Cerrahpaşa Med J 2025; 49: 1-6 ORIGINAL ARTICLE

The Impact of Maternal Anaemia on Foetal Growth Parameters in Somali Women: A Cross-Sectional Study

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Cite this article as: Erkok U, Topçu G, Yıldız P, et al. The impact of maternal anemia on fetal growth. *Cerrahpaşa Med J.* 2025, 49, 0019, doi:10.5152/cjm.2025.25019.

What is already known on this topic?

- *Anemia is a common condition during pregnancy, with its incidence and causes varying across geographic regions due to differences in nutritional status, healthcare access, and socioeconomic conditions. Globally, maternal anemia remains a significant public health issue, particularly in low-income countries such as Somalia. It is well established that maternal anemia can adversely affect fetal development, increasing the risk of complications such as LBW.*

What this study adds on the topic?

- *Despite the global burden of maternal anemia, there is a scarcity of context-specific data from Somalia regarding its prevalence and impact on pregnancy outcomes. This study contributes new evidence by assessing the prevalence of maternal anemia among Somali women and examining its association with neonatal birth weight. The findings help fill a critical knowledge gap and may inform targeted public health interventions and maternal care strategies in the Somali context.*

Abstract

Objective: Anemia is a magnitude of public health problem globally, mainly affecting pregnant women, particularly in underdeveloped countries like Somalia. This study aimed to address this gap by determining the prevalence of maternal anemia and its association with birth weight outcomes in Somalia.

Methods: This cross-sectional study was conducted at the Mogadishu Somali Turkey Training and Research Hospital between April 1 and September 25, 2023, involving 808 consecutive mothers who delivered in the third trimester. Maternal hemoglobin levels were measured at the time of delivery, and fetal growth parameters, including birth weight, height, head circumference, and APGAR score, were assessed.

Results: The study found that 67% of pregnant women had anemia. The majority of anemic patients (41.5%) had moderate anemia. In regression analysis, maternal hemoglobin level (P = .0001) and severe anemia (OR=3.28, 95%CI:1.54-6.95, P = .002) were independent risk factors for low birth weight (LBW). Also, maternal hemoglobin (P = .012) and severe anemia (OR=3.57, 95%CI:1.61-7.91, P = .002) were independent risk factors for a birth weight of ≥1500–2499 g.

Conclusion: The prevalence of anemia in pregnancy in Somalia is alarmingly high, with 67% of women affected. This study demonstrates a strong association between maternal anemia, particularly severe anemia, and adverse fetal growth outcomes, including LBW. These findings highlight the urgent need to address maternal iron requirements through targeted nutritional interventions, including iron supplementation and dietary support during pregnancy. Improving maternal nutrition and healthcare access is essential to enhancing fetal health and reducing the incidence of LBW in Somalia.

Keywords: Prevalence of maternal anemia, low birth weight, Somalia

Introduction

Anemia, a decrease in red blood cells or hemoglobin, is a significant public health problem globally, mainly affecting pregnant women, particularly in underdeveloped countries. The World Health Organization (WHO) reports that more than 1.62 billion people worldwide are affected by anemia.[1] In pregnancy, anemia is defined according to the WHO criteria as a blood hemoglobin level of less than 11 g per decilitre (g/dL). This threshold is used to classify anemia and assess its severe, moderate, and mild anemia.[2]

Anemia is a common condition during pregnancy, with incidence and causes varying based on geographic location, nutritional habits, and access to healthcare.[1,2] Globally, the World Health Organization estimates that 37% of pregnant women are affected by anemia.[1] The prevalence of

Received: May 24, 2025 **Revision Requested:** July 29, 2025 **Last Revision Received:** September 4, 2025 **Accepted:** September 24, 2025 **Publication Date:** November 28, 2025
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DOI: 10.5152/cjm.2025.25019

anemia during pregnancy in Somalia has been reported to range from 44.4% to 64.8%, reflecting the significant burden of this condition in the country.[3-5] These variations highlight the need for targeted interventions that address both the nutritional and healthcare challenges faced by pregnant women in different regions, including Somalia.

