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ORIGINAL ARTICLE

Impact of Maternal Iron Deficiency Anemia on Pregnancy Outcomes in the Third Trimester: A Study at Shaikh Zayed Medical Complex, Lahore.

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ABSTRACT

Background: Iron Deficiency Anemia (IDA) is a common nutritional issue worldwide, especially during pregnancy. Pregnant women are particularly vulnerable due to increased iron requirements for fetal growth and maternal blood volume expansion. IDA can lead to serious maternal and neonatal complications, including low birth weight (LBW), preterm labor, and increased maternal fatigue and weakness. This study investigates the impact of maternal IDA on pregnancy outcomes during the third trimester at Shaikh Zayed Medical Complex, Lahore.

Methodology: A prospective study was conducted on 227 pregnant women between April and September 2023. Participants in their third trimester, with or without IDA, were selected based on inclusion and exclusion criteria. Data were collected through simple random sampling and analyzed using SPSS version 26. A chi-square test was used to evaluate the relationship between IDA and pregnancy outcomes, with $p < 0.05$ considered statistically significant.

Results: Among the 227 participants, 82.4% had IDA. Significant maternal outcomes included fatigue (p=0.059), weakness (p=0.001), and dizziness (p=0.018). Neonates born to IDA mothers had a higher prevalence of LBW (p=0.016). Other factors, such as gestational age and hospital stay duration, were nonsignificant.

Conclusion: IDA in the third trimester significantly affects maternal and neonatal health, causing fatigue, weakness, dizziness, and LBW in newborns. Early screening, proper supplementation, and nutrition education are crucial to minimize the adverse effects of IDA during pregnancy. Future studies should include larger sample sizes and long-term impact assessments.

Keywords: Iron Deficiency Anemia (IDA), Pregnancy Outcomes, Low Birth Weight (LBW), Third Trimester, Maternal Health.

INTRODUCTION

Iron deficiency Anemia (IDA) is the most common nutritional anemia globally, affecting approximately 2 billion people.[1] In Pakistan, as per the National Nutritional Survey, iron deficiency anemia is more common among pregnant women is higher in rural areas (18.7%) than in urban areas (17.4%). Sindh (23. 8%) contributes the most of the iron deficiency anemic pregnant women followed by Baluchistan (19.0%) and Punjab (18.7%).[2] The World Health Organization (WHO) reported that 35.6% of women are anemic worldwide.[3] According to World Health Organization, The prevalence of Iron Deficiency Anemia is a more common health problem than other vitamin B12 deficiencies and folate, etc.[4] Because of the increased need for the iron requirement to meet physiological changes like fetal-placental growth, and expansion of plasma volume and erythrocyte mass during pregnancy, women are susceptible to iron deficiency anemia.[5] Due to plasma volume and red blood cell mass expansion, the pregnant woman demands further 500-1000mg iron for fetal growth.[6] In 2nd and 3rd trimesters, most of the iron is transferred to the fetus from mother during pregnancy.[7]

Iron Deficiency anemia increases the risks of Infection, maternal mortality and morbidity, delayed post-delivery recovery, postpartum hemorrhage(PPH), antepartum hemorrhage (APH), longer hospital stay, pre-eclampsia, amniotic fluid embolism, heart failure, delayed uterine contractions[8] cesarean section, poor wound healing, perinatal bleeding, poor maternal thyroid status and even maternal death.[9] If the woman is anemic at the onset of pregnancy, then there will be a seven times increase in the risk of death due to postpartum hemorrhage.[10] Maternal iron deficiency anemia is also involved in fetal preterm delivery, (LBW) low birth weight, spontaneous abortion, intrauterine death, cognitive disability[11], low APGAR scores[12], and low iron stores in newborns.[13] The development of the brain in the fetus, newborns, and children requires iron.[14, 15]

An early diagnosis can reduce the consequences on maternal and fetal outcomes during pregnancy. Serum ferritin and hemoglobin (HB) levels are low in Iron deficiency anemia.[16] Serum ferritin has been recommended as the responsive screening test for iron status in pregnancy.[17] According to World Health Organization (WHO), ferritin levels in serum concentration <15 confirms a decline in iron stores.[18]

During pregnancy iron deficiency anemia is treated with oral and intravenous iron (IV) supplements. Pregnancy-related iron deficiency anemia (IDA) can be effectively treated with IV iron supplementation, reported in a systematic review and meta-analysis.[19] Study also reveals that IV is more effective during the third trimester of pregnancy.[20] This study aims to assess the association between maternal iron deficiency anemia during the third trimester of pregnancy and its outcomes at Shaikh Zayed Medical Complex.

