

(RESEARCH ARTICLE)



The impact of gestational weight gain on pregnancy outcomes among Saudi women delivered at maternal and child hospital, Al Ahsa, Saudi Arabia, 2022

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Abstract

Background: The pregnant women who gain the excessive weight outside the recommendation of Institute of Medicine (IOM) during pregnancy lead to adverse pregnancy outcome. Women with excessive gestational weight gain have high risk of gestational diabetes, gestational hypertension, preeclampsia, cesarean section, macrosomia, preterm delivery and birth weight. The aim of this study was to assess the prevalence of excessive gestational weight gain and to identify its association with adverse pregnancy outcomes among Saudi women delivered at Maternity and Child hospital (MCH), Al Ahsa

Materials and Methods: It was a cross-sectional chart review study. All pregnant women who were admitted in the postnatal ward in MCH after delivery were the study population. A sample size of 250 was calculated using online software (OpenEpi). Convenience sampling was used, as we want to reach all the women who are admitted to the ward after delivery. A special data sheet was prepared based on similar previous study and modified to meet our study objectives. The data were computerized, processed and analyzed using SPSS version 24. Descriptive statistics were presented using counts, proportions (%), mean \pm , standard deviation whatever appropriate. The association of the weight gain and pregnancy outcome was tested by chi square test. A P -value cut off point of 0.05 or less was used to determine statistical significance.

Results: The data of 250 women could be collected during the study period. The mean age of the participants was 28.34 years \pm Std. Dev. 9.24 years. As far as the BMI is concerned more than thirty seven percent (37.6%) of the participants were of normal weight while 22% and 33.3% were overweight and obese respectively. Only 7.2% of the participants were underweight. The mean weight gain by the underweight pregnant women was 11.29Kg while those with normal weight were 10.5Kg. The pregnant women who were overweight gained a mean weight of 12.85kg and those who were obese gained 13.47kg. Recurrent UTI was significantly higher among the normal weight pregnant women with weight gain of 10.53kg than those of under weight with weight gain of 11.59 kg, overweight with weight gain of 12.85 kg and obese with weight gain of 13.47kg (40.54% vs. 2.7% vs. 26.13% vs. 30.62%, $P=0.023$). Vaginal infection ($P=0.023$), vaginal infection plus UTI (0.023) were significantly more associated with excess weight gain during pregnancy. Gestational diabetes ($P=0.013$), preeclampsia ($P=0.013$) was significantly more prevalent among the obese pregnant women. However the pregnancy induced hypertension was more prevalent among normal weight with weight gain of 10.53Kg ($P=0.013$). Normal delivery was significantly more common among the normal weight with weight gain of 10.53Kg than ($P=0.013$), delivery by induction ($P=0.013$) and the delivery by caesarian section was significantly more among the obese

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pregnant women with weight gain of 13.47kg The obese pregnant women with weight gain of 13.47kg were significantly associated with the preterm delivery ($P=0.034$).

Keywords: Weight gain; Pregnancy; Maternal complication; Obstetrical outcome

1 Introduction

During pregnancy, woman's weight increases due to normal physiology of pregnancy. Some women have high BMI pre-pregnancy and during pregnancy their weight increase excessively leading to adverse pregnancy outcome In the year 2010, Institute of Medicine (IOM) published a guideline regarding optimal weight gain during the pregnancy which was based on pre- pregnancy Body Mass Index (BMI).The recommendation suggest a weight gain of 12.5-18Kg for the women who were underweight while 11.50- 16 Kg for normal weight women and 7-11.5 kg for obese women ^[1]. The weight gain of pregnant women under the guideline of IOM has been found to be less associated with complication rather than those beyond this limitation.^[2]Gestational weight gain is defined as the difference between maternal weights pre-pregnancy to delivery.^[2]

