

# Relationship between Weight Pre-Pregnancy and Weight Gain during Pregnancy with Preterm Birth

Dönmez S<sup>1</sup> and Güner Ö<sup>2</sup>

<sup>1</sup>Department of Nursing, Institute of Health Sciences, Gaziantep University, Gaziantep-Turkey

<sup>2</sup>Faculty of Nursing, Ege University, İzmir-Turkey

\***Corresponding author:** Dönmez S, Research Assistant, Department of Nursing, Institute of Health Sciences, Gaziantep University, Gaziantep-Turkey, Tel: +90 342 3606060, E-mail: donmezsevgul@gmail.com

**Citation:** Dönmez S, Güner Ö (2017) Relationship Between Weight Pre-Pregnancy and Weight Gain During Pregnancy with Preterm Birth. J Nutr Health Sci 4(2): 207. doi: 10.15744/2393-9060.4.207

**Received Date:** January 24, 2017 **Accepted Date:** August 05, 2017 **Published Date:** August 08, 2017

## Abstract

Worldwide alarming increase of obesity prevalence has led the WHO to take into consideration as one of the most serious global health problems of the 21<sup>st</sup> century. 40% of women worldwide are overweight. The leading causes of obesity prevalence in women more often because during pregnancy and before pregnancy they gain excess weight. The rapid increase of obesity prevalence especially among women in the World cause women begin pregnancy overweight or obese and this can cause problems about pregnancy and birth. One of the most important of these problems are the threat of premature birth. Each year it is estimated that 15 million babies born before 37 weeks and it is increasing day by day. The relationship between weight gain during pregnancy of preterm birth and weight before pregnancy are discussed in the literature. Some studies suggest that obesity or less weight than usual increases the risk of preterm birth and some suggest it is not affect. Two studies done with 4735 and 8266 women shows that overweight and obesity increase the risk of preterm birth. As a result, despite efforts to reduce preterm birth, premature birth and infant mortality rate leads to an increase in morbidity and the incidence is increasing. It is thought that one of the most important cause of preterm birth balancing BMI pre-pregnancy and during pregnancy contribute positively maternal and neonatal outcomes. Pregnancy is not a good time to lose weight. Predicted weight gain during pregnancy should be set at the beginning of the monitoring.

**Keywords:** Preterm birth; Weight pre-pregnancy; Weight gain during pregnancy; Obesity

## Introduction

Since mankind has been struggling with starvation, famine and poverty throughout the history, excessive weight and obesity were perceived as the indications of health and wealth in almost all communities. Although starvation and poverty are still a major problem, health problems associated with both insufficient nourishment and infectious diseases have been replaced with health problems brought by overnutrition and obesity [1]. While obesity was considered a developed countries' problem at the beginning, it has been inevitable with increased income levels in developing countries, adaption of the western life style, decrease in energy consumption when energy intake increases and finally through migration from rural to urban. Furthermore, the decrease in physical activities due to facilitated life style in transportation, production and farming domains, the changes in nourishment habits in modern life (especially fast-food), rapidly eaten unhealthy foods and a nourishment style rich in fat, carbohydrates and refined sugar and poor in vegetable fibers in parallel with the spread of technological tools (cell-phone, television, computer, home theatre, etc.) have significantly contributed to the increase in obesity [1-4]. Consequently, the prevalence of obesity is constantly increasing regardless of east-west or rich-poor community discrimination. Today, the second most important cause of preventable deaths after smoking is obesity [4]. Therefore, obesity seems a multifactor chronic disease that reduces quality of life. This worrisome increase in obesity prevalence worldwide has led World Health Organization to consider obesity as one of the most serious global health problems in 21<sup>st</sup> century [4]. The Organisation for Economic Cooperation and Development (OECD) said that nearly one in two adults and one in six children are overweight or obese in OECD countries. While adult obesity rates are highest in the United States, Mexico, New Zealand and Hungary, they are lowest in Japan and Korea. Obesity rates are projected to increase further by 2030, and Korea and Switzerland are the countries where obesity rates are projected to increase at a faster pace. Social inequalities in overweight and obesity are strong, especially among women [5].