MATERIALS AND METHODS

Study Design and Setting

This was a prospective observational study conducted at the Department of Obstetrics and Gynecology, Shaikh Zayed Medical Complex, Lahore. The hospital is a major tertiary care institution serving a diverse population from both urban and semi-urban regions of Punjab, Pakistan. The study was carried out over a six-month period, from April 2023 to September 2023, to evaluate the impact of maternal iron deficiency anemia (IDA) on pregnancy outcomes in the third trimester.

Ethical Approval

Prior to initiation, the research protocol was reviewed and approved by the Technical and Ethical Review Committee (TERC) of Shaikh Zayed Medical Complex. The ethical approval was granted under TERC ID: TERC/SC/INT/2025/420 and Reference No. 02-TERC/NHRC-SZH/INT-SCI/770. The study was conducted in accordance with the ethical principles laid out in the Declaration of Helsinki. Written informed consent was obtained from all participants after explaining the study objectives, procedures, and their right to withdraw at any point. The confidentiality and anonymity of participants were strictly maintained throughout the study.

Study Population and Sampling Technique

A total of 227 pregnant women were enrolled through simple random sampling. The inclusion criteria targeted women in their third trimester (gestational age greater than 27 weeks) who visited the antenatal outpatient department (OPD) and subsequently delivered at Shaikh Zayed Medical Complex during the study period. Participants were categorized into two groups based on their hemoglobin and ferritin levels: iron-deficiency anemic and non-anemic.

Eligibility Criteria

The inclusion criteria comprised pregnant women in their third trimester (≥28 weeks of gestation), confirmed either by last menstrual period or ultrasonographic evaluation, who were diagnosed with iron deficiency anemia or non-anemic status and were admitted for delivery at Shaikh Zayed Medical Complex. Women who could be reached through mobile contact after discharge for follow-up were also included.

The exclusion criteria included women who refused to give written informed consent and those previously diagnosed with hemoglobinopathies such as thalassemia or sickle cell anemia. Women with chronic medical conditions including chronic liver disease, chronic kidney disease, megaloblastic anemia, aplastic anemia, or any major surgical history were excluded. Additionally, pregnant women diagnosed with gestational diabetes mellitus, pre-eclampsia, gestational hypertension, thyroid disorders, or urinary tract infections were also excluded to reduce confounding variables.

Data Collection Procedure

Data collection was conducted prospectively through direct interviews, clinical examinations, and review of medical records. A pre-structured questionnaire was used to record socio-demographic data such as maternal age, educational status, parity, history of miscarriage, gestational age, and maternal weight. Clinical symptoms like fatigue, paleness, weakness, dizziness, and shortness of breath were documented in relation to anemia status.

Blood samples were taken to assess hemoglobin concentration and serum ferritin levels. Anemia was classified according to WHO criteria: non-anemic (Hb >11

g/dL), mild anemia (Hb 10–10.9 g/dL), moderate anemia (Hb 7–9.9 g/dL), and severe anemia (Hb <7 g/dL). Serum ferritin levels less than 15 ng/mL were considered indicative of depleted iron stores.

Pregnancy outcomes were observed and recorded at the time of delivery. Maternal outcomes included mode of delivery (vaginal or cesarean), type of cesarean section (elective or emergency), length of hospital stay, and the presence of symptoms such as fatigue or weakness. Neonatal outcomes included birth weight, gestational age at birth (term vs. preterm), body length, and APGAR scores at 1 and 5 minutes.

Operational Definitions

Low birth weight (LBW) was defined as a birth weight of less than 2500 grams. Preterm birth was defined as delivery before the completion of 37 weeks of gestation. Preterm births were further categorized into early preterm (<34 weeks) and late preterm (34–36 weeks). An APGAR score of less than 7 at 1 or 5 minutes was considered low and potentially indicative of neonatal distress.

