

*Full Length Research Paper*

## Postpartum hemorrhage and weight gain during pregnancy

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weight gain in pregnancy may be a potential risk factor for both mother and infant. Weight gain during pregnancy determine base on Body Mass Index before pregnancy. Excessive gestational weight gain can cause complications for the mother such as Postpartum Hemorrhage. Approximately, forty percent of maternal mortality is attributed to excess bleeding after childbirth. The purpose of this study was to determine the relationship between gestational weight gain with Postpartum Hemorrhage and other pregnancy outcomes. In a descriptive cross-sectional study, 476 pregnant women categorized based on their Body Mass Index and weight gain into four groups based on Institute of Medicine recommendations. Then, determined correlation between weight gain during pregnancy with Postpartum Hemorrhage, method of delivery and fetal outcomes. Women with normal weight gain had better pregnancy outcomes. Women with high gestational weight gain had a higher rate of postpartum hemorrhage. Also, there was also a significant difference between cesarean delivery, method of delivery and neonatal weight with weight gain during pregnancy. The findings presented that prenatal care providers should consider women with excessive gestational weight gain at an increased risk unconditionally and they need special care to avoid the pregnancy-associated complications which is best for both infants and their mothers.

**Keywords:** Pregnancy; Body mass index; Weight gain; Postpartum Hemorrhage.

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### INTRODUCTION

Pre-pregnancy weight and gestational weight gain are important factors in both maternal and infant outcomes (Tsai et al., 2012) .

Weight gain during pregnancy for women with normal Body Mass Index (BMI) before pregnancy has been reported to be 11.5–16.0 Kg/m<sup>2</sup> by IOM (Table 1) and supported by several researches (Ee et al., 2014, Shin et al., 2013, Yazdanpanah et al., 2008).

Adequate weight gain and Optimal nutrition in pregnancy are important for securing, protecting and promoting the health of women and newborns .This is because of their relation to optimal perinatal outcome, a better health status later in life, normal adult weight and no obesity(Shin et al., 2013).

Excessive gestational Weight gain can cause complications for the mother. One of the most important

is Postpartum Hemorrhage. Hemorrhage is the single leading cause of maternal mortality morbidity and mortality in developed and developing countries (Wang et al., 2014, Hofmeyr et al., 2013, Rajaei et al., 2014).

Obstetric morbidities affect the life and reproductive career of women (Mutahir and Utoo, 2011). From reports in developed countries, about 2% of deliveries are associated with postpartum hemorrhage. The incidence of PPH is 40% after vaginal delivery and 30% after cesarean section. Criteria for PPH are based on the amount of blood loss. Obstetric hemorrhage is the single most important cause of maternal death. Each year 14 million women suffer from postpartum hemorrhage that nearly 140,000 of them die (Samimi et al., 2013, Wang et al., 2014, Al-Zirqi et al., 2008). Although the majority of these deaths occur in low income countries, several recent publications have noted an increasing trend in the incidence of postpartum hemorrhage (PPH) over time in high resource countries (Knight et al., 2009).

Postpartum hemorrhage is defined as blood loss of 500 cc or more after vaginal delivery 1000 Cc or more after cesarean deliveries since the end of the third stage (Cunningham and Williams, 2010, Sheldon et al., 2014, 2012, Stafford et al., 2008). The World Health Organization defines the postpartum period or puerperium as beginning 1 hour after the delivery of the placenta and continuing until 6 weeks (42 days) after the birth of the infant (Onyango et al., 2011, 2012). It is important to recognize excessive blood loss during childbirth (Schorn, 2010).