According to WHO, there are 1.9 billion over-weighted adults in 2014 and more than 600 million of them are obese. While 40% of women are over-weighted in the world, 29.3% of the women are over-weighted and 24.5% are obese in Turkey [6,7]. Studies carried out on this topic have demonstrated in Turkish women that the reduced physical activity, higher birth rate, longer lactation periods, accompanying diabetes and hypertension, lower income and education levels have significantly influenced the obesity [8,9]. However, over weight gained during pre-and-peri-gestational periods in women is one of the leading causes of obesity seen [10].

Gaining weight during pregnancy has categorized the BMI (in terms of kg/m<sup>2</sup>) as less than normal (<18.5), normal (between 18.5 and 24.9), above normal (between 25 and 29.9) and obese (>30). According to BMI (Body Mass Index), total weight gain (Ib) is recommended as less than normal (28-40), normal (25-35), above normal (15-25) and obese (11-20) (Table 1) [11,12].

Pre-gestational Health	BMI (kg/m <sup>2</sup> )	Recommended Range of Total Weight (Ib)	*Recommended Rates of Weight Gain in the Second and Third Trimesters (Ib) (Mange Range[Ib/wk])
Less than Normal	<18.5	28-40	1 (1-1.3)
Normal	18.5-24.9	25-35	1 (0.8-1)
Above Normal	25-29.9	15-25	0.6 (0.5-0.7)
Obese (includes all classes)	>30	11-20	0.5 (0.4-0.6)

\*Calculations assume a 1.1-4.4 Ib weight gain the first trimester

**Table 1:** The Guideline for Weight Gain during Pregnancy According to BMI [11,12]

Since obesity seen throughout pregnancy is related to a number of complications, it is considered as a higher risky situation and as an indication is thought to have a crucial importance in occurrence of unwanted gestational outcomes [10,13,14]. Preconception obesity rate varies between 1.8 and 25.3 % worldwide [15]. All over the world, women to initiate pregnancy with a weight above normal or as an obese in accordance with the rapid increase in the prevalence of over-weight and obesity among women have more birth-related problems. The most important one of these problems is the threat for preterm [13,16-18].

## Association with Obesity, Weight Pre-Pregnancy and Weight Gain During Pregnancy of Pre-term Birth

The threat for preterm that is called preterm birth is defined as a birth action that starts beginning from the first day of last menstruation between 20 and 37 weeks (140 and 259 days). "Premature labor" is defined as a delivery taking place between those weeks independent from the birth weight. It is estimated that 15 million babies are delivered before 37<sup>th</sup> week each year and this rate is steadily increasing. In 2013, preterm was held responsible for the death of approximately 1 million children younger than 5-year old. Preterm labor rate varies between 5 to 18 % in 184 countries [19]. Preterm labors are responsible for more than 75 % of perinatal mortalities and more than half of the long term morbidities [20,21].

Premature labors are also seen as the primary cause of mortality and morbidity in newborns. Although the advances in technology and patient monitoring, there is no a significant decrease in the incidence of premature actions and labors. Health centers and obstetricians attempt to reduce the preterm labor rate by considering the effects of premature labor on the early period of human health. In order to prevent preterm labor, high risk patients are intervened preconception and symptomatic patients during pregnancy [22]. Therefore, it is thought that reduction of factors that may cause risks by health professionals preconception will provide great advances about this subject. To this end, to predict and prevent preterm birth should be the essential goal. Especially, decreasing the body weight above normal preconception or preventing the preterm birth through controlled weight gain during pregnancy started to gain importance recently.

