Evaluation of Excessive Pregnancy Weight Gain Effect in Non-Diabetic Women with Normal Pre-Pregnancy BMI on Macrosomia of Neonates

Leila Sekhavat[1], Motaharah Golestan[2], and Razieh Fallah[2]

[1] Department of Obstetrics & Gynecology, Shaheed Sadoughi Hospital, Shaheed Sadoughi University of Medical Sciences and Health Services, Yazd, Iran

[2] Department of Pediateric, Shaheed Sadoughi Hospital, Shaheed Sadoughi University of Medical Sciences and Health Services, Yazd, Iran

Received: 18 Nov. 2009; Received in revised form: 19 May 2010; Accepted: 11 Sep. 2010

Abstract- The objective of this study was evaluation of excessive pregnancy weight gain effect in non-diabetic women with normal pre-pregnancy BMI on macrosomia of neonate. In a descriptive cross–sectional study, neonate weighs of all term pregnancy in non-diabetic women with normal pre-pregnancy BMI delivered from 2002 to 2004 in Shaheed Sadoughi Hospital in Yazd, were evaluated. Compared with mothers with normal pregnancy weight gain, the risk of macrosomia in offsprings was significantly elevated in women who had excess weight gain. The odds ratio (OR) was 3.3 (95% confidence interval [CI] = 2.2 – 5.1, P = 0.0001). Given the complications associated with delivering large babies, women may benefit from not gaining excess weight in pregnancy.

Acta Medica Iranica, 2011; 49(1): 21-24.

Keywords: Weight gain; Diabetes mellitus; Women; Fetal macrosomia

Introduction

It is already known that excess weight gain during pregnancy may associate with an increased risk of delivering large babies (1). In such deliveries, maternal and neonatal complications such as hemorrhage, infection, preeclampsia, perinatal mortality and rate of cesarean section are higher (1, 2). Although other studies about the effects of high maternal weight and excess weight gain on birth weight of newborns were done (3-6), but most of them focused on diabetic mothers (4, 6, 7) and based on maternal pre-pregnancy body mass index (BMI) (8, 9).

Some researchers investigated the impact of maternal weight gain during pregnancy on selected obstetric outcomes, e.g., macrosomia, meconium staining and increased cesarean rate (10-12).Comparison of maternal BMI classes or the effect of gestational weight gain after adjustments for maternal pre-pregnancy BMI were concerned in other studies (5, 11).

The influence of the amount of gestational weight gain on neonate birth weight had been less considered.

The purpose of the present study was to evaluate effects of excessive pregnancy weight gain in non-diabetic women with normal pre-pregnancy BMI ,on birth weights of their neonates and to answer the question that whether risk of newborn macrosomia is higher in heavier non-diabetic mothers or not.

Patients and Methods

In a descriptive cross–sectional study, medical records of all term pregnancy delivered between March 2002 and March 2004 in Shaheed Sadoughi Hospital in Yazd, were reviewed. Variables such as age, educational level , economic condition, number of previous pregnancies , pre-pregnancy weight, height (based on midwife records in first visit at the maternity health care center) and BMI (weight in kilogram/square of height in meter), gestational weight gain, birth weight, sex and gestational age (GA) of her neonate were carefully recorded.

Normal BMI (BMI=19.8 to 26) and normal pregnancy weight gain (11.5 to 16 kg), were as defined by the Institute of Medicine (IOM) guidelines

Corresponding Author: Leila Sekhavat
Department of Obstetrics & Gynecology, Shaheed Sadoughi Hospital, Shaheed Sadoughi University of Medical Sciences and Health Services, Yazd, Iran
Tel: +98 351 8224001, 913 1525637, Fax: +98 351 8224100, E-mail: sekhavat@ssu.ac.ir

(13). Gestational age was calculated using the first day of the last normal menstrual period (LMP) and macrosomia defined as a birth weight of 4000 grams (g) or more.

Diabetic mothers, multiple pregnancies, under or overweight women (19.8< BMI> 26), preterm (gestational age less than 37 weeks) or post term (GA more than 42 weeks) labors and those with missing midwife data were excluded. The study population consisted of 940 deliveries. In our hospital (Shahid Sedughi hospital) the total delivery number during that period was about 6000.

The data were analyzed using SPSS.15 statistical software. Chi-square and *t* student were used to compare was taken as $P < 0.05$ was statistical significance.

