

Predictors of Maternal Weight Gain during Normal and High Risk Pregnancies: a Retrospective Study in Primary Care, Eastern Saudi Arabia

Olfat S. Janbi¹, Amr A. Sabra^{1,2*}, AbdulAziz M. Sebiany¹, Ahmed S.Hafez^{1,3}

¹Department of Family and Community Medicine, College of Medicine, University of Dammam, Saudi Arabia. ² Primary Health Care Divisions, High Institute of Public Health, Alexandria University, Egypt. ³Department of Community, Environmental and Occupational Medicine, Faculty of Medicine, Ain-Shams University, Egypt

*Corresponding Author: Professor Amr Ahmed Sabra. Email: amrsabra_eg@yahoo.com

ABSTRACT

Background: Pregnancy is the only time in a woman's life where weight gain is expected and encouraged. Therefore, women are concerned whether pregnancy will have an impact on their body weight. **Objective:** To determine gestational weight gain during normal and high risk pregnancy and to find-out the maternal factors that are associated with maternal weight gain during normal and high risk pregnancies. **Subjects and Methods:** A retrospective study was conducted in Al-Khobar city, Eastern Saudi Arabia. All pregnant women registered, during the year 2010-2011 (n=323), at three randomly selected primary health care centers were included in the study. The number of records with completed registered studied variables and weight gain during pregnancy was 229 records (70.9% of total records) was divided according to the criteria of high risk pregnancy, into two groups, namely normal pregnancy (n=123) and high risk pregnancy (n=106). The maternal body weight gain was divided into three categories as low weight gain (≤ 8.0 kg), normal weight gain (8.1—16.0 kg) and high weight gain (≥ 16.1 kg). Statistical analysis was done using descriptive and analytic statistics as well as logistic regression analysis. **Results:** The rate of women having normal maternal weight gain during normal pregnancy was 35% as compared to those 18.9% during high risk pregnancy. While, 63.4% of women had low weight gain during normal pregnancy, 80.2% of them had low weight during high risk pregnancy. About 31.2% of women during normal pregnancy were aged 35-45years old when compared to 68.8% of women during high risk pregnancy and the difference was statistically significant ($p<0.01$). Increased parity and number of living children are significantly associated with low maternal weight gain during normal pregnancy. Decreased antenatal visits during high risk pregnancy were significantly associated with low weight gain during high risk pregnancy. **Conclusion:** Low weight gain was more during high risk pregnancy; increase in parity and number of living children during normal pregnancy, decreased antenatal visits during high risk pregnancy are significantly associated with low maternal weight gain. Suitable measures should be taken to control maternal body weight gain during pregnancy.

Key words: *Maternal Weight Gain, Primary Health Care, Predictors, Saudi Arabia.*

Janbi OS, Sabra AA, Sebiany AM, Hafez AS. Predictors of maternal weight gain during normal and high risk pregnancies: a retrospective study in primary care, Eastern Saudi Arabia. *Canad J Clin Nutr* 2013; 1 (1): 5-15.

DOI: <http://dx.doi.org/10.14206/canad.j.clin.nutr.2013.01.02>

INTRODUCTION

Pregnancy is the only time in a woman's life where weight gain is expected and encouraged. Therefore, women are concerned whether pregnancy will have an impact on their body weight. There are many body changes during pregnancy: an inevitable one is that pregnancy and weight gain go hand in hand, not making it any easier for the body image during pregnancy. Maternal weight gain in pregnancy can serve as a good mean of assessing the

wellbeing of the pregnant mother (1). The weight of the growing fetus itself should expect to have a gain between 10-12 kg and a 12-15kg of 'baby' respectively with a single pregnancy. During the first trimester pregnancy weight gain should be between 1-2 kg, and then about 500g per week for the rest of the pregnancy term (2).

Inadequate prenatal weight gain and low weight gain during pregnancy are significant risk factors for intra-uterine growth retardation, pre-term delivery and low birth weight in infants (3-7). Excessive weight gain on the other hand can lead to adverse maternal and fetal outcomes (8,9). Accordingly, suggestions for optimal weight gain is needed to ensure the best outcomes (10- 12). Gestational weight gain was defined as the difference between the maternal weight measured within one week prior to delivery and the maternal weight recorded at the first visit to the hospital. Gestational weight gains were grouped into three categories as low weight gain (≤ 8.0 kg), normal weight gain (8.1—16.0 kg) and over weight gain (≥ 16.1 kg) (13).