The number of studies examining the relationship between with preterm delivery of pre-pregnancy weight gain and weight gain in pregnancy is limited. Some studies reported that obesity, overweight or the weight less than normal have increased the risk for preterm labor; whereas others failed to show such an effect. ACOG indicates that obesity is associated with preterm delivery, but the relationship with spontaneous preterm delivery is controversial. Pregnancy is a period in which women experience significant changes in their body weights. BMI is one of the important factors affecting the prognosis of pregnancy. High or low BMI is associated with antenatal, intrapartum and postpartum complications (preeclampsia, gestational diabetes, preterm labor, postpartum hemorrhage) [23,24]. BMI is also one of the most significant factors related to preterm births in Central and Eastern Europe [25]. In a study carried out with 11323 pregnant women found that inadequate gestational weight gain and excessive gestational weight gain were independent risk factors for preterm birth compared with normal gestational weight gain [26,27]. Maternal and fetal outcomes such as low birth weight, macrosomia, birth rates of spontaneous preterm labor, cesarean delivery, maternal postpartum obesity have been found to be more healthy for pregnant women with body weight between the borders of The Institute of Medicine (IOM) [28]. Also, it is generally stated that obese women have a high risk for preterm labor, but low risk for spontaneous preterm labor. However, it is thought that the relationship between maternal obesity and preterm birth risk

is complex and potentially influenced by other factors including age, parity, smoking and ethnicity. Although the mechanism by which obesity reduces the risk of spontaneous preterm labor is not fully understood, it is stated that obese women may have a lower level of spontaneous uterine activity compared to normal weight and weaker women [29]. Obese pregnant women are more likely to develop gestational diabetes and preeclampsia causing maternal risk increasing the rates of preterm delivery [30]. In a systematic review of 49 studies, it was observed that as the BMI increases, the preterm delivery risk increases [31]. In a meta-analysis study carried out with 10 171 obese preterm births in pregnant women with gestational weight gain over the indicated increased risk [32]. In another study it was found that gestational weight gain above the recommendations and moderate weight gain during pregnancy is associated with preterm [33,34]. In a study by Vivatkusol, *et al.*, percentage of cesarean section was increased in the overweight and obese pregnant women; in contrast, the rate of preterm births showed an increase in underweight pregnant women [35]. Also, in another study found that risk of preterm birth were high in the insufficient weight gain groups regardless of BMI [36]. Huang, *et al.* reported that excessive gestational weight gain among underweight pregnant women, insufficient gestational weight gain among obese pregnant women and excessive gestational weight gain in last trimester were important indicators of preterm birth [37]. Hannaford, *et al.* found that pregnant women who gained weight below recommendations and normal-weight patients who gained below recommendation were twice as likely to deliver preterm [38]. Enomoto, *et al.* showed that poor weight gain in pregnancy correlated with a higher frequency preterm birth, preterm premature rupture of membranes, and spontaneous preterm birth. In a study carried out with 4735 women, the risks for preterm and cesarean section were significantly higher in obese pregnant women [14,39]. A study conducted with 8266 women living in Amsterdam found that overweight and obesity have increased the threat for preterm labor risk and the preterm labor risk was more prevalent in smoking and immigrant women [40]. In another study it was found that the risk for preterm birth has increased in obese pregnant women with singleton and multiple pregnancies [41]. In a study by Masho, *et al.*, in over weighted and obese women the decreased weight gain throughout pregnancy was found to be associated with lesser spontaneous preterm labor and lesser early premature membrane rupture [42]. Moreover, in another study, obesity has increased the risk for preterm birth in nulliparous, black and Hispanic women. Contrary to these studies, other studies found higher risk for preterm labor in women with weight less than normal [43,44]. In a study, Honest *et al.* reported that the weight preconception could not be helpful in predicting preterm labor [45]. In a study by Mamun, *et al.*, the risk for preterm labor was found higher in women who had weight less than normal preconception or had gained insufficient weight during pregnancy, whereas the risk was lower in those who gained overweight during pregnancy [13]. In Sharifzadeh, *et al.*'s study, it was reported that there was a significant negative relationship between preterm labor and maternal body mass index (BMI) and the preterm birth was more frequently seen in women with reduced BMI [46]. In a study by Kosa, *et al.*, both reduced and increased BMI preconception was found to be related to preterm labor [47]. Besides, in De Jongh, *et al.*'s study it was found that the normal BMI preconception was protective in Caucasian/non-Hispanic, Spanish and Asian pregnant women, but not in Black/non-Hispanic women [48].