The study suggests that only 30-40% of pregnant women gain weight within normal range while majority pregnant women have excessive gestational weight gain. ^[3]The excessive gestational weight gain during pregnancy is associated with maternal and neonatal complications.^[1,2] Women with excessive gestational weight gain have high risk of gestational diabetes, gestational hypertension, preeclampsia, cesarean section, macrosomia, preterm delivery and birth weight.^[3]The study has shown a co relation between the low and excess gestational weight gain with adverse prenatal outcome such as small for gestational age (SGA),large for gestational Age (LGA), macrosomia, neonatal seizure ,low apgar score and rarely infant death.^[4] The pregnant women who gain weight outside the recommended range may also experience various maternal outcome as well which may include increased risk for pregnancy-associated hypertension, gestational diabetes (GDM), complications during labor and delivery, and postpartum weight retention and subsequent maternal obesity as well as an increased risk for unsuccessful breastfeeding ,^[5] Adverse outcome of pregnant mother outside the 2009 Institute of Medicine (IOM) guidelines weight gain has been reported by many studies. Cochrane L et al in their study have found that the increasing body mass index was associated with an increased likelihood of transfer, diagnosis of gestational diabetes, elective and, especially, emergency Caesareans performed at the hospital. ^[6]Another study has reported that Incidence of adverse pregnancy outcome increased as pre-pregnancy BMI increased. Obese and overweight pregnant women were found to have greater risk of undergoing caesarian section (OR: 0.97, 95% CI: 0.9–1.05) and delivering a macrosomic neonate (OR = 2.36, 95% CI: 0.38–14.81) than normal weight women in this study. Neonates of obese (OR: 1.30, 95%, CI: 0.67–2.52) and overweight (OR: 1.33, 95% CI: 0.67–2.66) women had a higher risk of NICU admissions.^[7] Additionally, more women are becoming pregnant at an older age and are thus entering pregnancy with chronic conditions, such as type 2 diabetes that could contribute to increased morbidity during both the prenatal and postpartum periods. A rising trend of obesity among pregnant women is a matter of concern in Saudi Arabia also. According to one study more than twenty four percent of the pregnant women attending one hospital in Saudi Arabia were obese. The majority (62.4%) ended up with caesarian section.^[8] The aim of this study was to assess the prevalence of excessive gestational weight gain and to identify the association between excessive gestational weight gain (EGWG) and pregnancy outcomes (gestational diabetes, gestational hypertension, preeclampsia, cesarean section and preterm delivery) among Saudi women delivered at Maternity and Child hospital (MCH) during the 2 months time in the year 2021.

2 Material and methods

It was a cross-sectional chart review study conducted at Obstetrics and Genecology ward (postpartum ward) of Maternal and Child Hospital(MCH), Alahsa, Saudi Arabia.All pregnant women who were admitted in the postnatal ward in MCH after delivery were the study population .Women with chronic diseases such as, diabetes mellitus, hypertension, renal disease, cardiac disease and sickle cell disease were excluded from this study. A sample size of 250 was calculated using online software (OpenEpi).P-value was set as 0.05, power of 80%, population size of million, confidence limit of 5%, and design effect of 2. An additional 5% of sample size was included to compensate non-response rate and non-probably. Convenience sampling was used, as we want to reach all the women who are admitted to the ward after delivery. A special data sheet was prepared based on similar previous study and modified to meet our study objectives.The first section of the data sheet included socio-demographic characteristics of the participants such as maternal age, nationality, pre-pregnancy body weight (self-report), education, occupation and smoking habit. The second section of the data sheet contained obstetric factors (parity, vaginal bleeding during first and second trimester ,maternal gestational diabetes (GDM) and preeclampsia), types of delivery and fetal factors such as, gender and weight of baby. The data were computerized, processed and analyzed using SPSS version 24.Descriptive statistics were presented using

counts, proportions (%), mean \pm , standard deviation whatever appropriate. The association of the weight gain and pregnancy outcome was tested by chi square test. A P-value cut off point of 0.05 or less was used to determine statistical significance. A Pilot study of 20 participants was conducted to validate the questionnaire. Ethical approval from the institutional review board (IRB)/Ethical committee was obtained prior to data collection. Consent from each patient was also taken prior to the study.

3 Results

The data of 250 women could be collected during the study period. The mean age of the participants was 28.34 years \pm Std. Dev. 9.24 years (Range 16-38 years). The majority (54.0%) of the participants were in the age group of 25 to 34 years followed by those who were in the age group of 16-24 (24.8%) and those (21.2%) who were in the age group of more than 37 years of age.. The vast majority (94.8%) of the participants were Saudi. As far as the BMI is concerned more than thirty seven percent (37.6%) of the participants were of normal weight while 22% and 33.3% were overweight and obese respectively. Only 7.2% of the participants were underweight. Seventy two percent of the participants were smoker (72.0%). The majority of the participants (56.4%) were graduate while 40.8% were secondary educated and 2% primary educated. Less than one percent was illiterate. Majority of the participants (56.4%) were house wife while the rest were working. The details of the socio demographic characteristics are shown in table1.

