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Underweight In Pre-pregnancy: A Common But Overlooked Scenario.

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ABSTRACT

The incidence of underweight among women of reproductive age in South Asia is alarmingly elevated, leading to compromised immunity, infertility, and increased susceptibility to non-communicable diseases, while undernutrition during pregnancy adversely affects both neonatal and maternal health outcomes. An observational comparative study was conducted in the Obstetrics and Gynaecology department of the Government Medical College and Hospital located in South India. A convenience sampling method was employed. Two groups of antenatal women, one with underweight (<18.5 kg/m^2) and the other with normal weight (BMI 18.6-24.9 kg/m$^{2)}$ were followed up for the delivery and perinatal outcomes. A total of 100 antenatal women with 50 in each group of underweight and normal weight were included in the study, majority belongs to lower class (32%) and more than half of the study subjects (57%) had normal vaginal delivery. There was a significant association of underweight with mode of delivery, first stage of labour, and oligohydramnios. It is imperative to explore more about the underweight and its related effects on pregnancy outcomes.

Keywords: Pre-pregnancy, underweight, delivery outcomes, low body mass index

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INTRODUCTION

The World Health Organization (WHO) categorizes human body weight into various classifications as per body mass index (BMI). This BMI measurement is derived by taking an individual's weight in kilograms and dividing it by the square of their height in meters (kg m^2). Specifically, a body mass index (BMI) that is measured to be below the threshold of 18.5 kg/m^2 is officially designated as underweight, indicating a potential risk for health complications [1]. The persistent issue concerning the prevalence of underweight status among women of reproductive age continues to represent a significant public health challenge. Recent research has revealed that the prevalence rate of underweight women residing in low- and middle-income countries (LMICs) is alarmingly as high as 15%, with an even more striking statistic of 28% observed in the region of South Asia. This resulted in an economic burden that has been estimated to range between 2.5% and 3.8% of the gross domestic product (GDP) of the respective nations [2-4].

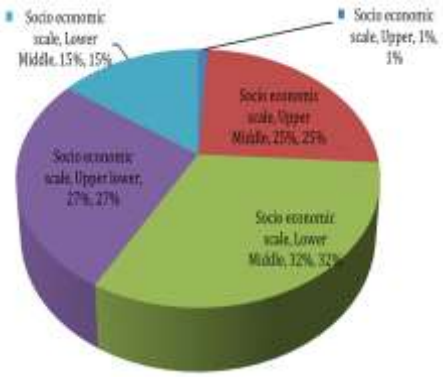
Although the worldwide incidence of underweight women diminished by 2%, from 12% in 2000 to 10% in 2016, with most regions exhibiting a reduction, South Asia uniquely observed only a significant decline from 27% to 22% [5]. At present, being overweight or obese at the time of conception has emerged as a significant and detrimental risk factor for poor obstetric outcomes. A variety of maternal complications and adverse perinatal outcomes, including gestational diabetes mellitus (GDM), gestational hypertension (GH), and pre-eclampsia, can be caused by maternal overweight or obesity. Numerous studies have established a correlation between maternal weight and reproductive outcomes [6]. Undoubtedly, there is strong literature support that suggests that obesity negatively impacts fertility, the success rates of assisted reproductive technology (ART), and various pregnancy and obstetric outcomes. Conversely, there exists a paucity of information regarding the effects of being underweight (body mass index [BMI] < 18.5 kg/m2) on these identical outcomes, and a very limited number of studies have been conducted that explored whether being underweight before pregnancy could cause significant obstetric complications [7]. Underweight women are at a higher risk of experiencing threatened miscarriage and toxicosis during pregnancy. These conditions can lead to significant maternal distress and require careful monitoring and management. Underweight women are more prone to anemia and other nutritional deficiencies, which can exacerbate pregnancy complications and affect fetal growth [8, 9]. Although more commonly associated with obesity, underweight women can also experience gestational hypertension and preeclampsia, which are serious conditions that can affect both maternal and fetal health. Maternal underweight is linked to placental pathologies, which can result in poor fetal development and long-term adverse outcomes for the child. These pathologies include maternal vascular malperfusion and decreased placental efficiency. There is an increased risk of low birth weight, small for gestational age, and preterm birth among underweight mothers, which can lead to various neonatal complications [10, 11]. Thus, pre-pregnancy underweight indirectly plays a huge role in determining the neonatal mortality as well as morbidity. All the above-mentioned theories have been explored in a very limited number of studies, especially in India. Thus, this study was conducted to determine the association of pre-pregnancy weight with maternal complications, mode of delivery, and perinatal outcomes