## Conclusion and Recommendations

Finally, despite attempts to reduce preterm labor the preterm labor still leads to increases in infant mortalities and mortalities and its incidence also continues to increase. It is thought that balancing BMI during preconception and pregnancy, which is one of the most important causes of preterm labor, will provide positive contributions to maternal and neonatal outcomes [14]. Pregnancy is not the right time for losing weight. Therefore, to encourage those women with higher BMI to lose weight preconception and become pregnant when they reached a suitable weight is very important in terms of prevention of potential problems. Furthermore, it is also important to both initiate pregnancy in a planned manner in the preconceptional period and make regular weight checks during pregnancy. The weight gain recommended during pregnancy should be determined at the beginning of follow-up, pregnant women should be informing of the nourishment and if necessary they should be referred to a dietitian. Co-operation with endocrinologists should be done for obese pregnancies with diabetes. Women must be training about nourishment, exercise and weight control during preconception and pregnancy. Since there are few studies carried out on the BMI at the preconception period, weight gain during pregnancy and complications in Turkey, more prospective studies are needed.

## References

1. Tsigos C, Hainer V, Basdevant A, Finer N, Fried M, et al. (2008) Management of obesity in adults: European Clinical Practice Guidelines. *Obesity Facts* 1: 106-116.
2. Tsoi E, Shaikh H, Robinson S, Teoh TG (2010) Obesity in pregnancy: A major healthcare issue. *Postgrad Med J* 86: 617-23.
3. Shaikh H, Robinson S, Teoh TG (2010) Management of maternal obesity prior to and during pregnancy. *Semin Fetal Neonatal Med* 15: 77-82.
4. World Health Organization (2013) Obesity and overweight. WHO fact sheet No 311.
5. The Organisation for Economic Cooperation and Development (OECD). *OECD Health Statistics* 2017.
6. World Health Organization (2015) Obesity and overweight.
7. Turkey Statistical Institute (TUİK) (2015) *Türkiye Sağlık Araştırması*, 2014.
8. Gundogan K, Bayram F, Gedik V, Kaya A, Karaman A, et al. (2013) Metabolic syndrome prevalence according to ATP III and IDF criteria and related factors in Turkish adults *Arch Med Sci* 9: 243-53.
9. Sonmez A, Bayram F, Barcin C, Ozsan M, Kaya A, et al. (2013) Waist circumference cutoff points to predict obesity, metabolic syndrome, and cardiovascular risk in Turkish adults. *Int J Endocrinol* 2013: 767202.
10. Ata KK, Şahin NH (2015) Gebelik Öncesi Beden Kitle İndeksinin Perinatal ve Neonatal Sonuçlara Etkisi. *Zeynep Kamil Tıp Bülteni* 46: 112-7.