The analyses made were corrected for the effect of gestational age on weight gain by dividing the observed weight gain by a factor that estimated what the weight gain should have been at 40th week of gestation. This factor was estimated for each gestational week (37–42) by the quotient between mean gestational weight gain for that week and mean gestational weight gain for infants born after 40 completed weeks.

Results

Large baby delivery accrued in 11.3% of women. Table 1 shows frequency of macrosomia of neonates based on maternal and neonatal characteristics. Women that delivered in 37th week of gestation, or had poor economic condition, had lowest proportion of macrosomia (7.4%, and 8.2%, respectively), while wealthy mothers had the highest proportion (19.4%).

Twenty five percent (237/940) of women had excess weight gain during pregnancy. Table 2 illustrates the risk of macrosomia based on weight gain status and indicates that 25.9% of excess weight gain and 9.1% of normal weight gain women delivered macrosomic babies. The odds ratio (OR) was 3.3 (95% confidence interval [CI] = 2.2 – 5.1 and *P* value = 0.0001) for excess weight gain. In the other words, nearly 50% of macrosomic neonates deliveries occurred in excess pregnancy weight gained mothers.

Table1. Frequency of macrosomia of neonate based on maternal and neonatal characteristics

Factor		**Total number**	**macrosomia**	*P* value
Mother age (year)	< 20	125	13	0.5
	20-29	412	47	
	30-40	291	44	
	>40	112	12	
Economic condition	Poor	73	6	0.03
	Meduim	553	49	
	Rich	314	61	
Neonate Sex	Male	457	65	0.2
	Female	483	51	
Maternal education level	High school and less	81	14	0.6
	Bachelor	603	65	
	Master and higher	256	37	
Gestational age(week)	37	67	5	0.04
	38-39	390	67	
	40-42	483	64	
Parity	Nullipara	510	65	0.269
	Multipara	483	51	

Table 2. Odds ratios for maternal weight gain in relation to risk of macrosomia

Maternal weight gain	**Macrosomia**		**OR (CI)**		
	N	**%**	**N**	**%**	
Excess	237	25.2	59	25.9	3.3 (2.2- 5.1)
Normal	473	50.3	43	9.1	0.5 (0.2-1.2)
Low	230	24.5	14	6.1	0.6 (0.3-1.2)

Discussion

The prevalence of macrosomia has been increasing over the past decade (5, 8). Delivery complications such as perineal laceration, cesarean section, shoulder dystonia, and postpartum hemorrhage are higher in large baby deliveries, which can in turn result in longer hospital stays or even higher perinatal mortality (2, 5, 11) and therefore, it is important to identify predictive factors.

In this study, rate of newborn macrosomia increased statistically significant in non-diabetic pregnant women with excess pregnancy weight gain which support other studies (2, 8, 14).

In the present study, excess pregnancy weight gained women constituted approximately one forth of population study, but half of macrosomic babies born by these women. While avoidance of excess weight gain before pregnancy is surely advisable, but present study suggests that by avoidance of excess weight gain during the course of pregnancy, the likelihood of delivering a large baby and concomitant complications may be reduced.

There are different ways to evaluate the relationship between maternal weight gain and macrosomia. A common way is to limit the study population to one maternal BMI class and evaluate gestational weight gain in relation with macrosomia (7). There are a few earlier studies that were able to show the risk of macrosomia at a specific pre-pregnancy BMI and different amounts of weight gain. Young *et al.* found an effect of excess weight gain on cesarean delivery rates due to large babies among underweight and normal weight women (11).

Maddah *et al.* found no association between fetal growth or gestation duration and high gestational weight gain among 274 women with normal BMI (15). Contradictory results were recently presented from Iceland, where excess weight gain among average weight women was associated with more delivery of large babies (10). In contrast to our study, Kabali *et al.* reported macrosomia only in overweight women with excess weight gain, but increased risks of macrosomia for normal weight with excess weight gain, not observed (8). The reason may be that, they combined prepregnancy overweigh and excess weight gain in their study.

Though statistically significant increased risk between macrosomia and excess weight gain was identified, it is important to consider study limitations. The dataset used in this analysis was intended for a different purpose and information were not collected on other important covariates such as paternal height and weight, family history of obesity and birth weight of parents. Therefore, it is not possible to estimate the extent to which these factors could have influenced the results. Further, information was not collected on weight gain within trimester, which might have identified a specific pattern of weight gain that affects fetal growth.