While established risk factors can be identified among risk factors of PPH during labor after multivariate analysis: uterine atony, prolonged labor, oxytocin stimulation of labor, cesarean section, instrumental delivery, genital lacerations and episiotomy, prolonged third stage of labor and neonatal birth weight (Wang et al., 2014, Fawcus and Moodley, 2013, Dzakpasu et al., 2014, Alsammani and Ahmed, 2012, Weissmann-Brenner et al., 2012, Warsheski et al., 2014). The most common cause of postpartum hemorrhage is uterine atony (Fawcus and Moodley, 2013). It is a fact that increasing uterine atony was associated with maternal excess weight gain and high neonatal birth weight (Weissmann-Brenner et al., 2012).

A strong association was reported between pregnancy weight gain and infant size which provided target ranges of recommended weight gains by pre-pregnancy BMI (Yu et al., 2013).

Also pregnancy weight gain correlated to method of delivery and maternal postpartum weight status (Li et al., 2013, He et al., 2014). Prevention of postpartum hemorrhage (PPH) is a major concern in regards to its impact on Maternal morbidity and mortality (Callaghan et al., 2008, Mutahir and Utoo, 2011, Samimi et al., 2013). In order to reduce mortality and morbidity, interest has focused on care processes, for getting this purpose, health-care providers should train (Zhang et al., 2010,

Prata et al., 2014).

This study was performed in order to determine the correlation between gestational weight gain with PPH and some maternal and fetal complications in patients receiving prenatal care and admitted for delivery at hospitals affiliated to Shiraz University of Medical Sciences.

## MATERIALS AND METHODS

This descriptive cross-sectional study was approved and supervised by the Ethics Committee of Shiraz University of Medical Science. 476 pregnant women with 18-40 years of age, gravidity of 1 to 5 and singleton pregnancy without any history of systemic disorder influencing pregnancy outcome such as hypertension, diabetes mellitus or substance abuse referring to three hospitals affiliated to Shiraz University of Medical Sciences were enrolled. A written informed consent was obtained from each subject.

In the initial examination in the first three months of gestation, Weight and height were measured and BMI calculated. Then, information was collected on gestational age and demographic status (age, education, height, weight and BMI), parity by a questionnaire.

In all pregnant women estimated gestational age was calculated based on the recalled LNMP (Last Normal Menstruation Period) and ultrasound studies. Baseline weight and height were recorded during the first visit.

Trained midwives visited the subjects at the health care centers at least once a month during their pregnancy to obtain gestation weight gain.

Before delivery, all the patients were weighed. We measured gestational weight gain as the difference between weight of delivery time and first trimester pregnancy weight (determined at the first antenatal visit) with a calibrated scale accurate to within 100g while subjects were wearing the possible lightest clothing and considering the initial maternal weight by subtracting initial maternal weight from new categorized regarding IOM recommendation (Table 1).

For this study, we considered pregnancy and delivery complications like PPH, method of delivery, neonatal characteristics as pregnancy outcomes. PPH was defined with blood loss in the first 24 hours of delivery of the baby. Measurement of blood loss was by the gravimetric method (Al Kadri et al., 2011). In this method; all the gauze, sheets and pads used during first 24 after labor were collected. For weighting them, was used a sensitive weighing gravimetric tool. Then, they recorded on a special sheet for every subject. It was necessary that the weight must be done quickly to limit evaporation loss.

Vaginal bleeding were grouped into two categories: normal and severe (PPH). Normal PPH was loss of blood less 500 ml and severe PPH was 500 ml or more. This

**Table 1.** Recommended ranges of total weight gain for pregnant women by prepregnancy Body Mass Index (BMI) for Singleton Gestation Adapted from the Institute of Medicine(IOM)

	BMI (Kg/m <sup>2</sup> )	Weight Gain	
		(kg)	Lb.
Low	<19.8	12.5-18	28-40
Normal	19.8-26	11.5-16	25-35
High	26-29	7-11.5	15-25
Obese	>29	7	15

**Table 2.** Comparative mean between PPH and Maternal weight gain

Wt. gain (kg)	PPH		Normal		Severe		Total	
	NO.	%	NO.	%	NO.	%	NO.	%
<6.8	43	95.6	2	4.4	45	9.5		
6.8-11.5	207	97.2	6	2.8	213	44.7		
11.6-16	136	87.2	20	12.7	156	32.7		
>16	53	85.5	9	14.5	62	13.1		
Total	439	92.2	37	7.8	476	100		

definition was based on Williams Obstetrics that Postpartum hemorrhage (PPH) was defined loss of blood, from the genital tract, after completing of third stage till 24 hours of vaginal delivery (Cunningham and Williams, 2010).