MATERIALS AND METHODS

An observational comparison study was conducted in the Obstetrics and Gynaecology department belonging to a Government Medical College and Hospital situated in Cuddalore district of South India. The study period was between August 2023 and September 2024. Convenience sampling method was employed. All women with the confirmation of pregnancy visiting the outpatient clinic of the Obstetrics and Gynaecology department were selected as study subjects. The weight of all these women before conception was asked and noted. The height of the mother was measured using the standardized scale. With the above height and weight parameters, body mass index was calculated. As per Body Mass Index, they are classified as underweight (BMI<18.5 kg/m^2) and normal weight (BMI 18.5 to 24.9 KG/M2) at the booking visit. Two groups of study subjects were made which one group of fifty antenatal women who had pre-pregnancy underweight, and another group of the same number with normal pre-pregnancy weight. Only the primigravid antenatal women and willing to give informed consent to participate in the study were included in the study. Those antenatal women with a BMI >25 kg/m2 were excluded from the study. Details on education, occupation, and monthly family income were obtained, through which the modified BG Prasad socioeconomic class was enumerated. The two groups of study subjects were followed up till the delivery. The details on maternal complications, type of delivery, and duration of labour were acquired during the study period. The APGAR score was used to assess the perinatal outcome of the study subjects. All the collected information was entered in an MS Excel sheet, and this data was interpreted using the SPSS

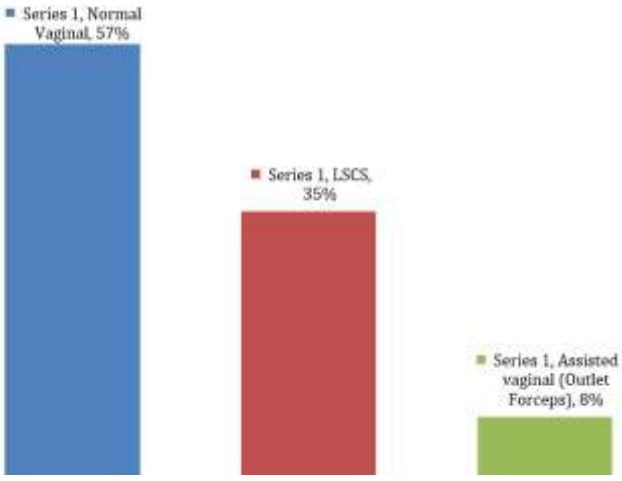
software version 26. Descriptive statistics such as frequency and proportions were used to depict the different socio-economic classes, delivery outcomes, maternal complications, and neonatal outcomes. Mean and standard deviation were used to show the duration of labour. To find the association of pre-pregnancy weight with socioeconomic class, delivery outcomes, maternal complications, and perinatal outcomes, chi-square statistical tests were used. To compare the mean differences in duration of labour between the two groups of study subjects, an unpaired t-test was used. A p-value significance of 0.05 was considered.

Figure 1: Socio-economic status of the study subjects



Out of a total of 100 study subjects, as per Modified BG Prasad Scale 2023, the majority belong to the lower class (32%), followed by the upper lower class (27%) and the upper middle class (25%). Only one study participant belongs to the upper socio-economic class.

Figure 2 Distribution of study subjects as per type of delivery (N=100)



With regards to type of delivery, more than half (57%) of the study subjects experienced normal vaginal delivery. LSCS was conducted among 35 study participants. Remaining study partici[ants had delivered vaginally assisted with outlet forceps.

Table 1: Comparison of socioeconomic status between pre-pregnancy underweight and normal weight groups. (N=100)

Variable		Under weight		Normal weight		X^2	P value
		N=50	%	N=50	%		
Socioeconomic status	Upper	0	0	1	2	18.52	0.001
	Upper middle	5	10	20	40		
	Lower middle	15	30	17	34		
	Upper lower	18	36	9	18		
	Lower	12	24	3	6		

Table :1: Among the participants who were underweight in pre-pregnancy, 36% belonged to the upper lower class, followed by 30% in the lower middle, and 24% belonged to the lower class. Among those who were of normal weight, 40% belonged to the upper middle class and 34% belonged to the lower middle class. The Proportion of participants in the lower socioeconomic class was higher among those who were underweight than among those who were normal. These differences in socioeconomic classes between the two study groups are statistically significant at p <0.05

Table 2: Comparison of type of delivery and duration of labour between pre-pregnancy underweight and normal weight groups (N=100)

Variable		Under weight		Normal weight		X^2	P value
		N	%	N	%		
Type of delivery	LSCS	13	26	22	44	4.937	0.085
	Outlet forceps	3	6	5	10		
	Vaginal	34	68	23	46		

Among those who were under weight, 68% gave birth through vaginal delivery followed by 26% through LSCS. Among those who were of normal weight, 46% delivered through vaginal delivery and 44% through LSCS. There is no statistical difference in the mode of delivery between women who were underweight and normal weight before pregnancy at p value >0.05.

Table 3- Comparison of duration of labour between pre-pregnancy underweight and normal weight groups (N=100)

Variables	Underweight	Normal weight	T value	P value
Duration of the I stage of labour (in hours)	11.43 ± 3.38	9.07 ± 3.31	2.829	0.006
Duration of the II stage of labour (in minutes)	46.49±13.06	56.79±24.61	2.176	0.033

Table:3The mean duration of the I stage of labour among those who were underweight and normal weight was 11.43 ± 3.38 hours and 9.07 ± 3.31 hours, respectively. The duration was significantly longer among those who were underweight than normal weight, with a P value of less than 0.05. The mean duration of II stage of labour among those who were under weight was 46.49 ± 13.06 minutes and for those in the normal weight the mean was 56.79 ± 24.61 minutes, The mean duration of II stage was significantly lower among those who were under weight than those who were normal with P value of less than 0.05.