Excessive gestational weight gain, in Saudi Arabia, is emerging as an important predictor of maternal and offspring obesity, as well as obstetrical complications. Independent of their weight entering pregnancy, mothers who gain excessively during pregnancy are more likely to deliver by cesarean section, have an unsuccessful trial of labor after cesarean section, develop pre-eclampsia, retain excessive weight after delivery, and become overweight or obese in later life (14). Various studies reported that the socio-demographic predictors of excessive weight gain during pregnancy were null parity, pre-pregnancy overweight, body mass index, low socioeconomic status, and young maternal age (2,4,6,8,14). The nature of weight gain during normal and high risk pregnancy in Saudi Arabia remains undetermined. The aim of the present study was to determine gestational weight gain during normal and high risk pregnancy and find-out the maternal factors associated with weight gain during normal and high risk pregnancies.

SUBJECTS AND METHODS

A retrospective epidemiological investigation based on population background was conducted during the year 2012 in Al-Khobar city, part of the eastern province in the Kingdom of Saudi Arabia (KSA). Married fertile women having children in catchments of randomly selected primary health care centers (PHCCs) were the units of observation and the target population of the present study. All available medical records of pregnant women in three out of the eight PHCCs, in Al-Khobar city, were randomly selected namely; Al-Akrabia, Ibn Hayyan and Al-Bayonia PHCCs. The specific inclusion criteria of the present study were the presence obstetric records of Saudi and Non Saudi women that attended their first antenatal visit during the study period in the selected PHCCs. The records of all pregnant women, who were developed according to the World Health Organization (WHO) known as "Mother and child health passport", who started their antenatal care from 1st October 2010 to 30th September 2011 were collected from the three randomly selected PHCCs. The total number of these antenatal records was 323, and the number of records with complete registered studied variables and gained weight during pregnancy was 229 records which represented 70.9% of the total records; they were divided according to the criteria of high risk pregnancy,(15) into two groups, namely normal pregnancy (n=123) and high risk pregnancy (n=106). The available maternal variables in the present study were socio-demographic and reproductive characteristics as well as family, past-medical and surgical histories, current obstetric history and maternal body weight gain. Obstetric outcome included preeclampsia, eclampsia, gestational diabetes, ante partum hemorrhage, full term and postdate deliveries. Values of maternal body weight gain were divided into three categories as low weight gain (≤ 8.0 kg), normal weight gain (8.1—16.0 kg) and high weight gain (≥ 16.1 kg) (13).

Demographic, antenatal data were explored; and women with normal weight were used as the reference or the comparison group for data analysis. The socio-economic status of the mothers was determined by scoring system (16) using parental education (0-4 scores for either paternal or maternal education); Paternal occupation (2-7 scores) and maternal occupation (0-1 score). Accordingly, the total score of socio-economic status ranged from 2-16 scores.

Data entry and verification was done and variables were described using frequency distribution for categorical variables. The chi-square (χ^2) and Fishers Exact test were used as a test of significant values for comparison of categorical variables and t test was used as a test of significance for quantitative variables. *P* value < 0.05 was chosen as the level of statistical significance using Statistical Package of Social Sciences (SPSS) version 16 (17). Logistic regression analysis was done to determine the main factors associated with weight gain and the results were expressed as Odds Ratio (OR) and corresponding 95% as confidence interval (CI). Pilot study was applied on fifteen files in Al-Akrabia PHCC in order to test the validity and reliability. Permission was taken from the concerned authority to conduct the study and confidentiality of the information was strictly adhered, with data to be used only for research purpose.