Table 1 Socio demographic characteristics of the participants

Variables	No.	Percentage
Age		
Mean: 28.34 years \pm Std. Dev. 9.24 years (Range 16-38 years).		
Age group		
16-24 years	62	24.8
25-34 years	135	54
>35 years	53	21.2
Nationality		
Saudi	237	94.8
Non Saudi	13	5.2
Maternal BMI		
Underweight	18	7.2
Normal Weight	94	37.6
Overweight	55	22
Obese	83	33.2
Smoking habit		
Non smoker	61	24.4
Smoker	180	72.0
Ex Smoker	9	3.6
Maternal Education		
Illiterate	2	0.8
Primary educated	5	2.0
Secondary educated	102	40.8
Graduate	141	56.4
Occupation		
House wife	109	43.6
Full time employed	141	56.4

3.1 Maternal complication during after delivery

More than forty four (44.4%) percent of the patients had recurrent UTI infection while 24% had vaginal infection and 11.6% had both UTI and vaginal infection .As far as complication during delivery is concerned, majority of them (67.6%) had pregnancy induced hypertension while 5.6% had gestational diabetes and 7.6% had pre-eclampsia . More than nineteen percent (19.2%) of the patients did not have any complication. Sixty six percent of the patients delivered normally while 26% delivered by induction and 8% by caesarian section. The details of the maternal complication are shown in table 2.

Table 2 Details of the maternal complication

Variables	Number	Percentage
History of infection during pregnancy		
No infection	50	20.0
Recurrent UTI	111	44.4
Vaginal infection	60	24.0
Both UTI and vaginal infection	29	11.6
Complication during pregnancy		
Normal	48	19.2
Gestational diabetes	14	5.6
Pre-eclampsia	19	7.6
Pregnancy induced hypertension	169	67.6
Types of delivery		
Normal	165	66.0
Induction	65	26.0
Caesarian	20	8.0

3.2 Obstetrical outcome:

Majority (52.8%) of the delivered baby were female .More than ten percent (10.4%) delivered preterm while the rest were delivered on term. Almost ninety percent (89.6%)of the babies were live birth while 8.8% were preterm and 1.6% still birth. The details of the Obstetrical outcome are shown in table3.

Table 3The Obstetrical Outcome

Variables	No.	Percentage
Gender		
Male	118	47.2
Female	132	52.8
Gestational age		
On term	224	89.6
Preterm	26	10.4
Outcomes		
Live birth	224	89.6
Preterm delivery	22	8.8
Still birth	4	1.6

3.3 The weight gain during pregnancy among the pregnant women with different BMI

The mean weight gain by the underweight pregnant women was 11.29Kg while those with normal weight were 10.5Kg. The pregnant women who were overweight gained a mean weight of 12.85kg and those who were obese gained 13.47kg. The details of the weight gain during pregnancy among the pregnant women with different BMI is shown in table 4.

Table 4 The details of the weight gain during pregnancy among the pregnant women with different BMI

Variable	Underweight (N=18) BMI <18.5 Kg/M	Normal weight(N=94) BMI 18.5- 24.9Kg/M	Overweight (N=55) BMI 25.0-29.9Kg/M	Obese(N=83) BMI >30 Kg/M
Weight gain	11.59 Kg	10.53Kg	12.85Kg	13.47 Kg

3.4 The co relation of socio demographic characteristics and maternal and obstetrical complication with the weight gain during pregnancy

