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Association Between Maternal Nutritional Status of Pre Pregnancy, Gestational Weight Gain and Preterm Birth

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ABSTRACT

Introduction: Maternal nutritional status of pre pregnancy and gestational weight gain affects the preterm birth. The association between maternal nutritional status of pre pregnancy and preterm birth appears to be complex and varied by studies from different countries, thus this association between the gestational weight gain and preterm birth is more consolidated. **Objective:** The study aims to determine any association between the pre pregnancy maternal nutritional status, gestational weight gain and the preterm birth rate in the Albanian context. **Method and materials:** In case control study, we analyzed women who have delivered in obstetric institutions in Tirana during the year 2012. Body mass index and gestational weight gain of 150 women who had a preterm delivery were compared with those of 150 matched control women who had a normal delivery regarding the gestation age. The self-reported pre pregnancy weight, height, gestational weight gain, age, education and parity are collected through a structured questioner. The body mass index and gestational weight gain are categorized based on the Institute of Medicine recommendation. The multiple logistic regression is used to measure the association between the nutritional status of pre pregnancy and gestational weight gain and the preterm birth rate. **Results:** The women which have a underweight status or obese of pre pregnancy are more likely to have a preterm birth compared to the women of a normal pre-pregnancy nutritional status (respectively OR =2.7 and 4.3 p<0.05). Women who do not reach the recommended gestational weight gain are more likely to have a preterm birth compared to the women which reach this weight (OR=1.8 p< 0.05). **Discussion:** Maternal nutritional status and gestational weight gain affects the risk for preterm birth. Pre-pregnancy and gestation nutritional assessments should be part of routine prenatal visits.

Key words: pre pregnancy, nutritional status, weight gain, preterm birth.

1. INTRODUCTION

Maternal nutritional status before and during pregnancy is important for health and quality of life in women and their growing fetus. A normal growth and development fetus, result of a normal pregnancy, depend on several factors. One of the factors is maternal nutritional status before and during gestation which is related to appropriate transport of metabolic substrates to enable the supply with fully required energy the growing fetus. Disorder of this equilibrium affects the pregnancy outcome in different way (1, 2, 3).

The association between pre pregnancy nutritional status and preterm birth appears to be complex and varied by studies from different countries. While preterm birth has been consistently associated with underweight of pre-pregnancy (4, 5, 6, 7, 8, 9), the association of preterm birth with overweight or obesity is still inconsistent and sometimes is conflicting. Although some studies suggest that obesity does not influence the rate of preterm birth (4, 5), other studies have found an increased rates of

preterm birth among obese women (6, 7, 8). In addition, a systematic review and meta-analysis indicated that overweight and obese women have increased risks of preterm birth overall (9).

Regarding the gestational weight gain impact on the preterm birth rate, the weight gain within the range recommendation by Institute of Medicine (IOM) is associated with the best outcomes for both mothers and infant (10). An abnormal weight gain during pregnancy is associated with higher risk for adverse outcome of pregnancy such as low birth weight, preterm birth or caesarian delivery (7, 11, 12, 13). However, studies has shown that gestational weight gain should not considered as a perfect diagnostic or screening tools because the pregnancy outcome are multifactorial in origin (14).

The influence of pre-pregnancy maternal nutritional status on preterm birth rate among Albanian women remains to be elucidated. Thus, the aim of the study is to determine any association of pre pregnancy maternal nutritional status and gestational weight gain on the preterm birth rate in the Albanian context.

2. MATERIALS AND METHODS

The study has been design as a case control study. The setting of the study was the obstetrical hospitals in Tirana and the study has been carried out during the 2012. In the study were included 300 women which has had a delivery in these hospitals Women who had a preterm delivery (150 subject -case group) were matched with women (150 subject control group) who had a normal delivery regarding the gestational age. The subject with twin gestation and history of gestational diabetes were excluded from the study.

The research protocol was approved by the Albanian National Research and Ethics Committee. Each of the participant provided informed consent. The information on self-reported weight and height of pre pregnancy, gestational weight gain, age and education, parity are collected through the structured questioner with women. Several studies have shown that recall weight and height of pre pregnancy weight reflects actual weight in women (15, 16).

As a preterm birth was estimated as birth of gestational less than 37 week where the beginning of birth is considered the first day of the last menstruation (17).

Pre pregnancy nutritional status was defined and categorized using body mass index [BMI = weight (kg)/height (m²)], according to the Institute of Medicine (IOM) (10) criteria: underweight < 19.8, 19.8-26.0 -normal weight. 26.0- 29.0 -overweight and more than 29 -obese; gestational weight gain was estimated by subtracting the pre pregnancy weight from the last weight before the delivery (performed in the hospital during the admission). The recommended gestational weight gain for each nutritional status is given in Table 1.

BMI level	Recommended weight gain (in Kg)
<19.8	12.5-18
19.8-26	11.5-16
26-29	7-11.5
>29	>7

Table 1. Recommended range of total weight for pregnant women by prepregnancy body mass index (from the IOM 1990)

The gestational weight gain in relation to pre-pregnancy weight was divided in two groups of normal and abnormal based on the recommendation of IOM (10). Accordingly, the normal is defined as weight gain within the suggested gain and abnormal one as above or below the recommendation.

The data are analyzed in SPSS 16. The adjusted odds ratios for the preterm birth was determined by multiple logistic regression models, while controlling for the maternal age, parity and education. A probability value of $p < 0.05$ was considered statistically significant.

