Original Article

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Exploring the Influence of Maternal Health, Education and Socioeconomic Status on Birth Weight in Rural Hospital Settings

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ABSTRACT

Background: *Birth weight is an important indicator of neonatal health and is influenced by various maternal factors. While previous research has explored these factors in different settings, there is limited research focused on rural hospital settings, which face unique challenges. This study aims to investigate the influence of maternal health, education and socioeconomic status on birth weight specifically within rural hospital settings.*

Materials and methods: *The study employed a cross-sectional design and collected data from 138 mothers and their newborn babies in the Upzila Health Complex of Shamnagar, Satkhira between January and May 2023.*

Results: *The results indicated that a significant association exists between birth weight and maternal education levels. Infants born to mothers with higher education levels had a lower likelihood of low birth weight. Similarly, a significant association was found between birth weight and family status, with infants from lower socioeconomic classes having a higher risk of low birth weight. Additionally, the study revealed a significant association between birth weight and maternal nutritional status, with infants of malnourished mothers being at higher risk of low birth weight.*

Conclusion: *This study provides valuable and important insights into the factors influencing newborn birth weight.*

Key words: Birthweight; Maternal education; Maternal nutritional status.

Introduction

Birth weight is an important indicator of neonatal health and serves as a key determinant of a child's chances of survival and healthy growth. It is widely accepted that several maternal factors, including health, education, and socioeconomic status, play significant roles in influencing birth weight outcomes. Idia on the effects of these factors is necessary for establishing effective interventions and improving maternal and child healthcare services in rural hospital settings.[1] Maternal health is a vital aspect of pregnancy and directly affects fetal growth and development. The affordability of antenatal care in the health center and the management of maternal medical conditions during pregnancy have a major impact on birth weight.[2] Maternal factors such as pre-existing medical conditions (e.g Diabetes, hypertension) gestational weight gain, and maternal nutrition are associated with birth weight variations.[3] Maternal education, another significant factor, plays a critical role in determining health-related knowledge and behaviors. Higher levels of education are associated with improved awareness of antenatal care, adequate nutrition, and overall maternal health practices. Several studies have established a positive correlation between maternal education and birth weight, suggesting that higher education levels are associated with a lower likelihood of Low Birth Weight (LBW).[4] Socioeconomic status, family income, father's occupation, and living conditions, also determine birth weight outcomes. Several studies have shown that lower socioeconomic status is associated with an increased risk of LBW[5]. Factors such as inadequate housing, limited financial resources, and reduced access to healthcare services may contribute to adverse birth outcomes. The study has explored the influence of maternal health, education and socioeconomic status on birth weight in various settings, there is limited research particularly focusing on rural hospital settings. Rural areas often face unique challenges, including limited healthcare infrastructure, geographical barriers and

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socio-cultural factors that may impact maternal and child health outcomes differently from urban areas. Therefore, assessing the influence of these factors in rural hospital settings is crucial for establishing targeted interventions and improving the health outcomes of rural populations. This study aims to address this research gap by exploring the influence of maternal health, education and socioeconomic status on birth weight specifically within rural hospital settings.

Materials and methods

This study employed a cross-sectional design to investigate the impact of maternal health, education, and socioeconomic status on birth weight in rural hospital settings. The study population consisted of women who gave birth to new born babies in the Upzila Health Complex of Shamnagar, Satkhira from January to May 2023. It was possible to collect data on 138 mothers and their babies. Data on maternal health, education, socioeconomic status and birth weight were collected using a structured questionnaire administered to the participants. Maternal health factors, including pre-existing medical conditions (e.g Diabetes, hypertension) pregnancy complications (e.g., gestational diabetes, preeclampsia) and maternal Body Mass Index (BMI) were assessed through self-reporting. Participants supplied information regarding their health status during pregnancy and any medical conditions they had prior to pregnancy. Birth weight was measured immediately after delivery using calibrated weighing scales. The birth weight of each newborn was recorded in grams. Descriptive statistics such as means, standard deviations, frequencies, and percentages were calculated to summarize the demographic characteristics of the study population. Bivariate analyses, such as chi-square tests were performed to explore the associations between maternal factors (Health, education, socioeconomic status) and birth weight.

Results

Table I Age of the mothers (n=138)

Age (Years)	Frequencies	Percentage
15-24	54	39.13
25-34	52	37.68
35-44	32	23.19
Total	138	100

Table I shows that among 138 mothers, most of them 54% were between the ages of 15-24 years. Mean age 27.90 (SD±7.76).