For the purpose of this study, all delivery methods were grouped into three categories: normal delivery, caesarean delivery and others (low forceps, ventouse). The method of delivery and gestational age were also recorded. The relationship between BMI and weight gain during pregnancy outside and within ranges based on IOM recommendation with pregnancy outcome was then determined.

Neonatal characteristics (Birth weight, length) were obtained from the obstetric records and their relationships were determined with PPH.

The SPSS software program was used for statistical analysis and  $P < 0.05$  was considered as statistically significant. The T Test and one way ANOVA were used to compare the means and the association between the two qualitative variables was assessed by Chi-Square test.

## RESULTS

A total of 476 women participated in this study. Their mean age was  $24.8 \pm 5.1$  years, with a range of 18 to 40 years old. Out of these cases, 1.8% had no education, 28.5% secondary school education, 28.9% had high school education, 32.4% had received a high school diploma, and 8.4% had university education.

The mean BMI, weight gain and gestational age at delivery were  $23.4 \pm 3.9$  Kg/m<sup>2</sup>,  $11.5 \pm 4$  kg, and  $275.5 \pm 11.4$  days, respectively.

118 (24.8%) participants were underweight, 270 (56.7%) had normal weight, 63 (13.2%) were overweight and 25 (5.13%) were obese according to their early pregnancy BMI.

307 (70.5%) mothers had normal vaginal delivery, 158 (33.2%) had caesarean delivery and the rest 11 (2.2%) had deliveries with ventouse.

There was a significant relationship between the method of delivery and BMI ( $P = 0.0009$ ). Caesarean delivery rate in the overweight women was higher than those in the other groups and the most common cause of caesarean section (39.2%) was cephalopelvic disproportion (CPD).

Also mothers who gained excessive weight (>16 kg) were more likely to have experienced pregnancy complications, have had their infant delivered by caesarean section ( $P < 0.0006$ ) and to have had higher birth weight infants. The rate of mal-presentation, cephalopelvic disproportion (CPD), and induction of labor was higher in women with more than 16 Kg gestational weight gain.

There was a significant relationship between Postpartum Hemorrhage and Maternal weight gain with  $P = 0.0006$  (Table 2). 37 out of 467 (7.8%) participants had PPH that 2 (5.4%) were in the group with weight gain of less than 6.8 kg, 6 (16.3%) in the group with weight gain 6.8-11.5 kg, 20 (54%) in the group with weight gain 11.5-16 kg and 9 (24.3%) were in the group with weight gain more than 16 kg.

**Table 3.** Comparative mean between birth weight and maternal weight gain

Maternal weight gain	Birth weight (g)							
	<2500	2500-4000	>4000	Total				
<6.8	11	25	34	75	0	0	45	9.3
6.8-11.5	21	9.9	193	89.7	1	0.4	215	45.1
11.6-16	8	5.1	148	94.3	1	0.6	157	33.1
>16	4	6.6	57	93.4	0	0	61	12.6
Total	44	9.2	430	90.3	2	0.5	476	100

The mean neonatal birth weight, length were 3,127.8 g and 49.1 cm, respectively while the mean birth interval was 2.7 years. 45.4% of these cases were multiparous and 54.6% nulliparous. In the overweight group, parity was higher than that in the other groups ( $P=0.001$ ) and early pregnancy weight gain with  $P=0.0002$  was related BMI.