Although other studies have shown that retrospective recall of pre-pregnancy weight, weight gain in pregnancy, and birth weight are remarkably accurate (8, 12, 15), in this study, information were collected through postpartum interviews, which may open the opportunity for recall error. It is also worth noting that although BMI is considered as an excellent measure of body composition, it is not perfect and is possible that a small number of women be missed.

Its large sample strengthened this study but other researchers are necessary for investigation of factors not considered here. In conclusion, non-diabetic women with normal pre-pregnancy BMI and excess pregnancy weight gain (more than 16 kg) have a greater risk of delivering a macrosomic baby. Given the significant complications associated with delivery of large babies, efforts to prevent excess pregnancy weight gain, may help reduce this problem.

References

1. Rosenberg TJ, Garbers S, Chavkin W, Chiasson MA. Prepregnancy weight and adverse perinatal outcomes in an ethnically diverse population. Obstet Gynecol 2003;102(5 Pt 1):1022-7.
2. Stotland NE, Hopkins LM, Caughey AB. Gestational weight gain, macrosomia, and risk of cesarean birth in nondiabetic nulliparas. Obstet Gynecol 2004; 104(4):671-7.
3. Yin YZ, Chen XW, Li XM, Hou HY, Zhou SS. Relations of pre-pregnant weight and weight gain during pregnancy with pregnancy-induced hypertension and birth weight. Di Yi Jun Yi Da Xue Xue Bao 2005;25(2):226-8.
4. Větr M. Risk factors associated with high birthweight deliveries. Ceska Gynekol 2005;70(5):347-54.
5. Bergmann RL, Richter R, Bergmann KE, Plagemann A, Brauer M, Dudenhausen JW. Secular trends in neonatal macrosomia in Berlin: influences of potential determinants. Paediatr Perinat Epidemiol 2003;17(3):244-9.
6. Bo S, Menato G, Signorile A, Bardelli C, Lezo A, Gallo ML, Gambino R, Cassader M, Massobrio M, Pagano G. Obesity or diabetes: what is worse for the mother and for the baby? Diabetes Metab 2003;29(2 Pt 1):175-8.

7. Clausen T, Burski TK, Øyen N, Godang K, Bollerslev J, Henriksen T. Maternal anthropometric and metabolic factors in the first half of pregnancy and risk of neonatal macrosomia in term pregnancies. A prospective study. Eur J Endocrinol 2005;153(6):887-94.
8. Kabali C, Werler MM. Pre-pregnant body mass index, weight gain and the risk of delivering large babies among non-diabetic mothers. Int J Gynaecol Obstet 2007;97(2):100-4.
9. Ehrenberg HM, Durnwald CP, Catalano P, Mercer BM. The influence of obesity and diabetes on the risk of cesarean delivery. Am J Obstet Gynecol 2004;191(3):969-74.
10. Thorsdottir I, Torfadottir JE, Birgisdottir BE, Geirsson RT. Weight gain in women of normal weight before pregnancy: complications in pregnancy or delivery and birth outcome. Obstet Gynecol 2002;99(5 Pt 1):799-806.
11. Young TK, Woodmansee B. Factors that are associated with cesarean delivery in a large private practice: the importance of prepregnancy body mass index and weight gain. Am J Obstet Gynecol 2002;187(2):312-8.
12. Cedergren M. Effects of gestational weight gain and body mass index on obstetric outcome in Sweden. Int J Gynaecol Obstet 2006;93(3):269-74.
13. Institute of Medicine. Meeting 2: Impact of Pregnancy Weight on Maternal and Child Health [Online]. 2006 May 2006 [cited 2011 Mar 1]; Available from: URL:http://www.iom.edu/Activities/SelectPops/pregweightwrkshp/2006-MAY-30.aspx
14. Maddah M, Karandish M, Mohammadpour-Ahranjani B, Neyestani TR, Vafa R, Rashidi A. Social factors and pregnancy weight gain in relation to infant birth weight: a study in public health centers in Rasht, Iran. Eur J Clin Nutr 2005;59(10):1208-12.
15. Catov JM, Newman AB, Kelsey SF, Roberts JM, Sutton-Tyrrell KC, Garcia M, Ayonayon HN, Tylavsky F, Ness RB. Accuracy and reliability of maternal recall of infant birth weight among older women. Ann Epidemiol 2006;16(6):429-31.
16. Bush A, Alton E, Davies JC, Griesenbach U, Jaffe A, editors. Cystic Fibrosis in the 21st Century. Basel, Karger: Prog Respir Res; 2006. p 264-9.