In pregnancy, anemia is a multifactorial condition influenced by various factors, including pregnancy-related physiological changes, nutritional deficiencies, chronic infections, and socioeconomic factors. Among these, dietary iron deficiency is the most prevalent cause of anemia during pregnancy.[6,7]

Maternal anemia can significantly affect the developmental process of the fetus, leading to various complications, including low birth weight (LBW). The reduced availability of essential nutrients and oxygen to the developing fetus due to anemia can result in restricted fetal growth, which ultimately impacts birth weight. As a consequence, anemia in pregnancy is a key factor associated with the increased risk of LBW, contributing to adverse neonatal outcomes.[8,9] Low birth weight is primarily associated with both short-term and long-term fetal outcomes. The global prevalence of LBW is up to 20%, with significant regional and country-specific variations. However, the highest rates of LBW are observed in low- and middle-income countries (LMICs), particularly within vulnerable populations. In these regions, anemia, along with other contributing health and socioeconomic factors, plays a critical role in increasing the risk of LBW. These factors include inadequate nutrition, limited access to healthcare, and socioeconomic vulnerabilities, all of which contribute to poor maternal health and adverse birth outcomes.[9,10]

There has been limited data specifically focusing on the prevalence of maternal anemia and its association with birth weight in Somali women. This study aimed to address this gap by determining the prevalence of maternal anemia and exploring its association with birth weight outcomes in Somalia. This study seeks to provide valuable insights into the impact of maternal anemia on fetal health, particularly birth weight, in a region with limited healthcare resources and high rates of maternal and neonatal health challenges.

Methods

Study Design and Participants

This cross-sectional study was conducted at the Mogadishu Somali Turkey Training and Research Hospital between April 1 and September 25, 2023, with a sample size of 808 consecutive mothers who delivered in the third trimester. Maternal variables collected included parity, gestational age at delivery, and maternal blood hemoglobin level at delivery; neonatal variables included APGAR score, birth weight, birth height, and head circumference. The inclusion criteria for women in the study were: age between 18 and 45 years, singleton pregnancy, and in the third trimester of pregnancy. Women were excluded if they had multi-gestation, malaria, pregnancy-related hypertension, chronic hypertension, diabetes mellitus, antepartum hemorrhage, or congenital fetal anomalies that could affect anemia and birth weight. These criteria helped ensure that the study sample was as homogeneous as possible, reducing the potential confounding factors that could impact the analysis of maternal anemia and its association with birth weight outcomes.

Ethics Approval and Consent to Participate

The study received formal ethics approval from the Mogadishu Somali Turkey Training and Research Hospital Ethics and Research Committee Institutional Review Board (IRB) (Permission date and number: 21.03.2023 and MSTH/15469/856). It was conducted by the principles and guidelines of the Declaration of Helsinki. All participants were fully informed about the study's objectives, methods, and potential outcomes. They provided informed consent to participate and agreed to the publication of the results. The research adhered to the Strengthening the Reporting of Observational Studies in Epidemiology checklist.

Definitions

Maternal anemia and LBW were defined according to the criteria provided by the World Health Organization: anemia in pregnancy was defined by a blood hemoglobin level of less than 11 g/dL, with mild (Hb 10-10.9 g/dL), moderate (Hb 7-9.9 g/dL), and severe (Hb <7 g/dL) forms. Low birth weight and are a birth weight <2500 grams and a birth weight <1500, respectively.[2] These definitions align with the WHO guidelines and were used to categorize and analyze the maternal and fetal health outcomes in this study.

