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Anemia as a risk factor for low birth weight in term pregnancies: A case-control study

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Abstract
Background: Low birth weight (LBW) is a public health issue since it causes several baby health issues. Anemia, a hemoglobin deficiency, is a common pregnancy problem. This case-control study will compare the birth weight of anemic mothers' babies to those of normal-hemoglobin mothers.
Objective: This case-control study explores the potential association between anemia in pregnant women and the likelihood of delivering a low birth weight baby.
Methods: CMH Saidpur, Nilphamari, Bangladesh, investigated the relationship between anemia and birth weight of baby in full-term mothers. From January 2022 to January 2023, 275 eligible volunteers participated in the study. Group A comprised women with anemia (hemoglobin < 10 g/dl) and Group B included individuals with normal hemoglobin levels.
Result: Group A: 40% over 32, 36.47% 18-24, 23.53% 25-31. Group B is much older, with 42.85% 25-31, 30.48% 18-24, and 26.67% over 32 (P-value = 0.0121). Most of group A (57.65%) had a BMI below 18.5, 29.41% between 18.5 and 25, and 12.94% above 25. In group B, 46.67% had a BMI between 18.5 and 25, 30.47% below 18, and 22.86% above 25. Groups A and B had different BMI distributions. Antenatal visit distribution differs considerably between groups ($p< 0.05$). The P-value for parity distribution variation is 0.0403. 103 (60.59%) had LUCS and 67 (39.41%) had NVD in group A. Group B included 15 NVD and 90 LUCS, making up 85.71% of the total. P-value < 0.05. A statistically significant correlation exists between group membership and diagnosis. In Group A, 98 (57.64%) had newborns under 2.5kg and 72 (42.35%) had infants beyond 2.5kg. In group B, 78 (45.88%) had neonates under 2.5kg and 92 (54.12%) had newborns exceeding 2.5kg. The weights of newborns in Group A and Group B differ considerably (p-value 0.0528).
Conclusion: This study indicated that term pregnancies with anemia were more likely to have low birth weight than those with normal birth weight. The study also found that maternal, low BMI, inadequate antenatal care, more prior pregnancies, and contributed to low birth weight.

Keywords: Anemia, low birth weight baby, antenatal follow-up

Introduction

Anemia during pregnancy is characterized by a decrease in the number of red blood cells or levels of hemoglobin. It can be attributed to various factors such as nutritional deficiencies (Iron, folate, or vitamin B12), chronic illnesses, and hemoglobin disorders. Extensive research has been conducted on the effects of anemia during pregnancy on negative pregnancy outcomes, specifically its association with low birth weight in multiple studies.

Throughout pregnancy, the iron needs for both the mother and fetus are considerably increased. During pregnancy, the need for iron in the developing fetus leads to an increase in the amount of iron that the mother needs, which is approximately 1 g. [1]. Anemia during pregnancy is a prevalent issue, with hemoglobin levels falling below 10 g/dl [2].

LBW has a profound impact on perinatal survival, infant morbidity, mortality, and the potential for developmental disabilities and future illnesses [3].

Infants with low birth weight (LBW) have a significantly higher mortality rate compared to infants with normal birth weight [4].

The annual prevalence of LBW in Middle South Asia is 31.1%, which is significantly higher than the prevalence in Asia as a whole, which stands at 19.7%. In developed countries like America and Europe, the incidence of low birth weight (LBW) is 6.8% and 6.5%, respectively.

Latin America has a rate of 10.1%, whereas Africa has a rate of 14%. The incidence of low-birth-weight infants in Pakistan ranges from 5% to 32% [5].

The association between anemia and adverse birth outcomes has demonstrated a range of results. Multiple studies have shown a clear link between anemia and an increased risk of low birth weight and preterm delivery [6-8].

Objective

The objective of this case-control study is to investigate whether anemia in pregnant women is associated with an increased risk of delivering a low birth weight baby.

Methodology

Study Area, Period, and And Design: A case-control study was conducted at CMH Saidpur, Nilphamari, Bangladesh to investigate the association between anemia and birth weight of baby. The study took place within the gynecology and obstetrics ward, focusing on expanding our understanding of this relationship in a professional manner. The study enrolled participants from January 2022 to January 2023. A total of 275 individuals were admitted to the ward during this period after careful consideration of their eligibility criteria.

- Group A consisted of 170 cases with hemoglobin levels below 10g/dl.
- Group B consisted of 105 cases with hemoglobin levels exceeding 10g/dl.