RESULTS

The total registered records of women who attended antenatal care during the study period were 323 records and 29.1% were excluded due to lack of registration of some variables under the study. A total of 229 maternal antenatal records were enrolled in the study. They were classified into normal (n=123) and high risk pregnancy (n=106) groups according to the criteria of high risk pregnancy¹⁵. The criteria of high risk pregnancy were previous stillbirth or neonatal deaths (4%), isoimmunisation RH (5.9%), previous surgery on reproductive tract (14.2%), history of low birth weight (< 2500g) in last pregnancy (7.7%), and any medical disease or condition (23.2%) (Table 1). Maternal weight gain was normal in 35% women during normal pregnancy as compared to 18.9% of the women during high risk pregnancy. However, low weight gain during normal pregnancy was observed among 63.4% women during normal pregnancy when compared to 80.2% during high risk pregnancy. The overweight gain was approximately the same during normal and high risk pregnancies (Figure 1). During normal pregnancy 31.2% of women were in the age group of 35-45 years old compared to 68.8% during high risk pregnancy and the difference was statistically significant (*p*<0.01) (Table 2). Moreover, there was no statistical significant difference between the studied women during normal and high risk pregnancies regarding nationality and maternal occupation. The reproductive characteristics of studied women revealed that 47.5% of them during normal pregnancy had abortions compared to 52.5% who had undergone abortion during high risk pregnancy; and 28.1% of women during normal had 5 or more living children as compared to 71.9% of women during high risk pregnancies. (Table 2). Family history of women showed that diabetes mellitus, hypertension, multiple pregnancy, and consanguinity are nearly the same during normal and high risk pregnancy (Table 3). Increase parity and increased number of living children are significantly associated with low maternal weight gain during normal pregnancy (Table 3). However, decreased antenatal visits during high risk pregnancy were significantly associated with low maternal weight gain during high risk pregnancy (Table 4). Moreover, an association between maternal weight gain, obstetric outcomes and prenatal morbidities was determined; however, the number of women during normal pregnancy was too small. Logistic regression analysis revealed that mother's education (OR= 1.7, CI =1.12- 2.45, Model X² (15) = 19.95, *P*<0.5) was the only significant (*P*<0.05) predicting factor associated with maternal weight gain

during normal pregnancy (Table 4). However, during high risk pregnancy neither socio-demographic factors nor reproductive characteristics were predictors of maternal weight gain.

DISCUSSION

Maternal weight was recorded at almost all antenatal primary care attendees and weight gain was considered as a clinical test during antenatal care. The amount of maternal weight gain was found to be compatible with normal pregnancy outcome (18-20). These have led to studies resulting in recommended weight gain during pregnancy (21). In the present study most of the women studied in Saudi were aged 25-35 years (56%); 94.1% were Saudi nationals and 95% were housewives. The findings are similar to the study done among Qatari married women (15), but a higher value for maternal age was reported by a study in Saudi Arabia (23). The reproductive characteristics of Saudi women showed that 26.6% had abortion and 34.1% had up to two children; this finding is inconsistent with other studies. (6,8,13,22). Past-medical history of anemia was observed among 20.4%, 14.2% had past surgical history of cesarean section, 27.5% had normal body weight gain (8.1 to <16) during pregnancy and the mean antenatal visits was 2.5 ± 1.2 .

Data of other previous studies (3, 13, 15, 23, 24) were inconsistent with these findings in the present study. The criteria of high risk pregnancy were previous stillbirth or neonatal deaths (4%), isoimmunisation RH (5.9%), previous surgery on reproductive tract (14.2%), history of low birth weight in last pregnancy (7.7%), and any medical disease or condition (23.2%). This study showed that there was statistically significant ($P < 0.01$) difference in age distribution of studied women during normal and high risk pregnancies. However, there was no statistical significant difference between the studied women during normal and high risk pregnancies regarding nationality and maternal occupation.

Also the reproductive characteristics of studied women revealed that there was statistical significant ($P < 0.01$) difference between the studied women during normal and high risk pregnancies number of living children. Family history of women showed that diabetes mellitus, hypertension, multiple pregnancy, and consanguinity are similar during normal and high risk pregnancy. Moreover, 18.8% of women studied during normal pregnancy had past-medical history of anemia, 12.5% had past-surgical history of cesarean section, 56.9% had 3-4 antenatal visits, 60% delivered pre-term babies and 68.8% had normal maternal weight gain during normal pregnancy.

Excessive gestational weight gain in Saudi Arabia is emerging as an important predictor of maternal obstetric complications. Mothers who gain weight excessively during pregnancy are more likely to deliver by caesarean section, develop pre-eclampsia, and become overweight or obese in later life (14). Increase parity and increased number of live births are significantly associated with low maternal weight gain during normal pregnancy. However, decreased antenatal visits during high risk pregnancy were significantly associated with low maternal weight gain during high risk pregnancy. These findings are inconsistent with findings of other studies performed in Ghana (2), Africa (25), Saudi Arabia (23,24) Also, there is an association between maternal weight gain and either obstetric outcomes or prenatal morbidities, although the present study involved small number of women in each variable under investigation during normal pregnancy.

Logistic regression analysis revealed that mother's education (OR= 1.7, CI =1.12- 2.45) ($P < 0.05$) was the only significant predicting factor associated with maternal weight gain during normal pregnancy. However, none of the socio-demographic factors and reproductive characteristics was found to be predictors of maternal weight gain during high risk pregnancy. This is not in accordance with various studies, which reported that an antenatal

visit during pregnancy was the significant preventive factor against adverse pregnancy outcome and complications (11-15).