Data Processing and Analysis

Descriptive statistics were calculated for the baseline characteristics of the participants. The data were analyzed using the Statistical Package for Social Sciences (SPSS) version 29.0 (IBM Corp., Armonk, NY, USA). Various statistical techniques were employed, including t-tests, ANOVA, chi-squared tests, and regression analysis, to explore the relationship between anemia and fetal birth weight. All analyses were conducted with a 2-sided significance level of 0.05 and 95% CI. These statistical methods were used to assess the associations and differences in the data, ensuring a robust analysis of the study's objectives.

Results

Demographic and Obstetric Features of the Participants

A total of 808 mothers were admitted for delivery and eligible for analysis. The mean age of the individuals was 26.8 ± 5.5 years (16 to 45). The mean gestational age at delivery was 37.8 ± 2.8 weeks, with a range of 28-42 weeks. Newborns' mean birth weight was 2952 ± 714 grams (g).

The clinical, obstetric, and sociodemographic details of the participants are presented in Table 1.

Incidence of Anemia and Low Birth Weight

The mean hemoglobin level among the study participants was 10.3 ± 1.8 g/dL, with values ranging from 3.90 g/dL to 14.2 g/dL. Of the 808 women included in the study, 541 (67%) were found to have anemia of varying severity. Among the anemic participants, the majority (41.5%, 335/808) had moderate anemia, followed by mild anemia (21.3%, 172/808) and severe anemia (4.2%, 34/808). In terms of birth weight, 21.5% (174/808) of the women delivered LBW babies, with birth weights ranging from 755 g to 2499 g and a mean birth weight of 1909 ± 514 g. Among the LBW babies, 44 (25.3%) were classified as VLBW, with an overall incidence of VLBW of 5.4% (44/808). Additionally, babies whose birth weight was between 1500 g and 2499 g accounted for 16.1% of the total sample.

Between-group Comparisons

The 2 groups, anemic and non-anemic, were similar in terms of maternal characteristics (age, delivery week) and fetal characteristics (weight, height, head circumference at birth, and APGAR score) (Table 1). In addition, maternal characteristics and fetal characteristics of anemic and non-anemic mothers were similar

Table 1. A Comparison of the Maternal and Newborn Clinical Characteristics of Those With and Without Anemia

Variables		Anemic (n = 541, %= 67)	Non-anemic (n = 267, % = 33)	T or X^2	*P*
Maternal age (years), mean ± SD		26.8 ± 5.8	27.1 ± 5.1	−0.852[a]	.394
Delivery weeks, mean ± SD		37.7 ± 2.9	38 ± 2.6	−1.440[a]	.150
Birth weight, mean ± SD		2924 ± 746	3011 ± 642	−1.636[a]	.102
Birth height, mean ± SD		48 ± 3.5	48.4 ± 2.3	−1.676[a]	.094
HC, mean ± SD		35 ± 1.7	35.2 ± 1.5	−1.583[a]	.114
Apgar (1. minute), mean ± SD		7 ± 2.1	7.1 ± 2.2	−0.363[a]	.716
Apgar (5. minute), mean ± SD		7.9 ± 2.3	8 ± 2.4	−0.302[a]	.763
Two groups, n (%)	<2500	127 (23.5)	47 (17.6)	3.648[b]	.056
	≥2500	414 (76.5)	220 (82.4)		
Three groups, n (%)	<1500	34 (6.3)	10 (3.7)	4.137[b]	.126
	1500-2499	93 (17.2)	37 (13.9)		
	≥2500	414 (76.5)	220 (82.4)		

[a]Independent-samples t-test; [b]chi-square test.

when 3 anemic forms (mild, moderate, and severe) were taken into consideration.

Furthermore, there were no significant differences between anemic and non-anemic mothers concerning varying thresholds of birth weight (Table 3). There was a higher percentage of LBW babies in mothers in the severe anemia group (41.2% in severe anemia, 18.6% in mild anemia, and 17.6% in the no anemia group, *P* = .006) as compared with the mild anemia and no anemia groups, particularly having an LBW of ≥1500–2499 g (35.3% vs. 13.4% and 13.9%, respectively; *P* = .020) (Table 2). These findings suggest that while the overall maternal and fetal characteristics were similar across groups, the severity of maternal anemia had a significant impact on the incidence of LBW, particularly for babies with a birth weight between 1500 g and 2499 g.