3. RESULTS

A total of 300 women participated in the study with a mean age of 27.6 ± 5.2 years. Of those, only 1.2 % was under age of 18 and 10.7 were over 35 years old. Based on the IOM recommended, the majority of the women has a normal BMI of prepregnancy (55.3 percent) and almost 1 in 4 women is underweight. The majority of women were nulliparous (56.5 %). Further demographic information is listed on Table 2.

The gestational age mean were $36.75 \text{ week} \pm 3.6$ week. The

BMI	Frequency %	Mean
		22.6 $\pm$ 3.8
<19.8	26.9	
19.8-26	55.3	
26-29	11.9	
>29	5.9	
Age group		27.6 $\pm$ 5.2 year
< 19	1.2	
19-34	88.1	
>35	10.7	
Parity		
nulliparous	56.5	
multiparous	43.5	
Education		
no education/primary school	5.1	
primary 8 years	39.5	
high school	29.6	
university +	25.7	
Weight gain		12.3 $\pm$ 4.3kg
normal	36.5	
abnormal	63.5	
university +	25.4	26.0

Table 2. Characteristic of women included on the study

lowest gestational age was 28 week and the longest gestational age is 42 week.

The overall gestational weight gain mean was 12.4 ± 4.3 kg meanwhile the weight gain mean in four pre pregnancy BMI groups (< 19.8 , 19.8 -26, 26-29, > 30) were respectively 12.7 ± 4.8 kg, 12.5 ± 4.2 kg, 11.7 ± 3.2 kg and 11.4 ± 3.7 kg . Only 36 % of the pregnant women reached the IOM recommendation on the gestational weight gain.

As it is shown in Table 3, the percentage of abnormal gestational weight gain is higher among women who give a preterm birth, compared with women of control group (70.5 versus 50.3 percent). In addition, the percentage of women of underweight nutritional status (with a BMI lower than 19.8) is higher among the women of the case group compared to the women of control group (35.2 versus 19.1 percent) and the percentage of normal nutritional status (pre pregnancy BMI 19.8-26) among the case group is lower compared to the control group of women (44.3 versus 65.6 percent). Further data on parity, age and education divided by the group is given in Table 3.

We further utilized the multiple logistic regression to estimate the association between nutritional status of pre pregnancy and gestational weight gain and the risk for preterm birth while controlling for the effect of potentially confounding variable (age, education and parity). A clear and significant relationship were seen between the abnormal gestational weight gain and preterm birth [OR = 1.8 CI: (1.1- 3) $p < 0.05$]. In addition, women with a normal BMI have less likely to have a preterm birth [OR = 0.4 CI: (0.25-0.69) $p < 0.01$] compared to other range of BMI and the women belong to the underweight group are

more likely to have a preterm birth [OR =2.7 CI: (1.3 4.1) $p < 0.001$] compared to normal weight women. The obese women (BMI > 30) are 4 time more in risk to have preterm birth compared to normal weigh women [OR =4.3 CI: (1.3 14.4) $p < 0.05$]. Thus, the overweight women do not have any increased risk or lower risk for preterm birth compared to the women with a normal nutritional status.

4. DISCUSSION

In our best knowledge, this is the first study to explore any association between nutritional status of pre-pregnancy and gestational weight gain and preterm birth rate in the Albanian context. Even more than half of the women have a normal nutritional status pre-pregnancy, most of them (63 percent) do not reach the recommended weight gain during pregnancy. Among women who have a under nutrition status before pregnancy, only 28 % of them reach the recommended gestational weight. The nutritional status of women before pregnancy (measured through the BMI index) seems to be a predictive factor on the adverse outcome of pregnancy, in our case the preterm birth. Underweight women or obese women (BMI pre pregnancy < 19.8 or a BMI pre pregnancy >30) increased the risk for preterm birth more than 2-4 times which place the nutritional status among the potential predictors on the preterm birth rate. A normal nutritional status of pre-pregnancy should consider a protector factor on preterm birth rate. These findings are consistent with the finding of other studies (6, 7, 8, 18). In addition, the gestational weight gain affects the risk for preterm birth. An abnormal gestational weight gain (less or above the recommendation of IOM) increases the risk for preterm birth with 2 times. A women with a poor nutritional status during pregnancy is higher risk on preterm birth and this relation has been previously illustrated by other studies (7, 19, 20).

5. CONCLUSION

The nutritional status of pre pregnancy and gestational weight gain can determine the preterm birth rate among the Albania women. These findings place the maternal nutritional status of pre pregnancy and gestational weight as potential predictors of preterm birth. Pre-pregnancy and gestation nutritional assessments should be part of routine prenatal visits.

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	frequency %	mean	frequency %	mean
	preterm		term	
BMI level				
<19.8	35.2		19.1	
19.8-26	44.3		65.6	
26-29	11.5		12.2	
>29	9.0		3.1	
Weight gain		11.3 ± 4.7 kg		13.3 ± 3.7kg
normal	29.5		42.7	
abnormal	70.5		52.3	
Age		27.9 ± 5.4 year		27.4± 4.9 year
< 19	4.1		3.1	
19-34	82.8		88.5	
>35	13.1		8.4	
Parity				
nulliparous	61.5		52.0	
multiparous	38.5		48.0	
Education				
no education/ primary school	4.1		6.1	
primary 8 years	43.4		35.9	
high school	27.0		32.1	
university +	25.4		26.0	

Table 3. BMI and weight gain based on the type of labor

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