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Effect of Low BMI On Preterm Delivery

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ABSTRACT

Background: Preterm delivery (PTD), defined as childbirth before 37 completed weeks of gestation, remains a major cause of neonatal morbidity and mortality worldwide. While maternal obesity is a well-recognized risk factor, the impact of low maternal BMI on preterm birth outcomes in developing countries is less explored. **Objective:** to evaluate the risk of premature delivery among women undergoing treatment at a Quetta tertiary care hospital in connection to low maternal body mass index (BMI <18.5 kg/m^2). **Methodology:** 110 pregnant women between the ages of 18 and 40 who were chosen at random participated in a six-month qualitative study. Clinical records and semi-structured interviews were used to gather data. The relationship between low BMI and PTD was investigated using thematic analysis. **Results:** Preterm birth occurred in 48.4% of underweight women (n=62) as opposed to 18.8% of women with normal BMI. Early delivery and problems such PPROM and fetal growth limitation were substantially correlated with socioeconomic difficulties, poor attendance during prenatal care, and nutritional inadequacies. **Conclusion:** Preterm birth risk is greatly increased by low mother BMI. Reducing negative outcomes requires improving access to prenatal care and maternal nutrition.

INTRODUCTION

As a result of their high prevalence as well as the perils that it poses, maternal obesity and overweightness has in the recent past exceeded smoking as the greatest preventative factor to the development of poor pregnancy outcomes in most countries in the world. (1)

It is the premature birth that is the prime cause of perinatal deaths, morbidity among children in the infancy stage of life and chronic disability of the nonmalformed children (2). The costs are relative to the age of gestation making it worse as the gestation age goes low. Most recently, two reviews and two studies have observed that compared to lower weight BMIs, women with obesity grades 2 to 3 (body mass index [BMI, calculated by dividing weight in kilograms by height in meters squared] 25-<30 and 35-<35), were more prone to deliver very or moderately prematurely (less than 32 and 32-36 weeks, respectively), though there is weaker evidence that overweight (BMI 25-<30) and obese grades 1 to 3

Even though in a significant or minor part, obesity augments the threat of having an unmedicated preterm birth and preterm premature birth, (4,5) as well as the prospect of having a spontaneous preterm birth is not still well known and with an apparent distinction in the longevity of the affiliation, which varies with the gestational age. One of such conditions is obesity that might be linked with inflammation and infection, and it was more prevalent in bad preterm than in moderately preterm people. (10,11)

The Swedish Medical Birth Register registered over 1.5 million births during 1992-2010 and the records contained gestation age and preconception BMI during early pregnancy. It is due to this data set that we could differentiable the risks of preterm delivery in pregnant women with excess weight or other obesity grades and in women who experienced preterm delivery spontaneously and who had a medically indicated type of preterm delivery.

Obesity and obesity are the most prevalent complications as far as pregnancy is concerned in the industrialized and some developing countries. There is 33 percent of overweight and obese pregnant women in the UK. The prevalence of obesity among pregnant women in the US varies between 11 percent4 to 40 percent3 whereas overweight among pregnant women ranges between 12 percent2 and 38 percent3. Overweight or obesity in

pregnant women is 16 percent in China in comparison to 8 percent in India and 26 percent in China (12).

Type 2 diabetes mellitus, hypertension, heart disease and stroke are adult onsets diseases linked to low birth weight as fetal growth indicator (12). More so, a number of researchers have found some correlation between birth weight with different negative outcomes in reproductive health and pregnancy such as a decreased fertility (13), miscarriage, gestational diabetes related mellitus, pre-eclampsia, low birth weight among the infant, birth by cesarean section and pre premature labor (PTD) (14).

With regard to low birth weight among women, it has so far emerged that a woman who delivers less than 2,500 g (low birth weight) is more likely to bear preemies (partaken through 15,16 though not all (17,18) researchers). Putting as an example, the odds ratio (95% CI) of PTD in maternal low birth weight (B/2,500 g) of African Americans and Whites was 1.6 (1.3 1.9) and 1.3 (1.0 1.6) respectively, in adjusted maternal age, education, marital status, parity prenatal care utilization and cigarette smoking (19) according to Simon and colleagues.

