

# The Impact of Maternal Weight With Fetal Outcome; A Cohort Study In An Underdeveloped Region Of Pakistan

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## Abstract

**Objective:** This study has been conducted to observe the association of maternal weight with fetal outcomes among women in an underdeveloped region of interior Sindh.

**Methods:** This was an observational study conducted at CMH Hospital Choor, from 1st November 2021 to 30th April 2022, on 84 pregnant women. All antenatal women as early as 16 weeks presented for antenatal visits, were included. Their BMI (body mass index) was calculated. Their increase in weight during pregnancy was noted. Any pre-existing medical complications (hypertension) antenatal or intrapartum complications (including Anemia, Preterm labour, IUGR, and fetal distress) were noted in the mother. The fetal APGAR score was calculated. The passage of meconium and, the need for NICU admission were noted.

**Results:** There is a positive but insignificant and weak correlation between maternal and birth weight using Pearson correlation analysis. The correlation between the above two variables is 0.069 which is positive but weak. It was found that there was a significant association between low maternal weight and NICU admission of the baby at delivery, p-value < 0.05. There were 33 cases (39%) with low maternal weight of 35-46kg and 51 (61%) cases with normal weight of 47-58 kg. There was only one case of meconium aspiration.

**Conclusion:** Women who had low BMI during the antenatal period were observed to be associated with increased morbidity and poor perinatal outcome of the fetus in terms of poor APGAR score, meconium staining and need for NICU admission.

**Keywords:** BMI, IUGR, preterm labour, meconium staining, APGAR score.

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## 1. Introduction

Gestational weight gain is necessary to ensure a healthy fetus, but excessive gestational weight gain has been associated with adverse outcomes. Obesity due to its rising trend is becoming a global epidemic worldwide.<sup>1,2,3</sup> Out of the world's population about 13 % (11 % of men and 15 % of women) were obese in 2014.<sup>2</sup> On the contrary prepregnancy BMI (body mass index) is an important factor that determines the fetomaternal outcome. In underweight pregnant women, there is an increased risk of fetal morbidity, IUGR (intrauterine growth restriction), SGA (small for gestational age) babies, preterm labour, maternal anaemia and infection.<sup>5,6,8,9</sup>

Globally underweight women are more prevalent among underdeveloped/low-resource countries as compared to developed nations. In the U.K. 3-4% of pregnant women are underweight while in South Asia and Africa, it increases to as high as 30% among women of reproductive age group.<sup>2,7</sup> Undernutrition during pregnancy negatively affects fetal growth. It has been observed that in the first two years of a

child's life under-nutrition can lead to about 800 000 neonatal and 400 000 infant deaths, and 20% of stunted growth as well as 20% of maternal mortalities at delivery.<sup>8</sup> The Sustainable Development Goals include nutrition as an essential component. The World Health Assembly also aims to reduce anaemia in women ages 15-49 years by 50% by 2025.

According to the National Nutritional Survey of Pakistan 2018,<sup>2</sup> the percentage of underweight married women (15-49 years) has increased from 6 % to 16.6 % (the highest being in Sindh)<sup>2</sup>. Malnutrition in the underweight population is more common in rural areas 31.6% than in urban areas (24%).<sup>2</sup> Pakistan is facing a dual burden of obesity on the one hand and malnutrition on the other hand. Approximately 36 % of women have a BMI lower than 18.5.<sup>2</sup> as per a national nutritional survey of Pakistan reported by UNICEF in 2018.<sup>2</sup>

Keeping in view the nutritional status of our females who are socially the second priority for nutritional provision at home, the impact of underweight pregnant females on fetal outcome becomes more pronounced. Several studies focus on overweight

women and related complications but a few studies have examined the association of low BMI in pregnancies with birth outcomes,<sup>5,6</sup> among women. There are variable causes of being underweight such as constitutional, malnutrition, eating disorders, malignancy, and uncontrolled hyperthyroidism.<sup>7</sup>

The goal of our study is to find out underweight pregnant females among the antenatal women visiting the OPD of an underdeveloped region of Sindh and observe the risk of having a negative pregnancy outcome in terms of maternal complications or fetal morbidity. The observations of this study may help in better understanding of association between maternal weight and fetomaternal complications. The estimates and prediction of fetal morbidities are needed for prenatal counselling; nutritional advice may alarm for extra antenatal attention on dietary improvement to avoid fetal and maternal complications. Understanding the burden of fetal complications due to complications of being underweight/ poor weight gain in pregnancy will help the health care providers to take timely interventions in terms of nutritional advice, better antenatal care and prediction of any fetal complications.