The pregnant women in the age group of 16-25 years with normal weight had higher weight increase of 10.35 kg as compared to those who were underweight (an increase of 11.59kg), overweight (an increase of 12.85 kg) and obese (an increase of 13.47 kg) (48.39% vs.22.58% vs.19.35% vs.9.68%, $P=0.043$). Similarly the percentage of obese pregnant women in the age group of 25-34 with weight gain of 10.53 kg was higher (38.52%) than those with normal weight (36.30), underweight (2.96%) and overweight (22.22%) ($P=0.043$). The obese pregnant women in the age group of >35 years had significant higher weight gain of 13.47kg as compared to those with underweight (0%) , normal weight (29.30%) and overweight (24.53%) ($P=0.043$). Non smoker normal weight pregnant women had higher weight gain (65.57%) of 10.53 kg than those who were underweight (0.0%) and 11.59 kg increase, overweight (24.60) with weight gain of 12.85kg and obese (9.83%) with weight gain of 13.47%kg . The weight gain of smoker pregnant women was higher (41.11%) among the obese pregnant women with 13.47kg gain than normal weight (27.77%) with 10.53 kg gain, those who were underweight (10/0%) with 11.59 kg gain, overweight (22.22%) with 12.85 kg gain ($P=0.043$). Recurrent UTI was significantly higher among the normal weight pregnant women with weight gain of 10.53Kg than those of underweight with weight gain of 11.59 kg , overweight with weight gain of 12.85 kg and obese with weight gain of 13.47kg (40.54% vs.2.7% vs.26.13% vs.30.62%, $P=0.023$). Vaginal infection was more prevalent among the obese pregnant women with weight gain of 13.47kg as compared to those who were underweight with weight gain of 11.59 kg, normal weight with weight gain of 10.53Kg and overweight with weight gain of 12.85 kg (46.67% vs.8.33% vs.20% vs.25% , $P=0.023$). Similarly vaginal infection and UTI together was more prevalent among the obese pregnant women with weight gain of 13.47kg as compared to those who were underweight with weight gain of 11.59 kg, normal weight with weight gain of 10.53Kg and overweight with weight gain of 12.85 kg (55.17% vs.6.90% vs.10.34% vs.27.59% , $P=0.023$). As far as complication during pregnancy is concerned gestational diabetes was significantly more prevalent among the obese pregnant women with weight gain of 13.47kg as compared to those who were underweight with weight gain of 11.59 kg, normal weight with weight gain of 10.53Kg and overweight with weight gain of 12.85 kg (57.12% vs.0.0% vs.7.14% vs.35.17%, $P=0.013$). Pre-eclampsia was also significantly more common prevalent among the obese pregnant women with weight gain of 13.47kg as compared to those who were underweight with weight gain of 11.59 kg, normal weight with weight gain of 10.53Kg and overweight with weight gain of 12.85 kg (42.10 vs.42.11 vs.15.79% vs.0.0%, $P=0.013$). However the pregnancy induced hypertension was more prevalent among normal weight with weight gain of 10.53Kg than those who were underweight with weight gain of 11.59 kg , overweight with weight gain of 12.85 and obese pregnant women with weight gain of 13.47kg (48.15% vs.0% vs.18.93% vs.34.92%, $P=0.013$). Normal delivery was significantly more common among the normal weight with weight gain of 10.53Kg than those who were underweight with weight gain of 11.59 kg , overweight with weight gain of 12.85 and obese pregnant women with weight gain of 13.47kg (54.54 vs.9.70% vs.27.27% vs.8.48%, $P=0.013$). Delivery by induction was more prevalent among obese pregnant women with weight gain of 13.47kg than those of were underweight with weight gain of 11.59 kg, normal weight with weight gain of 10.53Kg and overweight with weight gain of 12.85 kg (50.0% vs.3.07 vs.6.45 vs.45.16% , $P=0.013$). Similarly the delivery by caesarian section was significantly more among the obese pregnant women with weight gain of 13.47kg than those of were underweight with weight gain of 11.59 kg, normal weight with weight gain of 10.53Kg and overweight with weight gain of 12.85 kg (60% vs.0.0% vs.0.0% vs. 40%, $P=0.013$). The obese pregnant women with weight gain of 13.47kg were significantly associated with the preterm delivery than those of underweight with weight gain of 11.59 kg, normal weight with weight gain of 10.53Kg and overweight with weight gain of 12.85 kg (68.18% vs.0.0% vs.9.09% vs.27.73%, $P=0.034$). Hundred percent was found among obese pregnant women with weight gain of 13.47kg. The details of the association of weight gain during pregnancy and the outcome of pregnancy is shown in table 5.