CONCLUSION

The results of the present study demonstrated that 29.1% of the records were incomplete and was missing important data which may have not been performed or not recorded. Low maternal body weight gain during normal pregnancy was significantly associated with increase parity and increased number of children. However, decreased antenatal visits during high risk pregnancy were associated only significantly with low maternal weight gain. Also there is an association between maternal weight gain and obstetric outcomes and prenatal morbidities. Logistic regression analysis demonstrated that mother's education was the only significant predicting factor associated with maternal body weight gain during normal pregnancy. From the results of the present study, it is recommended that all primary health care team members providing antenatal care services should receive continuous medical education and in-service training about the new WHO model and be aware about the principles and importance of proper registration and recording. Health education sessions should be conducted for all females with particular attention to pregnant women about the hazards associated with excessive body weight gain during pregnancy and the different methods of its control, with special emphasis on lifestyle modification.

Conflicts of Interest

The authors indicated no potential or actual conflict of interest pertaining to this study.

Authors' Contributions

All authors made full contribution to data acquisition, interpretation of results, drafting and revising the final manuscript. All authors read and approved the final manuscript.

Study Limitations

There were no limitations.

Acknowledgements

The authors deeply extended their appreciation to the study subjects for their dedicated effort to complete this study.

REFERENCES

1. Varma TR. Maternal weight and weight gain in pregnancy and obstetric outcome. *Int J Gynaecol Obstet* 1984; 22(2):161-166.
2. Addo VN. Body mass index, weight gain during pregnancy and obstetric outcomes. *Ghana Med J* 2010; 44(2):64-69.
3. Lawoyin TO. Maternal weight and weight gain in Africans. Its relationship to birth weight. *J Trop Pediatr* 1991; 37(4):166-171.
4. Tulman L, Morin KH, Fawcett J. Pregnant weight and weight gain during pregnancy: relationship to functional status, symptoms, and energy. *J Obstet Gynecol Neonatal Nurs* 1998; 27(6):629-634.

5. Suitor CW. Maternal Weight Gain: A Report of an Expert Work Group. Arlington, VA: National Center for Education in Maternal and Child Health.1997
6. Marsoosi V, Jamal A, Eslamian L. Pre-pregnancy weight, low pregnancy weight gain, and preterm delivery. *Int J Gynaecol Obstet* 2004; 87(1):36-37.
7. Schieve LA, Cogswell ME, Scanlon KS, Perry G, Ferre C, Blackmore-Prince C. Pre-pregnancy body mass index and pregnancy weight gain: associations with preterm delivery. The NMIHS Collaborative Study Group. *Obstet Gynecol* 2000; 96(2):194-200.
8. Kumari AS. Pregnancy outcome in women with morbid obesity. *Int J Gynaecol Obstet* 2001; 73(2):101-107.
9. Ekblad U, Grenman S. Maternal weight, weight gain during pregnancy and pregnancy outcome. *Int J Gynaecol Obstet* 1992; 39(4):277-283.
10. Wells C, Murray EK. Weight gain during pregnancy: Colorado Pregnancy Risk Assessment Monitoring System (PRAMS), 1997-2000. Colorado. Health Statistics Section, Colorado Department of Public Health and Environment, 2003.
11. Abrams B, Altman SL, Pickett KE. Pregnancy weight gain: still controversial. *Am J Clin Nutr* 2000; 71:1233S-1241S.
12. Bracero LA, Byrne DW. Optimal maternal weight gain during singleton pregnancy. *Gynecol Obstet Invest* 1998; 46(1):9-16.
13. Cedergren M. Effects of gestational weight gain and body mass index on obstetric outcome in Sweden. *Int J Gynaecol Obstet* 2006; 93(3):269-274.
14. Stuebe AM, Oken E, Gillman MW. Associations of diet and physical activity during pregnancy with risk for excessive gestational weight gain. *Am J Obstet Gynecol* 2009; 201(1):58-61.
15. World health organization. WHO Antenatal Care Randomized Trial: Manual for the Implementation of the New Model. WHO/RHR/01.30. WHO, Geneva, 2002.
16. Park K. Demography and family planning: Textbook of preventive and social medicine.20th ed. Jabalpur: M/s Banarasidas Bhanos publisher 2009 pp.411- 446.
17. Statistical Package for Social Sciences (SPSS) version 16 for Windows. 2007. SPSS Inc., 1989-2007.
18. Copper RL, DuBard MB, Goldenberg RL, Oweis AI. The relationship of maternal attitude toward weight gain to weight gain during pregnancy and low birth weight. *Obstet Gynecol* 1995; 85(4):590-595.
19. Crane JM, White J, Murphy P, Burrage L, Hutchens D. The effect of gestational weight gain by body mass index on maternal and neonatal outcomes. *J Obstet Gynaecol Can* 2009; 31(1):28-35.
20. Rosso P. A new chart to monitor weight gain during pregnancy. *Am J Clin Nutr* 1985; 41(3):644-652.
21. National Academy of Sciences, Institute of Medicine, Food and Nutrition Board, Nutrition during pregnancy, Nutrition during pregnancy Part I- weight gain. Part II- Nutrition supplementation, Committee on Nutritional status during pregnancy and