Table II education of the mothers (n=138)

Level of education	Frequencies	Percentage
Primary	29	21.01
Secondary	26	18.84
SSC	28	20.29
HSC	28	20.29
Graduation	27	19.57
Total	138	100.00

In Table II among 138 mothers, 19.57%mothers completed graduation, 20.29%, and 20.29% of mothers passed SSC and HSC accordingly. 21% of mothers had studied up to class 5, 18.84% had studied up to class 8.

Table III Birth weight of the baby (n=138)

Weight in gram	Frequencies	Percentage
1500-1900	27	19.57
2000-2400	26	18.84
2500-2900	28	20.29
3000-3400	28	20.29
3500-3900	29	21.01
Total	138	100.00

In Table III 19.57% of the newborn baby's birth weight in between 1500-1900g, was 40.58% baby's birth weight in between 2500-2900 and 3000-3400g accordingly. Mean birth weight 2692.75 (SD±730) gms.

Table IV Association between the birth weight of newborn and mother education (n=138)

Weight in gram	Mothers' education					
	Primary	Secondary	SSC	HSC	Graduation	Total
1500-1900	10 (7.25%)	8 (5.80%)	4 (2.90%)	3 (2.17%)	2 (1.45%)	27 (19.57%)
2000-2400	10 (7.25%)	8 (5.80%)	4 (2.90%)	2 (1.45%)	2 (1.45%)	26 (18.84%)
2500-2900	4 (2.90%)	4 (2.90%)	8 (5.80%)	7 (5.07%)	5 (3.62%)	28 (20.29%)
3000-3400	3 (2.17%)	3 (2.17%)	7 (5.07%)	5 (3.62%)	10 (7.25%)	28 (20.29%)
3500-3900	2 (1.45%)	3 (2.17%)	5 (3.62%)	11 (7.97%)	8 (5.80%)	29 (21.01%)
Total	29 (21.01%)	26 (18.84%)	28 (20.29%)	28 (20.29%)	27 (19.57%)	138 (100%)

The chi-square statistic is 36.5886. The p-value is .002395. The result is significant at $p < .05$.

In Table IV, the weight range of 1500-1900 grams, the highest percentage of infants was observed for mothers with primary education (7.25%), followed by secondary education (5.80%). The total percentage of infants in this weight range was 19.57%.For the weight range of 2000-2400 grams, the pattern is similar, with primary education (7.25%) and secondary education (5.80%) having the highest percentages. The total percentage of infants in this weight range was 18.84%. In the weight

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range of 2500-2900 grams, SSC (Secondary School Certificate) education has the highest percentage (5.80%), followed by HSC (Higher Secondary Certificate) (5.07%). The total percentage of infants in this weight range was 20.29%. The weight range of 3000-3400 grams shows a similar trend, with the highest percentage of infants having a graduation degree (7.25%), followed by SSC (5.07%). The total percentage of infants in this weight range was 20.29%. In the weight range of 3500-3900 grams, HSC (7.97%) and graduation degree (5.80%) have the highest percentages. The total percentage of infants in this weight range was 21.01%. Overall, the chi-square test was conducted to assess the relationship between infants' weight and their mothers' education levels. The resulting chi-square statistic of 36.5886 and a p-value of .002395 indicate a statistically significant relationship between the variables. In simpler terms, the data suggests that there is an association between infants' weight and their mothers' education levels.

Table V Association between birth weight of new born and family status

Weight in gram	Family status					
	Lower class	Lower middle class	Middle class	Upper middle class	Upper class	Total
1500-1900	8 (5.80%)	10 (7.25%)	3 (2.17%)	2 (1.45%)	4 (2.90%)	27(19.57%)
2000-2400	10 (7.25%)	10 (7.25%)	2 (1.45%)	2 (1.45%)	2 (1.45%)	26 (18.84%)
2500-2900	4 (2.90%)	5 (3.62%)	7 (5.07%)	5 (3.62%)	7 (5.07%)	28 (20.29%)
3000-3400	3 (2.17%)	3 (2.17%)	5 (3.62%)	10 (7.25%)	7 (5.07%)	28(20.29%)
3500-3900	3 (2.17%)	2 (1.45%)	5 (3.62%)	8 (5.80%)	11 (7.97%)	29 (21.01%)
Total	28 (20.29%)	30 (21.74%)	22 (15.94%)	27 (19.57%)	31 (22.46%)	138 (100%)

The chi-square statistic is 37.6777. The p-value is .001682. The result is significant at $p < .05$.