11. American College of Obstetricians and Gynecologists (ACOG) (2013) Weight gain during pregnancy. Committee Opinion No. 548. *Obstet Gynecol* 121: 210-2.
12. Rasmussen KM, Yaktine AL (2009) Weight gain during pregnancy: reexamining the guidelines. Washington DC: National Academy Press.
13. Mamun AA, Callaway LK, O'calleghan MJ, Williams GM, Najman JM, et al. (2011) Associations of maternal prepregnancy obesity and excess pregnancy weight gains with adverse pregnancy outcomes and length of hospital stay. *BMC Pregnancy Childbirth* 11: 62.
14. Munim S, Maheen H (2012) Association of Gestational Weight Gain and Pre-Pregnancy Body Mass Index with Adverse Pregnancy Outcome. *J Coll Physicians Surg Pak* 22: 694-8.
15. Papachatzis E, Paparrodopoulos S, Papadopoulos V, Dimitriou G, Vantarakis A (2016) Pre-pregnancy maternal obesity in Greece: A case-control analysis. *Early Hum Dev* 93: 57-61.
16. Ding XX, Xu SJ, Hao JH, Huang K, Su PY, et al. (2016) Maternal pre-pregnancy BMI and adverse pregnancy outcomes among Chinese women: Results from the C-ABCS. *J Obstet Gynaecol.* 36: 328-32.
17. Reiss K, Breckenkamp J, Borde T, Brenne S, David M, et al. (2015) Contribution of overweight and obesity to adverse pregnancy outcomes among immigrant and non-immigrant women in Berlin, Germany. *Eur J Public Health* 25: 839-44.
18. Yanikkerem E, Mutlu S (2012) Maternal Obezitenin Sonuçları ve Önleme Stratejileri [Maternal Obesity: Consequences and Prevention Strategies]. *TAF Prev Med Bull* 11: 353-64.
19. Blencowe H, Cousens S, Oestergaard MZ, Chou D, Moller AB, et al. (2012) National, regional, and worldwide estimates of preterm birth rates in the year 2010 with time trends since 1990 for selected countries: a systematic analysis and implications.. *Lancet* 379: 2162-72.
20. Goldenberg MD (2002) The management of preterm labor. *Obstet Gynecol* 100: 1020-37.
21. Onat T, Abalı R, Turgut NE, Çelik S, Boran AB, et al. (2014) 10-15 ve 20-25 Haftalarda Ölçülen Servikal Uzunluğunun Preterm Doğumu Öngörmedeki Yeri. *İstanbul Med J* 15: 35-9.
22. Kamalak Z, Simavlı S, Duvarlı İC, Turhan NÖ (2011) Preterm Eylem Yönetimi. *Yeni Tıp Dergisi* 28: 13-6.
23. American College of Obstetricians and Gynecologists (ACOG) (2015) Obesity in pregnancy. ACOG Practice Bulletin No. 156. *Obstet Gynecol* 126: e112-22
24. Ekin A, Gezer C, Eftal C, Solmaz TU, Özeren M (2017) Gebelik Öncesi Vücut Kitle İndeksinin Perinatal Sonuçlara Etkisi [Effect of body mass index before pregnancy on perinatal outcomes]. *Bakırköy Tıp Dergisi* 13: 20-5.
25. Arora CP, Kacerovsky M, Zinner B, Ertl T, Ceausu I, et al. (2015) Disparities and relative risk ratio of preterm birth in six Central and Eastern European centers. *Croat Med J* 56: 119-27.
26. Wise LA, Palmer JR, Heffner LJ, Rosenberg L (2010) Prepregnancy body size, gestational weight gain, and risk of preterm birth in African-American women. *Epidemiology* 2: 243-52.
27. Zhang DD, Tan DX, Wang B, Cai XN, Zhou AF, et al. (2016) Association between gestational weight gain and preterm birth: a retrospective epidemiological analysis in Wuhan. *Chinese J Epidemiol* 37: 1012-6.
28. Abrams, B, Altman, SL, Pickett, KE (2007) Pregnancy weight gain: still controversial. *Am J Clin Nutr* 71: 1233-41.
29. McGuire W, Dyson L, Renfrew M (2010) Maternal obesity: consequences for children, challenges for clinicians and carers. *Semin Fetal Neonatal Med* 15: 108-12.
30. Farley DM, Choi J, Dudley DJ, Li C, Jenkins SL, et al. (2010) Placental amino acid transport and placental leptin resistance in pregnancies complicated by maternal obesity. *Placenta* 31: 718-24.
31. Salihu HM, Mbah AK, Alio AP, Clayton HB, Lynch O (2009) Low pre-pregnancy body mass index and risk of medically indicated versus spontaneous preterm singleton birth. *Eur J Obstet Gynecol Reprod Biol* 1: 119-23.