- lactation, Subcommittee on dietary intake and nutrient supplements during pregnancy.1990. Washington, D C: National Academy Press.
22. Chin J, Murtaugh M. Socio-demographic and behavioral predictors of gestational weight gain. *Am J Obstet Gynecol* 2012; 206: S255-S256.
 23. Hammad SM, El-Gilany A. The effect of body mass index on pregnancy outcomes. *The Egyptian Journal of Community Medicine* 2008; 26:15-26.
 24. Nisa MU, Aslam M, Ahmed SR, Rajab M, Kattea L. Impact of Obesity on Fetomaternal Outcome in Pregnant Saudi Females. *Int J Health Sci (Qassim)* 2009; 3(2): 187–195.
 25. Lawoyin TO. Maternal weight and weight Gain in Africans: Its relationship to birth weight. *J Trop Pediatr* 1991; 37(4):166-171.

Table 1: Number and percent distribution of studied pregnant women with criteria of high risk pregnancy

Criteria of high risk pregnancy	pregnant Women with high risk of pregnancy factors*	
	No.	%
Obstetric history:		
1-Previous stillbirths or neonatal loss	13	4.0
2-History of 3 or more consecutive spontaneous abortions	3	0.9
3-Birth weight of last baby < 2500g	25	7.7
4-Birth weight of last baby > 4500g	2	0.6
5-Last pregnancy hospital admission for H.T. or eclampsia / preeclampsia	3	0.9
6-Previous surgery on reproductive tract	46	14.2
Current pregnancy:		
1-Diagnosed or suspected multiple pregnancy	1	0.3
2-Age >40 years	9	2.8
3-Isoimmunization RH(-) in current or previous pregnancy	19	5.9
4-Vaginal bleeding	6	1.9
5-Pelvic mass	2	0.6
6-Blood pressure 140/90mmHg or more at booking	2	0.6
7-Cardiac diseases, Diabetes mellitus, or renal diseases	5	1.5
8-Any other severe medical diseases or conditions	75	23.2

*a pregnant woman may have more than one risk pregnancy factors

Table 2: Demographic, reproductive characteristics and family history of studied pregnant women during normal and high risk pregnancies

Characteristics	N	Normal pregnancy (n=123)		High risk pregnancy (n=106)		Test of Significance P value
		No.	%	No.	%	
A-Demographic characteristics						
1-Age group (years)						
15-<25	60	43	71.7	17	28.3	$\chi^2 = 14.651, P < 0.01$
25- <35	137	70	51.1	67	48.9	
35- 45	32	10	31.2	22	68.8	
2-Nationality						
Saudi	217	118	54.4	99	45.6	FET=0.74, $P > 0.05$
Non-Saudi	12	5	4.7	7	57.3	
3-Women occupation						
House wife	221	121	58.8	100	45.2	$\chi^2 = 2.75, P > 0.05$
Working for cash	8	2	25.0	6	75.0	
B- Reproductive characteristics						
1-Abortions						
	59	28	47.5	31	52.5	FET=1.25, $P > 0.05$
2-Stillbirths						
	2	0	0.0	2	100.0	-----
3-Number of living children						
1-2	74	38	51.4	36	48.6	$\chi^2 = 17.56, P < 0.01$
3-4	56	28	50.0	28	50.0	
≥ 5	32	9	28.1	23	71.9	
No living children	67	48	71.6	19	28.4	
C-Family History						
Diabetes Mellitus	121	63	52.1	58	47.9	$\chi^2 = 2.899, P > 0.05$
Multiple pregnancy	29	12	41.4	17	58.6	
Hypertension	109	61	56.0	48	44.0	
Blood disorders	6	4	66.7	2	33.3	
Consanguinity	20	9	45.0	11	55.0	

