women with normal BMI such as hypertension, increase rate of caesarean section, IUD. Table (2) shows distribution of medical complications, it is noticed that hypertension is positively associated with raised BMI ( $p=0.000$ ) this finding is in agreement with Madiha et al in 2005, who proved that hypertensive disorder more prevalent in obese pregnant women than in their lean counter parts and study done by [Begum KS.](#) et al in 2011, who found that Maternal obesity can result in unfavorable outcomes for the woman and fetus. Maternal risks during pregnancy include gestational diabetes and chronic hypertension leading to preeclampsia [8,9]. However the result is disagreed with Perlow et al 1992, who did not find an increased incidence of hypertension among obese patients [10]. This finding is consistent with Yogev et al in 2009 that No difference was found in fasting and mean blood glucose between obese and non obese women [11]. However it is contrary with Kumari et al in 2001 who reported that the incidence of gestational diabetes to be (24.5%) for patients with BMI greater than 40 compared with (2.2%) in normal BMI women; ( $p<0.0001$ ) [12].

Although the data revealed that history of infertility was higher in over weight (4%) and obese (4%) compared with normal BMI group (2%). But this relation was statistically not significant ( $P=0.813$ ). This finding is in agreement with Francisco et al, in 2000, who demonstrated that there is a strong association between obesity ( $BMI \geq 30$ ) and delayed conception [13]. Also this finding agrees with Hirschberg et al in 2009 who found that obesity has been associated with an increased risk of infertility and might also have a negative influence on pregnancy outcome [14].

The data shows that history of IUD was higher in multigravida obese women (8%)

compared with over weight (2%) and normal BMI group (0%). This is in agreement with Sohinee et al in 2007, who found that history of IUD was significantly higher in obese group compared with normal BMI group. Also agree with Sebire et al in 2001, who demonstrates a significant risk of IUD in obese women group compared with normal BMI group [15,16].

The present study shows that mode of delivery among all groups. In comparison with women of normal weight, for overweight and obese women, there is a progressive significant reduction in vaginal delivery with increasing BMI, which means that the delivery by cesarean section rises significantly with increase BMI. This finding is consistent with previous study by [Vinayagam](#) et al in 2012, who found that there was A statistically significant increase in delivery by caesarean section with increasing maternal BMI [17]. Roman et al in 2007, who reported that the rate of cesarean section in obese group is higher than normal BMI group women ( $p < 0.001$ ) [18].

Bergholt et al 2007, in their prospective study found that the incidence of cesarean delivery significantly rose with an increase in BMI. Women in labor with a BMI ( $>35$ ) had a (3.8) times greater chance of a cesarean delivery than women with a BMI ( $< 25$ ) [19]. But this finding disagree with Maryam et al 2008, who demonstrate that there were no significant differences between obese women and normal weight pregnant women regarding mode of delivery [20].

## 6. Conclusion

Regarding to the results of this study, it is concluded that:

High BMI significantly increases the risk of delivery by cesarean section. Obesity is associated with increased incidence of hypertension, infertility, and IUD

## 7. Recommendations

From the outcome of the present study the following recommendations may be suggested:

1. Carry out a survey in our country to know the prevalence of obese women. Further detailed studies needed to know the pathophysiological link between obesity and

various adverse outcome of pregnancy.

2. Perform public awareness about the hazard of obesity on the maternal outcome.
3. Body mass index should be measured as part of vital signs at routine annual check-ups and all women of child bearing age should be counseled to achieve and maintain optimal BMI. Women with high BMI planning a pregnancy should be counseled to participate in intensive nutrition programs aimed to achieve optimum BMI prior to conception

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