Correlation and Regression Analyses

In correlation analysis, maternal hemoglobin was consistently correlated with fetal birth weight, height, and head circumference and inversely correlated with LBW (Table 3). In binary logistic regression analysis, maternal hemoglobin level (OR = 1.17, 95% CI:1.06-1.29, *P* = .0001) and severe anemia (OR = 3.28, 95% CI:1.54-6.95, *P* = .002) were independent risk factors for LBW. Multinomial univariate logistic regression analysis based on the degree of LBW showed that maternal hemoglobin level (OR = 1.23, 95% CI:1.04-1.46, *P* = .017) was an independent risk factor for VLBW. Moreover, maternal hemoglobin levels (OR=1.15, 95% CI:1.03-1.28, *P* = .012) and severe anemia (OR = 3.57, 95% CI:1.61-7.91, *P* = .002) were found to be independent risk factors for a birth weight between 1500 g and 2499 g, further emphasizing the significant role of maternal hemoglobin in determining birth weight outcomes (Table 4).

This suggests that higher hemoglobin levels are associated with better fetal growth and a lower likelihood of LBW. These findings highlight the critical role of maternal hemoglobin and anemia in determining fetal birth weight and the potential for interventions aimed at improving maternal hemoglobin levels to reduce the risk of LBW and VLBW.

Discussion

This study highlights the concerning prevalence of anemia among pregnant women in the third trimester, particularly in the context of its potential association with LBW and VLBW. With a

Table 2. A Comparison of the Mean Maternal and Newborn Clinical Characteristics of Those with Anemia Severity Forms and Without Anemia

Variables		Severe (n = 34, % = 4.2)	Moderate (n = 335, % = 41.5)	Mild (n = 172, % = 21.3)	No-anemia (n = 267, % = 33.0)	*P*
Maternal age, mean ± SD		26.2 ± 6.4	26.8 ± 6	26.9 ± 5.3	27.1 ± 5.1	.765
Delivery (gestational week), mean ± SD		37.1 ± 2.9	37.5 ± 2.9	38.2 ± 2.7	38 ± 2.6	.117
Birth weight, mean ± SD		2761 ± 778	2909 ± 764	2984 ± 701	3011 ± 642	.121
Birth, height mean ± SD		48 ± 2.6	47.8 ± 3.9	48.3 ± 2.8	48.4 ± 2.3	.138
HC, mean ± SD		34.6 ± 1.9	34.9 ± 1.8	35.1 ± 1.4	35.2 ± 1.5	.126
Apgar (1.minute), mean ± SD		6.3 ± 3	6.9 ± 2.3	7.4 ± 1.5	7.1 ± 2.2	.501
Apgar (5.minute), mean ± SD		7.2 ± 3.5	7.8 ± 2.5	8.3 ± 1.6	8 ± 2.4	.773
Two groups, n (%)	<2500	14 (41.2)	81(24.2)	32 (18.6)	47 (17.6)	.006**
	≥2500	20 (58.8)	254 (75.8)	140 (81.4)	220 (82.4)	
Three groups, n (%)	<1500	2 (5.9)	23 (6.9)	9 (5.2)	10 (3.7)	.020*
	1500-2499	12 (35.3)	58 (17.3)	23 (13.4)	37 (13.9)	
	≥2500	20 (58.8)	254 (75.8)	140 (81.4)	220 (82.4)	

One-way ANOVA test (Bonferroni), SD, standard deviation, chi-square test.