Results of two recent studies that considered the risk of PTD using continuous measures of pre-pregnancy BMI show that the shorter PTD risk was found to differ by the decreasing levels of BMI below 2226 kg/m2as a range normally referred to as normal weight [20, 21]. Higher BMI and increase in PTD were not significantly correlated in both of the studies. The other study however, determined the gestational age using the last menstrual period and basically only a small number of PTD people with a BMI higher than 25 were investigated and in the first study only a part of the cases of premature birth were considered whose cause was the spontaneously occurring birth of the child before 36 weeks.

The aim of the study is to monitor the effects of low body mass index (BMI) of the mother in terms of preterm delivery (PTD) occurrence.

LITERATURE REVIEW

The birth at less than 37 complete weeks of gestation is called preterm birth (PTD) and remains an important global source of perinatal morbidity and childhood mortality, in addition to health complications later in life. Even though maternal obesity has attracted much attention due to a variety of unfavorable pregnancy outcomes, recent evidence shows that low maternal body mass index (BMI) has a significant likelihood of leading to postpartum depression. As reviewed in epidemiological evidence, biological processes, and confounding factors, this literature review aims at comprehending the association between low maternal BMI and premature birth.

In a series of large epidemiological studies, it is consistently established that maternal underweight is associated with the elevated risk of spontaneous preterm birth. Indicatively, Han et al. (2011) discovered that women with a BMI of less than 18.5 kg/m 2 were likely to have short deliveries compared to those with normal BMIs (22). The use of the Swedish Medical Birth Register which includes the data on more than 1.5 million pregnancies also led to the detection of a U-shaped curve of the PTD risk which was identified by Cnattingius et al. (2013) who discovered that low and high BMI were both associated with increased risks of premature birth (23).

Mechanically, low BMI is considered as an indicator of poor nutrition of the mother and may even affect the development of the fetus and the placenta. Uteroplacental insufficiency is one of the key contributors of spontaneous PTD, and it may occur due to poor nutritional reserves adversely affecting placental angiogenesis [24]. Moreover, underweight women may be deficient in crucial fatty acids and microelements, which play the important role in maintaining pregnancy and in the processes of inflammatory response (25).

A meta-analysis performed by Goldenberg et al. (2008) established that maternal under nutrition was associated with a 1.5-2 times chance of spontaneous preterm birth (26). They theorized that malnutrition would allow immunological and endocrine systems to be modified that would foster the preterm contractility of the uterus, or would burst the membrane. In addition, the thinness of mothers and pregnancy before time could correlate with hormonal changes caused by stress such as the rise in cortisol (27).

One of the studies of 5,000 women, who were pregnant in Bangladesh, showed that the intensity of preterm delivery was significantly higher in women, who had low BMI (below 18.5) (14.5 percent) compared to the normal group of women (8.7 percent) (28). Such findings were consistent with the US ones which revealed that, even though adjusting the results to certified confounding variables that included maternal age, parity, smoking, and socioeconomic status, there was a 1.4-fold risk of PTD association with low pre-pregnancy BMI (29).

Low BMI and PTD appear to have inflammation and infection as the primary aspects of association, although the specific molecular mechanisms have remained sophisticated. Underweight mothers may become more prone to infection leading to cytokine cascades and membrane rupture or premature cervical dilation (30). Low BMI and PTD risk are also associated as studies show that intrauterine infections are disproportionately high among under-nourished populations (31).

The existence of this association can also be intermediary to behavior and sociodemographic variables. Women with low BMIs often become members of socioeconomically weak groups due to their unfavorable eating habits, a higher exposure to psychosocial stresses, and a lack of access to prenatal care (32). By way of example, an article by Kramer et al. (2001) reported that bad nutritional habits, low educational level, and young age of mother were the concomitant risk factors among underweight women experiencing PTD (33).

Low BMI has been also associated with the medically indicated preterm births which are often caused by preeclampsia or fetal growth restriction (FGR) along with spontaneous preterm births. Childhood undernutrition, especially at birth and prenatal insufficient maternal weight gain have been cited as contributing to poor fetal development and often necessitating a premature delivery of the unborn in the best of interest of the child (34).