Table 5 The details of the association of weight gain during pregnancy and the outcome of pregnancy

Variables	Underweight (N=18) 11.59Kg weight gain	Normal weigh(N=94) 10.53Kg	Overweight (N=55) 12.85Kg	Obese(N-83) 13.47 Kg	P Value
Age group					0.043
16-24 years	14(22.58)	30(48.39)	12(19.35)	6(9.68)	
25-34 years	4(2.96)	49(36.30)	30(22.22)	52(38.52)	
>35 years	0	15(28.30)	13(24.53)	25(47.17)	
Smoking habit					0.043
Non smoker	0	40(65.57)	15(24.60)	6(9.83)	
Smoker	16(10.0)	50(27.77)	40(22.22)	74(41.11)	
Pastsmoker	2(22.22)	4(44.44)	0	3(33.34)	
History of infection during pregnancy					0.023
No infection	8(16.0)	34(68.0)	3(6.0)	5(6.0)	
Recurrent UTI	3(2.7))	45(40.54)	29(26.13)	34(30.62)	
Vaginal infection	5(8.33)	12(20.0)	15(25.0)	28(46.67)	
Both UTI and vaginal infection	2(6.90)	3(10.34)	8(27.59)	16(55.17)	
Complication during pregnancy					0.013
Normal	18(37.50)	12(25.0)	10(20.83)	8(16.67)	
Gestational diabetes	0(0.0)	1(7.14)	5(35.71)	8(57.12)	
Pre -eclampsia	0(0.0)	3(15.79)	8(42.11)	8(42.10)	
Pregnancy induced hypertension	0(0.0)	78(46.15)	32(18.93)	59(34.92)	
Types of Delivery					0.013
Normal	16(9.70)	90(54.54)	45(27.27)	14(8.48)	
Induction	2(3.07)	4(6.45)	28(45.16)	31(50.0)	
Caeserian	0	0	8(40.)	12(60.0)	
Outcomes					0.034
Live birth	18(8.03)	92(41.07)	50(22.32)	64(28.57)	
Preterm delivery	0	2(9.09)	5(22.73)	15(68.18)	
Still birth	0	0	0	4(100.0)	

4 Discussion

This present study examined the maternal and obstetric outcome of the excess weight gain during pregnancy and its association with the sociodemographic factors. We found that in the first half of their pregnancy, more than one third of the participants (40%) gained gestational weight outside the IOM recommendations for their BMI category and the overweight and obese women were more likely to overestimate the appropriate GWG for their baseline BMI. The most significant predictors of excess early GWG were pre-pregnancy BMI and SES status. It is of concern that only half the cohort (51.0%) understood the potential impact of excess GWG on their baby and furthermore, the women who gained

the most weight outside the IOM guideline were less likely to believe that excess GWG would impact negatively on their baby. These findings make it clear that education around GWG is required to advise women about what are the expected healthy GWG parameters for their BMI. Our findings support other studies that have reported women who are overweight and obese women are more likely to gain excess weight as per the IOM guidelines for their BMI category.^[9,10,11] Recommendations regarding appropriate GWG are particularly relevant to overweight and obese women who are already at risk of complications for their pregnancy and offspring due to their pre-pregnancy weight. Any additional risks that accompany excessive GWG may further complicate their pregnancy, their future health and the health of their child. There are limited data on how many women are gaining excessive weight in early pregnancy in Australia. Only one Australian study (n = 664) has examined early gestational weight gain, in the context of overall weight gain in pregnancy. This study reported women had already reached their recommended weight for the total pregnancy, and 2% had exceeded their total weight gain recommended for the pregnancy.^[12] The authors also noted that total gestational weight gain correlated with weight gain in early pregnancy. The LIMIT trial found that delivery of advice about diet, exercise and behavioral changes, to women who are already overweight or obese during pregnancy.^[9,11]

Even though pre-pregnancy BMI is a significant predictor of early excess GWG in our study, up to a third of normal weight women also gained weight in excess of that recommended by the IOM. This is of concern because even women with a healthy weight are at risk, because early excess GWG significantly increases the risk of gestational diabetes, particularly amongst normal weight women.^[12]

5 Conclusion

Women are gaining weight in early pregnancy outside the recommendations of the IOM. The women at particular risk of excess early GWG are those who are overweight and obese. These women need to be targeted for appropriate counselling preconception or in early pregnancy. This study also suggests that there remains a lack of understanding of healthy weight gain recommendations in early pregnancy, where weight gain has a significant impact on short-term pregnancy outcomes and also long-term consequences for both the mother and child.

Compliance with ethical standards

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Disclosure of conflict of interest

No conflicts of interest.

Statement of ethical approval

The present research work does not contain any studies performed on animals/human subjects by any of the authors.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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