Table 4: Comparison of maternal complications between pre-pregnancy underweight and normal weight groups. (N=100)

Variable		Under weight		Normal weight		X^2	P value
		N	%	N	%		
GDM	Yes	6	12	5	10	0.102	0.749
	No	44	88	45	90		
Anaemia	Yes	14	28	11	22	0.480	0.488
	No	36	72	39	78		
GHTN	Yes	1	2	5	10	2.837	0.092
	No	49	98	45	90		
Oligohydramnios	Yes	4	8	0	0	4.167	0.041
	No	46	92	50	100		
PPH	Yes	5	10	5	10	0.001	1
	No	45	90	45	90		
SSI	Yes	2	4	1	2	0.344	0.558
	No	48	96	49	98		

Table 4 Among those who were underweight and overweight, the proportion of GDM was 12% and 10%, respectively. The proportion of anaemia was 28% among those who were underweight and 22% among those who were of normal weight. Among those who were underweight, 2% developed gestational hypertension, and the proportion was 10% among those with normal weight. In both groups 10% developed PPH and 4% developed SSI in the underweight group, while 2% in the normal weight group. Both groups were similar concerning GDM, anaemia, GHTN, PPH, and SSI, with a P value of more than 0.05. Among those underweight, 8% had oligohydramnios, and none developed oligohydramnios in the normal weight group. The proportion of oligohydramnios was significantly higher in the underweight group than in the normal weight group, with a P value of less than 0.05.

Table 5: Comparison of neonatal complications between pre-pregnancy underweight and normal weight groups.

Variable		Under weight		Normal weight		X^2	P value
		N	%	N	%		
IUGR	Yes	5	10	9	18	1.329	0.249
	No	45	90	41	82		
APGAR 1 min	<7	20	40	23	46	0.367	0.545
	≥ 7	30	60	27	54		
APGAR 5 mins	<7	0	0	0	0	-	-
	≥ 7	50	100	50	100		

10% babies had IUGR among the mothers who were underweight in pre-pregnancy, and among those of normal weight, the proportion of IUGR was 18%. Both groups were similar concerning the proportion of IUGR, with a P value of more than 0.05. Among the mothers who were underweight and normal weight in the pre-pregnancy period, the babies with an APGAR score of less than 7 at 1 minute were 40% and 46%, respectively. At the 5th minute, no baby from either group had an APGAR score of less than 7. Both groups were similar about the pattern of APGAR score at 1 and 5 minutes, with a P value of more than 0.05.

DISCUSSION

Our follow-up study was conducted among the antenatal women, in which two groups were made based on the pre-pregnancy weight, i.e., underweight and normal weight. In the present study, it was observed that the proportion of underweight was higher among those who were in the upper lower, and lower classes of socioeconomic status. Also, we could find that the proportion of normal weight women was high among the upper middle class. A study conducted by Mahanta LB et al also showed that underweight prevalence was higher among the low socio-economic status. This finding strongly tells us that there is underweight is influenced by socioeconomic status [12]. This demographic is more vulnerable to undernutrition due to factors such as limited access to healthcare, inadequate nutrition, and lower educational attainment. It was found that no significant difference in proportion of reported normal vaginal deliveries among pre pregnancy underweight and normal weight women. To the best of our knowledge, there were no similar studies that explored the mode of delivery and pre-pregnancy underweight. In the current study, it was observed that the duration of the first stage of labour was significantly higher among the underweight women than the normal weight women, whereas the duration of the second stage of labour was higher among the underweight women. There is a notable gap in research specifically addressing the impact of being underweight on labour duration. Most studies focus on the challenges faced by overweight and obese women, leaving a need for more targeted research on underweight women 13-15]. Among all the maternal complications, it was identified that oligohydramnios was found to be significantly associated with pre-pregnancy underweight. While the direct relationship between pre-pregnancy underweights and oligohydramnios is not explicitly detailed in the provided studies, both conditions independently contribute to adverse pregnancy outcomes such as low birth weight and increased caesarean delivery rates [14]. In terms of neonatal outcomes, no significant differences in observations were found between the underweight and normal weight women. But literature shows that pre-pregnancy underweight is associated with an increased risk of IUGR, which is characterized by a fetus not growing at the expected rate during pregnancy, although specifically in terms of pre-pregnancy underweight, no studies exist to oppose our study findings [15]. The limitations of our study are that maternal weight gain should also be considered since being normal weight before pregnancy could also experience insufficient weight gain during the antenatal period. Although there are no similar studies to

support our study findings, this could help in further exploration of the relationship between pre-pregnancy underweight and its outcomes.

CONCLUSION

Very few studies have documented the effect of underweight on pregnancy. The results suggest that more people of lower socioeconomic status are at risk of being underweight. The duration of 1st stage of labour is significantly longer in underweight women, thus leading to increased morbidity and an arduous labour experience for the women. Thus, there is a need for an elaborate study on undernutrition in young married women and pregnancy.

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