Inclusion criteria

1. Women who have completed a full-term pregnancy with a single baby (lasting 37-42 weeks of gestation)
2. Pre-diagnosed cases of anemia.

Exclusion criteria

1. Multiple pregnancies
2. Presence of underlying medical problems that have a major impact on birth weight and anemia risk regardless of pregnancy, such as HTN, DM, CKD, thalassemia, and sickle cell disease.
3. Fetal anomalies: Identified anomalies in the fetus that may directly affect birth weight.

Data Analysis

The offered checklist is divided into two distinct sections. The first part of the study included important baseline factors such as age, occupation, BMI, antenatal check-up, and parity. The second section of the report covers the mode of delivery and birth weight of the delivered children. The information was entered into the SPSS 23 software. The significance threshold was established at a level of 0.05.

Case Definition

Maternal anemia was categorized into two levels: mild and moderate anemia.

Anemia in pregnancy or maternal anemia can be diagnosed if the Hb concentration falls below 10 g/dl during the first, second, or third trimester [9]. An LBW infant refers to an infant with a weight of less than 2500 grams [10].

Results

The different baseline profiles of the study cases are outlined in Table I. Within Group A, the distribution of cases is as follows: 40% are over 32 years old, 36.47% are between 18-24 years old, and 23.53% fall within the 25-31 age range. Within Group B, the highest percentage of cases fell within the 25-31 age range at 42.85%, followed by the 18-24 age range at 30.48%, and those over 32 years at 26.67%. The P-value is 0.0121. There is a statistically significant difference in the age distribution between Group A and Group B.

The study found that the majority of cases (78.82%) were unoccupied, with the remaining cases (21.18%) were working in different jobs. Within group B, the majority of cases consisted of unoccupied (71.43%), with occupied accounting for the remaining cases (28.57%). There is no statistically significant difference in the occupational distribution between Group A and Group B.

Within group A, the majority of individuals (57.65%) had a BMI below 18.5, while 29.41% fell within the range of 18.5 to 25, and 12.94% had a BMI exceeding 25. Within group B, 46.67% of individuals had a BMI ranging from 18.5 to 25, 30.47% had a BMI below 18.5, and 22.86% had a BMI exceeding 25. There is a statistically significant disparity in the BMI distribution between Group A and Group B.

The majority of group a participants had less than 4 antenatal visits (62.94%), while the remaining individuals had more than 4 antenatal visits (37.06%). Within group B, the majority of individuals attended more than 4 antenatal visits (52.38%), while the remaining individuals attended less than 4 antenatal visits (47.62%). There is a statistically significant variance in the antenatal visit distribution between Group A and Group B.

In group A, 42.35% had parity 1, 32.35% had parity 2, and 43% had parity 3 or more. Within group B, the distribution of parity was as follows: 42.86% had parity 2, 36.19% had parity 1, and 20.95% had parity 3 or more. The p-value equals 0.0403. There is evidence indicating a statistical difference in the distribution of parity between the two groups.

Figure 1 in group A depicts the methodology employed to present the research cases. In group A, 67 patients (39.41%) had NVD, and the remaining 103 cases (60.59%) had LUCS. Within Group B, 15 patients were diagnosed with NVD, while 90 cases were diagnosed with LUCS, representing 85.71% of the total. The p-value is below 0.05. An association between group membership and diagnosis is statistically significant.

In Group A, 98 cases (57.64%) involved infants weighing below 2.5kg, while 72 cases (42.35%) had infants weighing more than 2.5kg, as shown in Figure 2. Within group B, 78 cases (45.88%) involved infants weighing less than 2.5kg, while 92 cases (54.12%) had newborns weighing over 2.5kg. The p-value is 0.0528. indicating a significant difference in the weights of infants between Group A and Group B.