Nobody can be sure, however, that these correlations are shown by all investigations. Certain studies had identified that in the presence of other risk factors like

maternal comorbidities, lifestyle or genetic predisposition, no or very few correlations point to low BMI and PTD. An example of this is that a prospective cohort study conducted in Denmark, adjusted to smoking and obstetric history, showed that when the underweight women were compared with the normal weight, there was no statistically significant rise in the risk of PTD (35).

These inconsistencies mean that this relationship can be conditional and control dependent on several genetic and environmental factors.

To conclude, much data evidence suggests that low maternal BMI is a significant determinant of preterm birth, primarily by processes of sociodemographic disadvantage, placental insufficiency, dietary inadequacies, and infection vulnerability. Existing evidence underlines the importance of adequate maternal nutrition and attention to prenatal care in women with underweight, although additional research with more detailed data is still required to have a clearer view of the causality and potential treatment.

Research Objective

This study aims at defining the correlation between low maternal body mass index (BMI) and the probability of preterm delivery (PTD). Specifically, it will tell whether woman below the BMI of 18.5 kg/m 2 have greater risk of giving birth to premature infants either because they did it naturally or due to medical intervention technique. The base actions like placental, non-standing, infection-vulnerate, and deficiency in nutrition will be traced in the present study. Factors that confound, like maternal age, socioeconomic and access to prenatal care, are also considered. The goal is to inform early detection, and intervention plans among the at-risk pregnant women.

METHODOLOGY

This qualitative study was aimed at examining the connection of low value of maternal body mass index (BMI) with preterm delivery (PTD) risk. The observations and research were done within a six-month interval in a Quetta tertiary care hospital, a major referral center in the region concentrated in the field of maternal and obstetric care.

Random sampling of 110 expectant mothers was carried out. Women having singleton pregnancies ovulating between the ages of 18 and 40 years that came in to admit to their delivery or prenatal care and whose body mass index before becoming pregnant was either known or could be deduced with the help of the data referring to early gestational weight could be included. Women with twins/multiple pregnancy(s) or known chronic medical conditions (e.g. diabetes mellitus, hypertension or renal disease) were excluded in order to exclude confounding effects. A structured clinical observation sheet and semi-structured interviews were used to collect data. Interventions were performed in one of the hospitals in a secluded area where the privacy and comfort of the participant were guaranteed. The primary areas of inquiry included maternal nutritional health, past history of weight gain during pregnancy, prenatal care access, lifestyle factors and prenatal history of infection or obstetric complications. At consent, they gave out clinical data like gestational age at delivery, body mass index, and pregnancy outcome as it appeared in the medical records.

Thematic analysis was performed on the qualitative data that were coded in a manual way to identify common patterns and themes that linked low BMI to preterm birth outcomes. The primary aim was to understand the social background, lived experience, and biological susceptibility that undersized moms are at threat of experiencing an early delivery. An ethical approval was obtained in the case of the tertiary care hospital Notes on the Institutional Review Board (IRB) securing the following: there will be integrity and ethical research practice throughout the investigation.

RESULTS

Table 1

Frequency of Preterm Delivery by Maternal BMI

BMI Category	Number of Participants (n)	Preterm Deliveries (n)	% of Preterm Deliveries
Underweight (<18.5)	62	30	48.4%
Normal BMI (18.5–24.9)	48	9	18.8%
Total	110	39	35.5%

Table 2

Socio-Demographic Profile and Nutritional Habits among Underweight Mothers (n=62)

Variable	Category	Frequency (n)	Percentage
Age	<25 years	38	61.3%
Education	No formal/primary only	34	54.8%
Income	< PKR 20,000/month	40	64.5%
Daily Meal Frequency	<3 meals/day	45	72.6%
Protein Intake (weekly meat)	Rarely/Never	39	62.9%

