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INFLUENCE OF BODY MASS INDEX ON THE INCIDENCE OF PRETERM LABOUR

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Abstract

Nutritional status of the women has been considered as an important prognostic indicator of pregnancy outcome and risk of preterm birth. Few studies have evaluated the patterns of body mass index in developing regions where malnutrition and poor weight gain as well as maternal obesity have significant influences on the pregnancy outcome. This study aims to show the effect of pregnancy body mass index on the incidence of preterm labour.

This is a prospective descriptive study of 200 women attended Basrah Maternity and Child Hospital who were diagnosed with preterm labour were recruited in the study. Patients were classified into categories that were based on their body mass index (BMI) according to the national institute of health guidelines. Rate of spontaneous preterm birth were determined.

Women with body mass index <19 kg/m2 had 34.5% of spontaneous preterm labour, with BMI 19-24.9 kg/m2 had 28.5% of spontaneous preterm labour, while those with BMI 25-29.9 kg/m2 had 21% of spontaneous preterm labour, women with BMI 30-34.9 kg/m2 had 14% of spontaneous preterm labour and with BMI >/35kg/m2 had 2%of spontaneous preterm labour. Risk of spontaneous preterm labour tend to progressively decrease with increasing body mass index.

Thinner women who have preterm delivery tend to deliver at earlier gestational age than women who were obese 42.3% of non obese women deliver before 30 weeks of gestation compared to 25% of the obese, 44% of non obese deliver at gestational age 30-40 weeks compared to 28.25 of the obese.

In conclusion, high body mass index is associated with a lower rate of spontaneous preterm birth.

Introduction

Pre-term labour is an important problem associated with a high perinatal mortality and morbidity. It can be defined as delivery of a baby before 37 completed weeks of pregnancy[1]. incidence of preterm birth in developed world is between 7 and 12%, there has been a small gradual rise in the incidence of preterm birth associated with assisted reproduction causing multiple pregnancy and an increased tendency to obstetric intervention[2].

Body mass index (BMI): is determined by weight in (kg) divided by height (in meter squared)[3]. It is designed for men and women between the age of 18-65 years. A healthy BMI score is between 18.5-26. A score below 18.5 indicate under weight , a value above 26 indicate overweight[4].

The nature of association between BMI and preterm delivery is complex and remain undetermined. Although pregnancy BMI is affected by genetic as well as nutritional components. A low BMI might be a general marker for minimal tissue nutrition reserves[3].

Additionally women with a low BMI might have a less capacity for fluid expansion during pregnancy. Pregnancy

weight gain is multifaceted include increase in maternal fat and nutrient stores, growth of breasts and uterine tissue, increase in plasma volume and weight gain directly resulting from the product of conception[3].

Thus the relation between pregnancy weight gain and preterm delivery could be explained by direct or indirect factor include energy and nutrient intake, physical activity, maternal pregnancy complication that might influence fluid retention and weight gain, such as hypertension and diabetes; or the contribution of fetal growth and weight to the total pregnancy weight gain[5].

There are several hypotheses regarding the mechanism by which pregnancy weight gain related to preterm delivery. One of these hypothesis assessment of preterm aetiology and medical complication that might affect pregnancy weight gain, including diabetes, hypertension, and polyhydramnios. Gestational diabetes generally has been associated with lower pregnancy weight gain[5,6].

Hypertension also has been related to low and high pregnancy weight gain[7]. Pre-existing diabetes has been associated with high pregnancy gain[8]. Polyhydramnios also might lead to pregnancy weight gain after excluding women with one of the mentioned complication. Association originally found between low pregnancy weight gain and preterm delivery persisted, thus low pregnancy weight gain does not appear to be merely a marker for those complications. Maternal anemia particularly that caused by iron deficiency, has been associated with preterm delivery[9,10]. Excluding pregnancies complicated by that condition did not affected our finding substantially, in the fully excluded sample, the association between low pregnancy weight gain and the preterm delivery appeared to be even strong.