Table 3. Correlations of Maternal Hemoglobin With Fetal Birth Weight, Low Birth Weight, Height, and Head Circumference

Parameters	r	P
Birth weight	0.094	.008**
Birth height	0.080	.023*
HC	0.102	.004**
LBW	−0.109	.002**

LBW, Spearman coefficient; the others: Pearson coefficient, HC, head circumference.

prevalence rate of 67%, the anemia rate among the study's participants stands as one of the highest reported in African countries, only trailing behind the figure from the Republic of Benin at 68.2%.[10] To this knowledge, there have been only 3 reports from incidence of anemia in Somali pregnant women (44.4%, 49%, and 64.8 %).[3-5]

In this study, the distribution of anemia severity among pregnant women in their third trimester showed that moderate anemia was the most prevalent, accounting for 41.5% of the cases, followed by mild anemia at 21.3%, and severe anemia at 4.2%. This pattern of anemia severity is somewhat consistent with findings from other countries, such as Tanzania, where the distribution was 30.6%, 25.3%, and 26.3% for moderate, mild, and severe anemia, respectively,[11] and Egypt, where the rates were 39%, 21.1%, and 12%, respectively.[12] Understanding the distribution of anemia severity is crucial for tailoring effective public health strategies. The higher prevalence of moderate anemia in this study, as seen in other countries, emphasizes the need for targeted interventions that focus on both prevention and treatment. Given the relatively low prevalence of severe anemia (4.2%), it is possible that more widespread iron supplementation and nutritional improvements are helping to mitigate the most extreme cases of anemia. However, the moderate forms of anemia remain a significant concern, requiring further attention. As the severity of anemia increases, the risk of adverse pregnancy outcomes also escalates, making early detection and appropriate management critical. For more severe cases, interventions such as increased iron supplementation, dietary modifications, and possibly even blood transfusions may be necessary. In countries with high anemia rates, like the one in this study, promoting iron-rich diets, improving access to prenatal care, and ensuring the consistent provision of iron supplements can help reduce both the incidence and severity of anemia, ultimately improving maternal and fetal health outcomes.

In this study, the prevalence of LBW was found to be 21.5%, a concerning figure that underscores the need for targeted interventions to address the underlying factors contributing to LBW in this population. The prevalence of LBW in this study is in line with global trends, particularly in LMICs, where LBW rates tend to be highest, especially among the most vulnerable groups. Regional estimates of LBW further highlight the disproportionate burden in certain areas. In South Asia, the prevalence of LBW is alarmingly high at 47%, while in Southern Africa, it is 13%, and in West and Central Africa, it stands at 12%.[13] These rates indicate that while LBW is a global issue, certain regions face significantly higher challenges, with factors such as inadequate nutrition, limited access to quality healthcare, and socioeconomic vulnerabilities playing a major role. In regions like Sub-Saharan Africa, where access to prenatal care and nutrition is often inadequate, the risk of LBW is compounded by maternal anemia, infections, and poor maternal health conditions. The higher prevalence of anemia in this study population, combined with the LBW rate, suggests that addressing maternal health holistically by improving nutrition, iron supplementation, access to prenatal care, and overall healthcare infrastructure can play a crucial role in reducing LBW rates. To effectively tackle LBW in these regions, public health initiatives should focus on improving maternal nutrition, increasing access to quality prenatal care, and addressing socioeconomic disparities that contribute to poor health outcomes. Furthermore, healthcare systems should prioritize early identification and management of risk factors such as anemia, infections, and other conditions that increase the likelihood of LBW.