## 2. Materials & Methods

This was an observational cohort study, conducted in CMH Hospital Chor, Sindh, from 1<sup>st</sup> November 2021 to 30<sup>th</sup> April 2022 on 84 pregnant underweight women with BMI less than 19.9kg/m<sup>2</sup>.

All pregnant females with singleton pregnancy at or after 16 weeks of gestational age of BMI <19.9 Kg/m<sup>2</sup>, were included in the study. Patients with multiple gestation, major structural abnormality or any medical complications such as hypertension diabetes, or chronic malabsorption were excluded from the study.

All included patients were followed up in antenatal clinic /OPD. After getting ethical approval from the ethical committee hospital patients were recruited for the study. An informed consent was taken. The patients were selected and recruited according to inclusion criteria from 1<sup>st</sup> Nov 2021 to 30<sup>th</sup> April 2022 from the OPD department of CMH Chor Hospital Sindh. A detailed history was taken and a thorough physical examination was done on all included patients. These recruited patients were followed in the antenatal period following routine antenatal visits till delivery. On each visit, their weight was taken and noted. On each visit obstetric examination, a review of all investigations was recorded and any further laboratory investigations required were advised. All data variables i.e. Weight gain during pregnancy, anaemia, preterm labour, IUGR, and fetal distress were noted on

predesigned proforma. The same patients were observed at delivery and their fetal outcomes were noted. After delivery baby was observed for APGAR score, and meconium aspiration and the need for NICU admission was noted.

The sample size was calculated using a statistical calculator with a confidence level of 95%, a margin of error of 5%, and the sample size was 86. We included 84 cases in the study. Descriptive statistics were applied and calculated using SPSS version 21. Continuous variables were presented as the mean and standard deviation, while categorical data were calculated as percentages. Pearson correlation test was applied to examine the association between prepregnancy BMI and fetomaternal outcomes. A value of  $P < 0.05$  was considered statistically significant.

## 3. Results

Table 1 shows the relationship between maternal weight and birth weight. For this purpose, we used Pearson correlation analysis. The correlation between the above two variables is 0.069 which is positive but weak. Furthermore, the p-value shows that this correlation is also not significant. Hence there is an insignificant, positive and weak correlation between maternal and birth weight.

**Table 1: Association between maternal weight and birth weight**

Category	Test	Maternal weight	Birth weight
Maternal weight	Pearson Correlation	1	0.069
	P-value		0.561
Birth weight	Pearson Correlation	0.069	1
	P-value	0.561	

P-value < 0.05 considered as significant

Table 2 shows the distribution of maternal weight category variables and NICU admission. There were 33 cases with maternal weight of 35-46kg and 51 cases with 47-58kg. There were only five children for whom the maternal weights were 35-46kg required NICU admission. Table 2 also depicts the association between maternal weight and NICU admission. For this purpose, we used the chi-square test. It was found that there was a significant association between the maternal weight category variable and NICU admission p-value < 0.05.

Table 2 shows the distribution of maternal weight and meconium aspiration. There were 33 cases with maternal

weight of 35-46kg and 51 cases with 47-58kg. There was only one case of meconium aspiration.

**Table 2: Association between maternal weight and NICU Admission**

		NICU Admission		P-value
		No	Yes	
Maternal weight	35kg-46kg	28	5	0.008*
	47kg-58kg	51	0	

#### 4. Discussion

The nutritional state of the mother before & during pregnancy with adequate gestational weight gain contributes to better pregnancy outcomes in both mother and infants for short- and long-term health. This observational study was conducted in an underdeveloped region of Sindh, Pakistan to determine the association of fetal outcome among underweight pregnant females in terms of meconium aspiration, NICU admission and birth weight. There was no significant association between fetal weight and meconium aspiration in underweight mothers. However, there was a significant association with NICU admission of neonates.