Table 1: Baseline profiles of our study cases

Socio-demographic data	Group A(n=170)		Group B(n=105)		
	Frequency	Percentage	Frequency	Percentage	P-value
Age (Years)					
18-24	62	36.47	32	30.48	0.0121.
25-31	40	23.53	45	42.85	
>32	68	40	28	26.67	
Occupation					
Working	36	21.18	30	28.57	0.2959
Housewife	134	78.82	75	71.43	
BMI					
<18.5	98	57.65	32	30.47	0.0005
18.5-25	50	29.41	49	46.67	
>25	22	12.94	24	22.86	
Antenatal follow-up					
>4 visits	63	37.06	55	52.38	0.0417
<4 visits	107	62.94	50	47.62	
Parity					
1	72	42.35	38	36.19	0.0403
2	55	32.35	45	42.86	
3 or more	43	25.3	22	20.95	

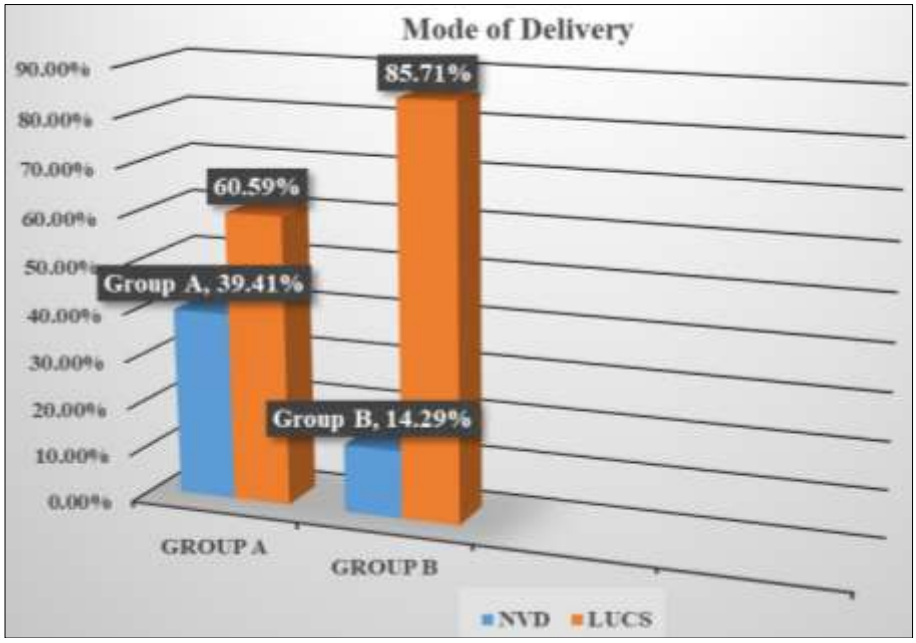

Fig 1: Mode of delivery of our study cases (n=275)

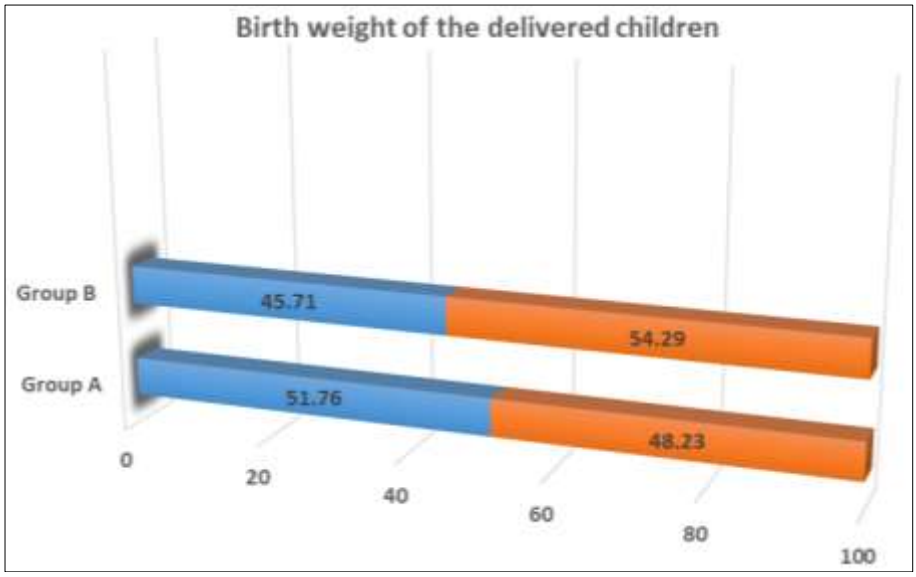

Fig 2: Birth weight of the delivered children (n=275)

Discussion

Group A has a diverse distribution of cases. Among the group, 40% are over 32 years old, 36.47% are between 18-24 years old, and 23.53% fall within the 25-31 age range. Group B had the highest percentage of cases in the 25-31 age range, accounting for 42.85% of the total. This was followed by the 18-24 age range, which made up 30.48% of the cases. The remaining 26.67% of cases were from individuals over the age of 32. The P-value is 0.0121, which indicates statistical significance. The age distribution between Group A and Group B shows a notable statistical difference.