Table 3: Maternal body gain and socio-demographic characteristics of studied pregnant women during normal and high risk pregnancies

Variables	Maternal Body Gain					
	Normal pregnancy (n=123)			High risk pregnancy (n=106)		
	Normal weight gain (8.1-<16) (n=43)	Low weight gain (<8) (n=78)	Over weight gain (≥16) (n=2)	Normal weight gain (8.1-<16) (n=20)	Low weight gain (<8) (n=85)	Over weight gain (≥16) (n=1)
Age (x ±SD)	25.3±3.9	27.1±5.6	25.0±11.3	29.0 ±5.5	29.8±5.9	-----
Parity (x ±SD)	2.2 ±1.4	3.5 ±2.3*	2.5 ±2.1	3.5 ±2.9	2.8 ±0.85*	-----
Number of Antenatal care visits (x ±SD)	3.4 ±0.7	3.1 ±0.9	3.0 ±0.001	3.5 ±0.7	4.5±2.8	-----
Number of living children (x ±SD)	0.97 ±1.2	1.9±1.8*	2.5±2.1*	2.1 ±1.9	1.9±1.8	-----

* $P < 0.05$

Table 4: Logistic regression analysis of significant factors predicting maternal body weight gain among studied pregnant women during normal pregnancy

Variables	B coefficient	B	P-value	O.R.	95 % Confidence interval of O.R.	
					Lower	Upper
Mother education	0.503	0.2	0.012	1.7	1.12	2.45
Constant	91.19	7.84	-----	----	-----	-----
Model $X^2 = 19.95$, $P > 0.05$						

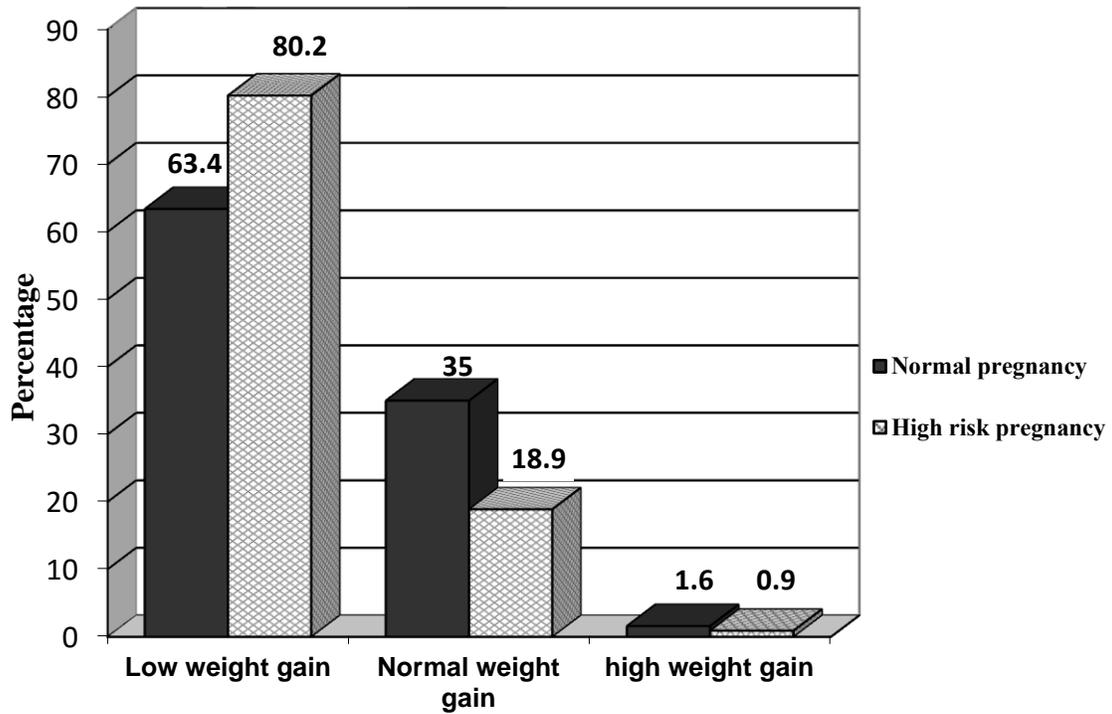


Figure 1: Percentage of pregnant women achieved body weight gain during normal and high risk pregnancy