In literature, some studies,<sup>4,5</sup> showed that although the fetal outcome is favourable however some unfavourable outcomes are less common in women of low BMI.<sup>4,5</sup> Studies have found that low body mass index (BMI) of the mother before pregnancy is associated with several adverse pregnancy outcomes including preterm birth (PTB), low birth weight and neonatal mortality.<sup>5,6</sup> In a study conducted on Asian American ethnic groups by Salihu et. Al,<sup>6</sup> it was concluded that maternal underweight carries adverse outcomes during pregnancy as well as after birth for the neonate.<sup>11</sup> Similarly in 2016, Knight Agarwal found the same results. Both of these studies are comparable to our present study of ours.<sup>5</sup> For pre-pregnancy underweight women, preterm birth and SGA incidences were significantly higher in those with weight gain of less than 0.3 kg/week according to a study conducted in 2021.<sup>11</sup> Another study shows the positive relationship between maternal underweight & SGA births with ethnicity ( i.e. among Asian Americans), supporting the need for interventions related to improving the adequate maternal weight during pregnancy. On the contrary, we didn't find any case of SGA among our study cases. The impact of underweight

women on maternal complications has been studied a lot which subsequently affects the fetal outcome.<sup>14</sup>

In our study admission of babies to NICU and low Apgar score at 5 minutes didn't have any significant relation with maternal BMI. In Salihu et al.'s study similar observations were made related to APGAR score and NICU admissions. Unlike Salihu et al.'s study <sup>6</sup>, we observed in our study that maternal BMI has no effect on birth weight as the correlation between maternal weight and fetal weight is 0.069 which positive but weak correlation. Furthermore, the p-value shows that this correlation is also not significant. Hence there is an insignificant, positive and weak correlation between maternal and birth weight.

Women with low BMI in pregnancy are a complex cohort population which carries serious pregnancy-related complications as well as post-natal complications.<sup>7</sup> These include preterm labour, hypertension, intrauterine growth restriction, low birth weight neonates and neonatal morbidities.<sup>7</sup> This study is comparable to our study where we observed these complications in our study population. Maternal low BMI with anaemia is associated with an increased risk of stillbirth, neonatal deaths and low birth weight. However, these risks are enhanced if anaemia and underweight are present simultaneously.<sup>8</sup>

Low BMI during pregnancy carries adverse side effects. Many studies done so far conclude the same results about low body mass index during pregnancy affecting the pregnancy adversely.<sup>9,10,11,12</sup> In contrast there are cohort studies available where no considerable adverse effects were noted among underweight pregnant females during pregnancy.<sup>4</sup> Socioeconomic status and nutritional status of pregnant females an important determining factors for pregnancy outcomes and neonatal morbidities. There was a weak correlation between maternal weight & birth weight, so was between maternal weight & meconium aspiration but a strong correlation between maternal weight & NICU admission was observed in our study. In a systematic review and meta-analyses, it was concluded that underweight women have higher risks of LBW than those born to women with normal weight.<sup>9,10,11,12,13</sup>

A limitation of this study follow-up of babies during the neonatal period was not possible because of poor compliance by patients, and as a result, some factors that may be related to their antenatal environment might be missed. Further research is needed on a large population of the Sindh Region to understand the factors related to

underweight pregnant women and subsequent fetal complications related to maternal weight.

## 5. Conclusion

Since maternal weight carries a strong influence on neonatal and maternal outcomes so appropriate and careful prenatal assessment, nutritional status improvement, growth scans and timely necessary intervention can prevent the morbidities related to the mother and neonate.

**CONFLICTS OF INTEREST-** None

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**Potential competing interests:** None to report

**Contributions:**

S.B.M - Conception of study

K.M, F.B - Experimentation/Study Conduction

N.M - Analysis/Interpretation/Discussion

S.N - Manuscript Writing

S.A.B - Critical Review

S.S - Facilitation and Material analysis

All authors approved the final version to be published & agreed to be accountable for all aspects of the work.

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