There have been discrepant reports concerning the association between maternal hemoglobin concentration and fetal birth weight. In a meta-analysis involving 26 studies in LMICs, only 17 studies reported an association between maternal anemia and

Table 4. Associations of Anemia and Anemia Severity Forms with Maternal Age, Delivery Weeks, Low Birth Weight, Very Low Birth Weight and a Birth Weight of ≥1500-2499 g

Dependent Variables	Independent Variables	OR (%95 CI)	P
Maternal age	Anemia	1.01 (0.99-1.04)	.394
	Severe	0.97 (0.91-1.0)	.377
	Moderate	0.99 (0.96-1.02)	.422
	Mild	0.99 (0.96-1.03)	.685
Delivery weeks	Anemia	1.04 (0.99-1.1)	.151
	Severe	0.91(0.81-1.01)	.092
	Moderate	0.94 (0.88-1.00)	.034
	Mild	1.03 (0.95-1.11)	.457
LBW (<2500 g)	Hemoglobin level	1.17 (1.06-1.29)	.001**
	Anemia	3.26 (2.67-3.98)	.057
	Severe	3.28 (1.54-6.95)	.002**
	Moderate	1.49 (1.00-2.23)	.051
	Mild	1.07 (0.65-1.76)	.790
VLBW (<1500 g)	Hemoglobin level	1.23 (1.04-1.46)	.017*
	Anemia	1.80 (0.87-3.72)	.109
	Severe	2.20 (0.45-10.74)	.330
	Moderate	1.99 (0.93-4.28)	.077
	Mild	1.41 (0.56-3.57)	.463
1500-2499 g	Hemoglobin level	1.15 (1.03-1.28)	.012*
	Anemia	1.33 (0.88-2.02)	.171
	Severe	3.57 (1.61-7.91)	.002**
	Moderate	1.36 (0.87-2.13)	.183
	Mild	1.02 (0.58-1.79)	.935

OR, odds ratio.

LBW.[14] This suggests that while there may be an association in some cases, it is not universally observed, and other factors might be contributing to LBW outcomes in these populations. Similarly, another meta-analysis focused on South Asian countries, which included 25 studies, found that 21 of them did report a higher incidence of LBW among babies born to anemic mothers. This points to a more consistent association between maternal anemia and LBW in South Asia, but it remains unclear why the relationship is not as strong or consistent in other regions.[15] Even in a Bangladesh study, a poverty-stricken country, no association was found between maternal anemia and LBW outcomes.[16] This result challenges the assumption that maternal anemia is always a major risk factor for LBW and suggests that there may be other underlying factors, such as socioeconomic conditions, access to healthcare, or even other nutritional deficiencies, that play a more prominent role in determining birth weight in certain settings. These inconsistencies highlight the need for more research to understand the complex interplay of maternal health, nutrition, and socioeconomic factors that contribute to LBW. While maternal anemia may be a significant factor in some contexts, it may not always be the primary determinant of LBW, especially in regions with different healthcare and socioeconomic conditions. Further studies should explore the potential confounding factors, such as maternal age, parity, nutritional status, and access to healthcare, that may influence the relationship between maternal anemia and fetal birth weight.

In the current study performed among Somali women in the third trimester of their pregnancies, the high incidence of anemia (67%) resulted in LBW births at 21.5%, as demonstrated with a significant correlation between maternal hemoglobin level and birth weight. Moreover, in logistic regression analysis, maternal hemoglobin level was found to be an independent risk factor for both LBW and VLBW. Another independent risk factor was severe anemia, but only for LBW of ≥1500-2499 g, not for VLBW (<1500 g) possible due to insufficient sample size. These findings are consistent with other studies that have reported a relationship between maternal anemia and adverse birth outcomes, although data on this association from African countries remain limited. For instance, a systematic review and meta-analysis of studies on South African pregnant women found a significant association between maternal anemia and LBW,[17] reinforcing the relevance of addressing anemia as a key factor in improving maternal and fetal health outcomes in the region. Similarly, in northwest Ethiopia, maternal anemia was identified as a predictor of poor pregnancy outcomes, including LBW, highlighting the importance of managing anemia to reduce the risk of adverse birth weights.[8]

The association between maternal anemia and LBW is a critical area for public health attention, particularly in Sub-Saharan Africa, where anemia remains highly prevalent among pregnant women. Addressing maternal anemia through improved nutrition, iron supplementation, and access to prenatal care could reduce the incidence of LBW and VLBW, ultimately improving maternal and neonatal health outcomes.