In Table V, the weight range of 1500-1900 grams, the highest percentage of infants is observed in the lower middle class (7.25%), followed by the lower class (5.80%). The total percentage of infants in this weight range is 19.57%. For the weight range of 2000-2400 grams, the lower middle class and lower class have the highest percentages (Both 7.25%). The total percentage of infants in this weight range is 18.84%. In the weight range of 2500-2900 grams, the middle class has the highest percentage (5.07%), followed by the lower middle class (3.62%). The total percentage of infants in this weight range is 20.29%. The weight range of 3000-3400 grams shows a similar trend, with the upper middle class having the highest percentage (7.25%), followed by the middle class (3.62%). The total percentage of infants in this weight range is 20.29%. In the weight range of 3500-3900 grams, the upper class has the highest percentage (7.97%), followed by the upper middle class (5.80%). The total percentage of infants in this weight range is 21.01%.Overall, the chi-square test was conducted to assess the relationship between infants' weight and their family status. The resulting chi-square statistic of 37.6777 and a p-value of 0.001682 indicate a statistically significant relationship between the variables. In simpler terms, the data suggests that there is an association between infants' weight and their family status.

Table VI Association between birth weight of newborn and mother nutritional status

Weight of newborn in gram	Mother nutritional status		
	Normal nutritional status	Malnutrition	Total
1500-1900	7 (5.07%)	20 (14.49%)	27(19.57%)
2000-2400	10 (7.25%)	16 (11.59%)	26 (18.84%)
2500-2900	12 (8.70%)	16 (11.59%)	28 (20.29%)
3000-3400	18 (13.04%)	10 (7.25%)	28(20.29%)
3500-3900	18 (13.04%)	11 (7.97%)	29 (21.01%)
Total	65 (47.10%)	73 (52.90%)	138(100%)

The chi-square statistic is 11.7664. The p-value is .019175. The result is significant at $p < .05$

In Table VI, the weight range of 1500-1900 grams, the majority of newborns with normal nutritional status of mothers account for 5.07%, while those mothers with malnutrition account for 14.49%. The total percentage of newborns in this weight range was 19.57%.For the weight range of 2000-2400 grams, newborns with normal nutritional status of mothers represent 7.25%, while those with malnutrition account for 11.59%. The total percentage of newborns in this weight range was 18.84%. In the weight range of 2500-2900 grams, newborns with normal nutritional status of mothers account for 8.70%, while those with malnutrition account for 11.59%. The total percentage of newborns in this weight range is 20.29%. The weight range of 3000-3400 grams shows a higher percentage of newborns with normal nutritional status of mothers (13.04%) compared to those with malnutrition (7.25%). The total percentage of newborns in this weight range was 20.29%. In the weight range of 3500-3900 grams, newborns with normal nutritional status of mothers account for 13.04%, while those with malnutrition account for 7.97%. The total percentage of newborns in this weight range was 21.01%. Overall, the chi-square test was conducted to assess the relationship between newborns' weight and their mother's nutritional status. The resulting chi-square statistic of 11.7664 and a p-value of 0.019175 indicate a statistically significant relationship between the birth weight and nutrition status.

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Table VII Association between the birth weight of newborn and anemia of mother during the antenatal period

Weight of newborn in gram	Anemia of the mother during the antenatal period		Total
	Yes	No	
1500-1900	23 (16.67%)	4 (2.90%)	27 (19.57%)
2000-2400	16 (11.59%)	10 (7.25%)	26 (18.84%)
2500-2900	12 (8.70%)	16 (11.59%)	28 (20.29%)
3000-3400	8 (5.80%)	20 (14.49%)	28 (20.29%)
3500-3900	11 (7.97%)	18 (13.04%)	29 (21.01%)
Total	70 (50.72%)	68 (49.28%)	138 (100%)

The chi-square statistic is 22.1346. The p-value is .000188. The result is significant at $p < .05$.