32. Faucher MA, Hastings-Tolsma M, Song JJ, Willoughby DS, Bader SG (2016) Gestational weight gain and preterm birth in obese women: a systematic review and meta-analysis. *BJOG* 123: 199-206.
33. Goldstein RF, Abell SK, Ranasinha S, Misso M, Boyle JA, et al. (2017) Association of Gestational Weight Gain With Maternal and Infant Outcomes: A Systematic Review and Meta-analysis. *JAMA* 317: 2207-25.
34. Leonard SA, Petito LC, Stephansson O, Hutcheon JA, Bodnar LM, et al. (2017) Weight gain during pregnancy and the black-white disparity in preterm birth. *Ann Epidemiol* 27: 323-8.
35. Vivatkusol Y, Thavaramara T, Phaloprakarn C (2017) Inappropriate gestational weight gain among teenage pregnancies: prevalence and pregnancy outcomes. *Int J Womens Health* 9: 347-52.
36. Kaimura M, Oda M, Mitsubuchi H, Ohba T, Katoh T (2017) Participant Characteristics in the Kumamoto University Regional Center of Japan Environment and Children's Study (JECS): Association of Pregnancy Outcomes with Pregestational Maternal Body Mass Index and Maternal Weight Gain during Pregnancy. *Nihon Eiseigaku Zasshi* 72: 128-34.
37. Huang A, Ji Z, Zhao W, Hu H, Yang Q, et al. (2016) Rate of gestational weight gain and preterm birth in relation to prepregnancy body mass indices and trimester: a follow-up study in China. *Reprod Health* 13: 93.
38. Hannaford KE, Tuuli MG, Odibo L, Macones GA, Odibo AO (2017) Gestational Weight Gain: Association with Adverse Pregnancy Outcomes. *Am J Perinatol* 34: 147-54.
39. Enomoto K, Aoki S, Toma R, Fujiwara K, Sakamaki K, et al. (2016) Pregnancy Outcomes Based on Pre-Pregnancy Body Mass Index in Japanese Women. *PLoS One* 11: e0157081.
40. Djelantik AA, Kunst AE, van der Wal MF, Smit HA, Vrijkotte TG (2012) Contribution of overweight and obesity to the occurrence of adverse pregnancy outcomes in a multi-ethnic cohort: population attributive fractions for Amsterdam. *BJOG* 119: 283-90.
41. Lucovnik M, Blickstein I, Verdenik I, Trojner-Bregar A, Tu N (2015) Maternal obesity in singleton versus twin gestations: a population-based matched case-control study. *J Matern Fetal Neonatal Med* 28: 623-5.
42. Masho SW, Bishop DL, Munn M (2013) Pre-pregnancy BMI and weight gain: where is the tipping point for preterm birth?. *BMC Pregnancy Childbirth* 13: 120.
43. Gibbs RS., Karlan BY, Haney AF, Nygaard I (2008) Danforth's obstetrics and gynecology. Philadelphia: Lippincott Williams and Wilkins, 171.
44. Salihu H, Mbah AK, Alio AP, Kornosky JL, Whiteman VE, et al. (2010) Nulliparity and preterm birth in the era of obesity epidemic. *J Matern Fetal Neonatal Med* 23: 1444-50.
45. Honest H, Bachmann LM, Ngai C, Gupta JK, Kleijnen J, et al. (2005) The accuracy of maternal anthropometry measurements as predictors for spontaneous preterm birth a systematic review. *Eur J Obstet Gynecol Reprod Biol* 1: 11-20.

46. Sharifzadeh F, Kashanian M, Jouhari S, Sheikhsari N (2015) Relationship between pre-pregnancy maternal BMI with spontaneous preterm delivery and birth weight. J Obstet Gynaecol 35: 354-7.
47. Kosa JL, Guendelman S, Pearl M, Graham S, Abrams B, et al. (2011) The Association Between Pre-pregnancy BMI and Preterm Delivery in a Diverse Southern California Population of Working Women. Matern Child Health J 15: 772-81.
48. de Jongh BE, Paul DA, Hoffman M, Locke R (2014) Effects of Pre-pregnancy Obesity, Race/Ethnicity and Prematurity. Matern Child Health J 18: 511-17.

Submit your next manuscript to Annex Publishers and benefit from:

- ▶ Easy online submission process
- ▶ Rapid peer review process
- ▶ Online article availability soon after acceptance for Publication
- ▶ Open access: articles available free online
- ▶ More accessibility of the articles to the readers/researchers within the field
- ▶ Better discount on subsequent article submission

Submit your manuscript at

<http://www.annexpublishers.com/paper-submission.php>