The role of maternal nutrition in the causal pathway for preterm delivery requires further considerations. Frentzen et al found increase ketonurea, possible indicator of recent nutrient deficiency, among women presenting with preterm contraction at 32 weeks compared with control subjects[11].

A biological plausible point of convergence at which BMI might influence the risk of preterm birth is immunity and inflammation[12]. They noted that concomitant presence of elevated vaginal (pH) and neutrophil in the vagina in early pregnancy is associated with an increase frequency of early preterm labour[13].

Low BMI increase the risk of high neutrophil and high vaginal (pH) which leads to increase risk of preterm labour. Nutritional education may be effective on improving weight gain during pregnancy. Special attention should be paid to women with low pregnancy BMI and abnormal weight gain as well as illiterate women who are at higher risk of weight gain[14].

Several studies have indicate that preterm delivery rate is higher among those who have low BMI. They reported that cervical length measurements are higher in those women with high BMI and they have lower incidence of preterm delivery and concluded that maternal obesity has protective action on preterm incidence and they report that mean cervical length in women with low BMI significantly lower compared to subject with normal or high BMI[13,14]. Cervical length of women with BMI of more than 23kg/m2 was longer than these with BMI of 23kg/m2 or less[15].

This study aims to evaluate the relationship between pregnancy maternal body mass index and preterm birth.

Material and methods

This is a prospective descriptive study carried out over a period of 12 months extended from first of June 2007 to the first of June 2008 in Basrah Maternity and child Hospital involving a total of 200 pregnant women attend the labour ward with spontaneous preterm Labour i.e. labour occurred between 28 to 37 weeks of gestation.

Gestational age was based on the last menstrual period, if the last menstrual and the earliest ultrasound evaluation agreed within 10 days. If not the earliest ultrasound scan was used to define gestational age.

On admission a detailed history and thorough general, abdominal and pelvic examination was done for each women with spontaneous preterm labour.

Investigations in form of hemoglobin, blood sugar and general urine assessment was done to exclude anemia, diabetes and urinary infection.

Exclusion criteria included:

Multiple pregnancy, obvious Congenital fetal abnormality confirmed by ultrasound examination, Placenta preavia and placental abruption, a history of cervical cerclage in the current pregnancy, polyhydramnios and oligohydraminos, intra uterine death, a history of medical illness such as hypertension, diabetes Mellitus and chronic or acute renal disease which my influence gestational age at delivery. Body Mass index (BMI) was estimated for each lady (Weight in Kilograms / height in meter square).

Women were classified into groups according to the National institute of Health guidelines[16]:

1. under weight BMI, < 19 Kg/m2.
2. Normal weight BMI, 19–24 .9 Kg/ m2.
3. Over weight BMI, 25 – 29 .9 Kg/ m2.
4. Class I obesity BMI, 30 – 34 .9 kg/ m2.
5. Class II Obesity BMI, > 35 kg / m2.

The Demographic distribution of women involved in this study in relation to preterm labour was studied including age, parity, educational level and history of previous spontaneous preterm labour.

Statistical analysis were performed with SPSS (statistical package for social sciences). Category variables were compared with the use of the chi-squared tests. Multiple regression analysis system was used to assess the relationship between preterm birth and maternal body mass index, while being controlled for potent confounders ex.(age, parity, educational level and previous spontaneous preterm birth).

Results

Table I, shows the distribution of patients according to demographic factors. A total of 200 pregnant women with preterm labour participated in the study, of these patients 25 (12.5%) were less than 20 years, 106 (53%) were between 20-40 years and 69 (34.5%) were more than 40 years.104 (52%) were multiparous and 96(48%) were nulliparous.

In total 62 (31%) had no education, 111 (55.5%) had less than high school education and only 27 (13.5%) had finished high school or university. The majority of women with preterm labour had previous history of such condition (78.5) compared to (21.5%) who had no such a history. When the patients body mass index were classified into groups according to the National Institute Of Health Guidelines. The risk of preterm labour tend to progressively decrease with increasing body mass index, under weight (34.5%), normal weight (28.5%) over weight (21%), class I obesity (14%), class II or morbid obesity (2%) P value <0.05 as table II shows.