In the weight range of 1500-1900 grams, newborns of mothers with anemia during the antenatal period account for 16.67%, while those whose mothers did not have anemia account for 2.90%. The total percentage of newborns in this weight range is 19.57%. For the weight range of 2000-2400 grams, newborns of mothers with anemia represent 11.59%, while those whose mothers did not have anemia account for 7.25%. The total percentage of newborns in this weight range is 18.84%. In the weight range of 2500-2900 grams, newborns of mothers with anemia account for 8.70%, while those whose mothers did not have anemia account for 11.59%. The total percentage of newborns in this weight range is 20.29%. The weight range of 3000-3400 grams shows a lower percentage of newborns of mothers with anemia (5.80%) compared to those whose mothers did not have anemia (14.49%). The total percentage of newborns in this weight range is 20.29%. In the weight range of 3500-3900 grams, newborns of mothers with anemia account for 7.97%, while those whose mothers did not have anemia account for 13.04%. The total percentage of newborns in this weight range is 21.01%. Overall, the chi-square test was conducted to assess the relationship between newborns' weight and whether the mother had anemia during the antenatal period. The resulting chi-square statistic of 22.1346 and a p-value of 0.000188 indicate a statistically significant relationship between the variables. In simpler terms, the data suggests that there is an association between newborns' weight and whether the mother had anemia during the antenatal period.

Discussion

The results of the analysis revealed several important findings. Among the 138 mothers included in the study, the majority (39.13%) were between the ages of 15-24 years. The mean age of the mothers was 27.90, with a standard deviation of 7.76.19.57% of the mothers had completed graduate degree. Additionally, 20.29% of the mothers had passed the Secondary School Certificate (SSC) and the Higher Secondary Certificate (HSC) each. A significant proportion of the mothers (21.01%) had studied up to the primary level (class 5), while 18.84% had completed education up to class 8. It showed that 19.57% of the infants had birth weights ranging from 1500-1900 grams.

The most common birth weight range was 3500-3900 grams, accounting for 21.01% of the newborns. The mean birth weight was 2692.75 grams, with a standard deviation of 730 grams. It revealed that the weight range of 1500-1900 grams had the highest percentage of infants born to mothers with primary education (7.25%) and secondary education (5.80%). The chi-square test indicated a statistically significant relationship between birth weight and maternal education. This is supported by studies of World Health Organisation and Richard EB who found a positive correlation between birth weight and maternal education level.[6,7] Other studies showed that no significant relationship between birth weight and maternal education level.[8,9] The weight range of 1500-1900 grams had the highest percentage of infants born to lower-middle-class families (7.25%) and lower-class families (5.80%). the chi-square test was conducted to assess the relationship between infants' weight and their family status. The resulting chi-square statistic of 37.6777 and a p-value of 0.001682 indicate a statistically significant relationship between the variable as supported by the two studies.[10,11] It was indicated that infants born to mothers with malnutrition accounted for higher percentages in all weight ranges compared to those born to mothers with normal nutritional status. The chi-square test showed a statistically significant relationship between birth weight and maternal nutritional status. It revealed that infants born to mothers with anemia had lower percentages in all weight ranges compared to those born to mothers without anemia. The chi-square test indicated a statistically significant relationship between birth weight and maternal anemia during the antenatal period. Some studies found the same contributing factor to LBW.[12-14] The results showed a high level of association between maternal education, economic status, and anemia with low birth weight. In summary, the findings highlight the associations between various factors and the birth weight of newborns, including maternal age, education level, family status, maternal nutritional status, and the presence of maternal anemia during the antenatal period. These results provide

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valuable insights for understanding the potential influences on newborn birth weight and can contribute to the development of targeted interventions and support programs to improve maternal and neonatal health outcomes.

Conclusion

The analysis of the data presented in this study provides important insights into the factors influencing newborn birth weight. The findings demonstrate significant associations between birth weight and various factors, shedding light on the complex interplay between maternal characteristics and neonatal outcomes. Moreover, the educational background of the mothers varied, with a substantial number having completed only primary or secondary education. This suggests the importance of educational initiatives to empower women and improve maternal and child health outcomes.The family status also demonstrated a significant relationship with birth weight, emphasizing the need for comprehensive social support for families, particularly those in lower socio-economic classes. Furthermore, maternal nutritional status was found to influence birth weight, with infants born to malnourished mothers having higher percentages in all weight ranges. This underscores the importance of adequate maternal nutrition during pregnancy and the implementation of nutritional interventions to enhance birth outcomes. The presence of maternal anemia during the antenatal period was associated with lower birth weights, emphasizing the significance of early detection and management of anemia in pregnant women.

Recommendation

Further research and interventions focusing on addressing these factors can contribute to reducing the incidence of low birth weight and improving neonatal health outcomes in rural areas.

Disclosure

All the authors declared no competing interest.

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