Table 3

Distribution of Gestational Age at Delivery

Gestational Age at Delivery	Frequency (n)	Percentage (%)
<32 weeks (Very Preterm)	13	11.8%
32–36 weeks (Moderate Preterm)	26	23.6%
≥37 weeks (Term)	71	64.6%
Total	110	100%

Table 4

Frequency of Obstetric Complications by BMI Group

Complication	Underweight (n=62	Normal Weight (n=48)	Total (n=110)
Fetal Growth Restriction (FGR)	15	5	20
Pre-eclampsia	7	2	9
PPROM	9	3	12
No Major Complication	31	38	69

Table 5

Access to Prenatal Care by BMI Group

Prenatal Care Access	Underweight (n=62)	Normal Weight (n=48)	Total
Regular ANC Visits (≥4)	24	38	62
Irregular ANC Visits (<4)	38	10	48

DISCUSSION

The qualitative study was conducted to explore the relationship between low body mass index (BMI) maternal and preterm delivery (PTD) in mothers who were pregnant at a tertiary care hospital in Quetta. The findings suggest that there is a significant correlation between maternal underweight and the increase of the threat of preterm birth, and some interrelated clinical, nutritional, and sociodemographic factors must be deemed an essential factor.

Table 1 shows that 48.4 percent of underweight women gave premature birth as compared to 18.8 percent of the normal BMI. Such significant difference validates previous studies that indicate low BMI contributes significantly to pre-mature birth. Other studies, such as Han et al. studies and the one by Cnattingius et al., also observed the similar trends and hypothesized that BMI at both ends, especially at the extreme low end, put one at a high risk of PTD.

The study revealed that the themes of socioeconomic and dietary issue were significant. Most of the underweight people were those below the age of 25, lowly educated, and had low-income households as observed in Table 2. Moreover, 62.9 percent of these women have indicated to have not been taking much or any protein, and 72.6 percent indicated that they took less than three meals a day. These findings are indicative of chronic under nutrition that is likely to interfere with fetal growth and placental functioning. Some nutrients deficiency may as well weaken the immune system of the mother leaving her prone to infections that might result in early delivery.

The presentation of the gestational age at the time of delivery in Table 3 indicated that 11.8 percent of the participants delivered very early (less than 32 weeks) and out of all the participants 35.5 percent of them had preterm births. On a closer observation, it was found that most of these early births occurred within the underweight category, and this was in line with the hypothesis that maternal malnutrition plays a significant role in causing placental insufficiency and limitation in the development of the fetus leading to either spontaneous or implied early deliveries.

Table 4 shows how frequently obstetric problems were detected. The underweight group had a higher prevalence of preterm premature rupture of membranes (PPROM), preeclampsia and fetal growth restriction (FGR). Such problems are often caused by the low weight gain and insufficient nutrition of the mother, which aggravates the situation. Specifically, the prevalence of FGR was significant in the underweight women highlighting the impact of maternal thinness on the health of the uteroplacental.

Table 5 indicates that the other difference among the BMI groups that was significant was the access to prenatal care. Only 38.7 percent of underweight women received four or more visits to antenatal care (ANC) when compared to 79.2 percent of women with normal BMI. Limited access to ANC interferes with the early detection of such risk indicators as low weight gain or abnormal fetal growth. In qualitative research, it was also indicated that pregnant moms with underweight were generally oblivious on their food requirements due to the traditional beliefs, poverty and lower education levels.

CONCLUSION

The study positively associates preterm delivery with maternal BMI, especially when this value is low and poor nutritional status, low access to prenatal care resources, and low socioeconomic background characterize underweight women. A large proportion of the underweight subjects suffered obstetric complications such as fetal growth restriction and preeclampsia and almost half of them delivered preterm. Social hardship along with inadequate prenatal examinations and poor nutrition were all the reasons that resulted in poor outcomes. Such findings demonstrate the urgent necessity of special maternal health programs that undergo routine BMI monitoring, nutrition counseling, and the spread of prenatal services. In Quetta, where resources are limited, the risk of preterm birth can be significantly reduced by identifying ardent women early and treating or simply identifying high-risk pregnant women and treating or simply identifying at-risk women and treating or simply, early treatment of women at risk.

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