Given the compelling evidence that LBW is a significant risk factor for both child survival and development, this study aimed to highlight the impact of maternal anemia on LBW in an underdeveloped country, with the goal of raising awareness about these preventable public health issues. The findings from this study reveal alarmingly high incidences of both maternal anemia (67%) and LBW (21.5%), underscoring the urgent need for more effective interventions, especially in settings affected by poverty and conflict.

The high prevalence of maternal anemia and LBW in this war-stricken and impoverished country paints a stark picture of the limitations of current international efforts, including those driven by organizations such as the United Nations and UNICEF. Despite their work in promoting maternal and child health, these efforts appear to be insufficient in addressing the root causes of these problems in such vulnerable populations. This gap highlights the pressing need for more targeted and context-specific interventions, as well as greater investment in healthcare infrastructure, nutrition programs, and maternal care services.

International organizations, governments, and local communities must work together to prioritize maternal health in these high-risk environments. Interventions could include scaling up iron and micronutrient supplementation, improving prenatal care, strengthening public health systems, and addressing the socioeconomic factors that exacerbate the risks of anemia and LBW. Additionally, the focus should not only be on the immediate needs but also on long-term strategies to reduce poverty, improve education, and promote gender equality, which all play crucial roles in improving maternal and child health outcomes.

Strengths and Limitations

While it is true that the data from a single hospital may limit the broader applicability of the findings to the general population, the conclusions drawn from this study remain highly relevant and applicable to similar contexts, particularly in underdeveloped regions affected by poverty, conflict, and limited access to healthcare. The high prevalence of maternal anemia and LBW observed in this study mirrors the challenges faced by many low-resource settings, where similar socioeconomic and healthcare barriers exist. The study provides valuable insights into the impact of maternal aemia on fetal outcomes, which can be used to inform public health strategies in other comparable settings. Although the sample is geographically specific, the issues of anemia, LBW, and the need for effective maternal care are universal concerns in vulnerable populations. Therefore, the findings can serve as a foundation for further research and help guide targeted interventions in areas with similar socioeconomic conditions, healthcare infrastructure, and challenges. Furthermore, the study highlights the need for more comprehensive, large-scale research to confirm these associations across diverse settings and strengthen the evidence base for policy and programmatic recommendations. It also calls for increased attention to maternal health in conflict- and poverty-stricken areas, where addressing preventable conditions like anemia could have a significant impact on reducing LBW and improving maternal and child health outcomes.

This study found a high prevalence of maternal anemia (67%) and LBW (21.5%) among pregnant women in Somalia. These findings highlight the urgent need for improved antenatal care, nutritional education, and iron supplementation programs to reduce the burden of maternal anemia and its impact on birth outcomes.

Data Availability Statement: The data that support the findings of this study are available on request from the corresponding author.

Ethics Committee Approval: Ethical committee approval was received from the Ethics Committee of University of Mogadishu Somali Turkey Training and Research Hospital (Approval no: MSTH/15469/856, Date: 25.09.2023).

Informed Consent: Written informed consent was obtained from participants who participated in this study.

Peer-review: Externally peer reviewed.

Author Contributions: Concept – U.E., I.S.H., Design – U.E., I.S.H., A.B.; Supervision – U.E., I.S.H.; Resource – U.E., I.S.H., A.B. Materials – F.Y.Y.; Data Collection and/or Processing – U.E., I.S.H. Analysis and/or Interpretation – A.B., K.G., G.G.; Literature Search – G.T., P.Y., G.G., A.B.; Writing – A.B., G.T., P.Y.; Critical Review – A.B., K.G., G.T., P.Y., G.G.

Acknowledgements: The authors would like to express their sincere gratitude to the Somali women who participated in this study.

Declaration of Interests: The authors declare that they have no competing interest.

Funding: The authors declared that this study has received no financial support.

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