Table III shows the rate of spontaneous preterm labour was higher and at earlier gestational age in non obese women compared to obese, the incidence of preterm labour in non obese versus obese in gestational age <30 weeks was (42.3% versus 25%, p<0.05), while in those with gestational age 30-34weeks (44% versus 28.2%, p<0.05) and (13.7% versus 46.8%) in gestational age more than 35 weeks but this result was not significant p>0.05 which may indicate that the association between BMI and incidence of spontaneous preterm labour tend to be less significant with advancement of gestational age.

Table I: Patients characteristics

Patients characteristic	NO	%
Age		
<20 year old	25	12.5
20-40	106	53
>40	69	34.5
total	200	100%
parity		
nulliparous	96	48
multiparous	104	52
total	200	100%
Education		
Illiterate	62	31
Less than high school	111	55.5
More than high school	27	13.5
total	200	100%
History of previous preterm labour		
yes	43	21.5
no	157	78.5
total	200	100%

Table II: The relation of BMI to the spontaneous preterm birth

Body mass index	Spontaneous Preterm Births	
	No.	%
<19 kg/m2	69	34.5
19-24.9 kg/m2	57	28.5
25-29.9 kg/m2	42	21
30-34.9 kg/m2	28	14
>/35 kg/m2	4	2
Total	200	100%

Table III: Relation of BMI and gestational age at delivery

Gestational age	Non obese BMI 19 - 30kg/m2		Obese BMI>/30kg/m2		P.value
	No.	%	No	%	
28-30 weeks	71	42.3%	8	25%	<0.05(significant)
31-34weeks	74	44%	9	28.2%	<0.05(significant)
35-37weeks	23	13.7%	15	46.8%	>0.05(not significant)
TOTAL	168	100%	32	100%	

Discussion

The incidence of preterm births has remained almost constant in spite of advances in obstetric neonatal risk scoring systems, tools to predict preterm labour and use of variety of tocolytic agents. Prematurity account for high perinatal mortality rate and demand large resources, technical and non technical. One of the most significant challenge for obstetrician treating the pregnant woman, continue. to be diagnosis and prevention of preterm labour[14]. Our study shows that maternal thinness was associated with increase spontaneous preterm birth, these results were similar to many studies who have found an association between low body mass index and an increased risk of preterm labour. Ehrenberg et al[17] recently describe a population of 15.196 patients in which low body mass index (<19.8 kg /m2) at the time of birth were associated with an increased risk of spontaneous preterm birth using a multivariable analysis. In a population of 17,ooo patients, Wen et al[18] showed that a previous preterm delivery and very low maternal weight had the greatest association with preterm birth. Thus, because low maternal weight is associated with an increased rate of spontaneous preterm birth, there may be a continuous inverse association between body mass index and risk of spontaneous preterm birth.

In our study thinner women who have preterm delivery tend to deliver at early gestational age than women who were obese, in agreement with our results, Sebire et al[19] found that obese gravidas had a reduced risk for preterm birth at <32 weeks of gestation but, not at <37 weeks of gestation. Nattingius et al[20] on the other hand found an increased risk for spontaneous preterm birth at 32 or more weeks of gestation in obese nulliparous.

Maternal obesity is known to be associated with an increased population of systemic pro-inflammatory cytokines[21]. Thus, the reduced rate of spontaneous preterm labour in obese population is not likely due to a reduced systemic inflammatory process. Some studies describe malnutrition as a factor in the cause of spontaneous preterm birth. Decreased intake of calories, protein, vitamins and minerals which often are associated with decreased body mass index may explain the higher rate of spontaneous preterm birth in thin patients. In obese women the increased intake of various nutrients may be related to a reduced rate of spontaneous preterm birth[22].

In summary we found a strong inverse association between pregnancy body mass index and spontaneous preterm birth. Further research is needed to investigate the different mechanisms that are responsible for spontaneous and indicated preterm birth in obese and non obese women.

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