The study revealed that a significant portion of the cases (78.82%) were housewife, while the remaining cases (21.18%) were engaged in various occupations. In group B, the majority of cases were Housewife, making up 71.43% of the total. The remaining cases were occupied, accounting for 28.57%. The occupational distribution between Group A and Group B does not show any statistically significant difference.

In group A, a significant proportion of individuals (57.65%) had a BMI below 18.5. Another notable percentage (29.41%) fell within the range of 18.5 to 25, while a smaller portion (12.94%) had a BMI exceeding 25. In group B, nearly half of the individuals (46.67%) had a BMI within the healthy range of 18.5 to 25. A significant portion (30.47%) had a BMI below 18.5, indicating potential underweight. On the other hand, a considerable proportion (22.86%) had a BMI exceeding 25, suggesting a higher risk of being overweight or obese. There is a noticeable difference in the BMI distribution between Group A and Group B which is supported by statistical evidence.

A significant portion of participants in group A had fewer than 4 antenatal visits, with the majority accounting for 62.94%. Conversely, the remaining individuals in the group had a higher number of antenatal visits, making up 37.06% of the total. In group B, a significant number of individuals attended more than 4 antenatal visits (52.38%), whereas the rest attended less than 4 antenatal visits (47.62%). The antenatal visit distribution between Group A and Group B shows a notable difference in statistical significance.

Research in India revealed that inadequate ANC has a more significant effect on the birth weight of underweight babies, as opposed to those who have a normal weight. This aligns with the results we obtained from our study [11].

Within group A, there was a distribution of parities: 42.35% had a parity of 1, 32.35% had a parity of 2, and 43% had a parity of 3 or more. The distribution of parity within group B was as follows: 42.86% had a parity of 2, 36.19% had a parity of 1, and 20.95% had a parity of 3 or more. The p-value is 0.0403, which indicates statistical significance. There is evidence suggesting a statistical disparity in the distribution of parity between the two groups.

Research conducted in India revealed that women giving birth for the first time had a greater likelihood of delivering babies with low birth weight when compared to women who had given birth multiple times [12].

Within group A, NVD was observed in 67 patients (39.41%), while the remaining 103 cases (60.59%) exhibited LUCS. In Group B, 15 patients were diagnosed with NVD, while 90 cases were diagnosed with LUCS, accounting for 85.71% of the total. The p-value is statistically significant at a level of 0.05. The statistical analysis reveals a significant association between group membership and diagnosis.

Our study provides an analysis of the hemoglobin levels observed in participants during the third trimester. In the sample of 275 cases, the hemoglobin levels were distributed as follows: 43.64% of individuals had hemoglobin levels in the range of 10-12 g/dl, while 38.18% had levels between 12-15 g/dl. Additionally, 18.18% of the participants had hemoglobin levels ranging from 8-10 g/dl.

In Group A, a majority of cases (57.64%) involved infants weighing below 2.5kg, while a smaller portion (42.35%) had infants weighing more than 2.5kg. In group B, a significant number of cases (45.88%) involved infants weighing less than 2.5kg, while the remaining cases (54.12%) had newborns weighing over 2.5kg. The p-value is 0.0528, suggesting a notable distinction in the weights of infants between Group A and Group B.

Our study found a strong correlation between anemia during pregnancy (Hb<10 gm %) and low birth weight, which aligns with the findings of a study conducted in Karnataka [13].

Conclusion

Ultimately, this study uncovered notable distinctions between the two groups in various important aspects. There were notable differences in age distribution, BMI, antenatal visits, parity, diagnosis (NVD vs. LUCS), and infant weight between the two groups, which were found to be statistically significant. Group A exhibited a greater proportion of cases in the younger age ranges, lower BMI, fewer antenatal visits, lower parity, and a higher prevalence of NVD and low birth weight infants in a professional manner. In contrast, Group B exhibited a greater number of cases in the older age range, a more evenly distributed BMI, a higher frequency of antenatal visits, a higher number of previous pregnancies, and a higher occurrence of cesarean sections and infants with higher birth weights. Based on these findings, it appears that the two groups are likely different populations with different risk factors. Additional research is necessary to discover the root causes of these discrepancies and customize healthcare interventions accordingly.

Conflict of Interest

Not available

Financial Support

Not available

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