Among women with low weight gain, the percentage whose infants were small for gestational age (<2500) was 25 and any infants was not >4000g.

Neonatal birth weight and length had a significant relationship with BMI,  $P=0.0002$ .

There was a significant difference between weight gain in BMI of less than 19.8 Kg/m<sup>2</sup> according to IOM recommendation and birth weight, length. Also, a significant difference existed between newborn size and gestational weight gain in BMI of 19.8-26 kg/m<sup>2</sup> according to IOM recommendation (Table 3).

## DISCUSSION

It is possible that women who gain excess weight during pregnancy experience more postnatal complications than women who gain adequate weight during pregnancy.

As expected the prevalence of overweight and obesity for the current obstetric population has increased two to three folds during the last three decades (Mamun et al., 2011). In our population, which included only pregnant women without any clinical disease, confirmed this result that prevalence higher BMI than normal was 18.4%.

Although rising rates of obesity, demonstrated in many countries, may impact on the incidence of PPH; raised Body Mass Index (BMI) is a reported risk factor for hemorrhage (Gollop et al., 2014, Kominiarek et al., 2013).

We found a significant an association between maternal weight gain and postpartum hemorrhage. The fact that increasing postpartum hemorrhage was associated with maternal excess weight gain may reflect to high neonatal birth weight and uterine atony. Findings of early pregnancy obesity and excess weight gain associated with caesarean delivery, pregnancy complications and neonatal birth weight are consistent

with previous studies (Ovesen et al., 2011, Mamun et al., 2011, Dzakpasu et al., 2014, NP. et al., 2014).

Uterine atony can accrue in fetal macrosomia. Several studies confirm that fetal macrosomia is associated with postpartum hemorrhage (Alsammani and Ahmed, 2012, Weissmann-Brenner et al., 2012).

In study of Mamun and et al had mentioned that pre-pregnancy obesity or excessive weight gain are associated with greater risk of pregnancy complications, caesarean delivery and greater birth and placenta weight (Mamun et al., 2011). We found women who gained excess weight during pregnancy were at greater risk for caesarean section and higher birth weight difference

Some reports indicate that weight gain has a significant relationship with poor pregnancy outcomes such as preterm delivery, meconium with vaginal delivery and perinatal death, longer maternal hospital stay, increased neonatal ICU admission and infection in women submitted to cesarean section were less common in women with a normal BMI and gestational weight gain within IOM recommendation based on prepregnancy BMI. Authors of these researches believe that weight should continuously be monitor in pregnancy outcomes (Triunfo and Lanzone, 2014, Sunsaneevithayakul et al., 2014, Park et al., 2014, Meher Un et al., 2009, Flick AA, 2010 ).

It is an important reason why weight gain in pregnancy should be monitored is the relation of weight gain in pregnancy and pre-pregnancy BMI with pregnancy outcomes, being shown in studies in different countries.

The results of this research indicate that some pregnancy outcomes such as neonatal size, weight, length method of delivery and weight gain have a significant association with weight gain rate. It was also observed that some complications such as low gestational age and LBW in underweight women and in those with low weight gain were observed more than in the other groups, the results being similar to those in other study (Liu et al., 2012).

In order to reduce maternal morbidity and thereby indirectly maternal mortality and to improve the overall maternal health, prevention of excess weight gain can play a significant role (Shirazee et al., 2010).

Therefore, must health care providers to encourage pregnant women to "stay in the range" of the weight gain recommended by the IOM, which is best for both infants and their mothers.

Considering the findings of this research, interventional strategies must be developed to reach prepregnancy normal weight conditions and monitor women's weight gain throughout their pregnancy. Pregnancy in women with abnormal weight should be considered as a high risk factor.

The most important factor in reducing maternal mortality is the provision of quality care with a skilled health professional present at every birth. Antenatal care can identify high-risk women, who can be offered counseling so they can make informed decisions. In addition, maternal mortality and morbidity are decreased by careful postnatal cares.

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