Statistical Analysis

Data were entered using Microsoft Excel 2019 and analyzed using SPSS version 26. Descriptive statistics including frequency distributions and percentages were used to describe categorical variables. Cross-tabulations were performed to assess the distribution of maternal and neonatal outcomes between IDA and non-IDA groups.

Inferential statistics were applied to determine associations between anemia status and pregnancy outcomes. The Chi-square test was used for comparing categorical variables, and Fisher's exact test was applied when cell counts were small. A p-value of less than 0.05 was considered statistically significant. The results were presented in the form of tables and graphical charts, such as bar graphs and pie charts, particularly for anemia severity and ferritin level distributions.

RESULTS

A total of 227 pregnant women were enrolled in this study, all in their third trimester of pregnancy. The majority of participants (71.8%) were aged between 22–32 years, followed by 21.1% who were over 32 years of age, and only 7.0% were under 22 years. Regarding educational background, 42.3% had attained a bachelor's degree, while 33.0% had completed matriculation, and 24.7% were illiterate. In terms of weight, 56.5% of women weighed between 65–90 kg, while 35.0% were under 65 kg, and only 8.5% were over 90 kg. Most women (73.5%) had a gestational age above 220 days. When parity was assessed, 47.3% were in their third pregnancy, while 28.3% and 24.3% were in their first and second pregnancies respectively. Among those with a history of miscarriage, 64% had one miscarriage and 36% had more than one.

Table 1: shows the Distribution of Pregnant women by Maternal Demographics, Out of 227 participants, most of the participants were aged 22-32 years (71.8%), with 42.3% holding a bachelor's degree and 24.7% being illiterate. Most participants (56.5%) weighed 65-90 kg, and 73.5% were with gestational age (>220 days). Almost half (47.3%) were in their third pregnancy, while 28.3% were in their first pregnancy. Of women with a history of miscarriage, 64.0% had one miscarriage, and 36.0% had more than one.

Table 1: Distribution of Pregnant women by Maternal Demographics

Parameters	Numbers	Percentage
Age	**227**	**100.00%**
<22years	16	7.00%
22-32years-	163	71.80%
>32years	48	21.10%
Education	**227**	**100.00%**
Illiterate	56	24.70%
Matriculation	75	33.00%
Bachelors	96	42.30%
Weight	**200**	**100.00%**
<65kg	70	35.00%
65-90kg	113	56.50%
>90kg	17	8.50%
Gestational Age	**219**	**100.00%**
190-220,days	58	26.50%
>220,days	161	73.50%
Pregnancy number	**226**	**100.00%**
First Pregnancy	64	28.30%
Second Pregnancy	55	24.30%
Third Pregnancy	107	47.30%
Miscarriage	**50**	**100.00%**
1 Miscarriage	32	64.00%
>1 Miscarriage	18	36.00%

Table 2 Shows the Comparison of Maternal Characteristics with Iron deficiency anemia and Non-Iron Deficiency Anemia. Miscarriage was only significant among Maternal Demographic factors that differed between Iron deficiency anemic women and non-iron deficiency anemic women. Iron Deficiency Anemia was more frequent in those women with miscarriages.

Table2: Comparison of Maternal Demographics with IDA Status

Parameters	IDA n=187	Non IDA=38	P value
Age			0.28
<22years	11(68.8%)	5(31.3%)	
22-32years	137(84.0%)	26(16.0%)	
>32years	39(84.8%)	7(15.2%)	
Education			0.36
Illiterate	48(85.7%)	8(14.3%)	
Matriculation	64(86.5%)	10(13.5%)	
Bachelors	75(78.9%)	20(21.1%)	
Weight			0.442
<65kg	57(81.4%)	13(18.6%)	
65-90kg	94(83.9%)	18(16.1%)	
>90kg	16(94.1%)	1(5.9%)	
Gestational Age			0.599
190-220, days	46(80.7%)	11(19.3%)	
>220, days	134(83.8%)	26(16.3%)	
Pregnancy number			0.396
First Pregnancy	51(79.7%)	13(20.3%)	
Second Pregnancy	44(80.0%)	11(20.0%)	
Third Pregnancy	91(86.7%)	14(13.3%)	
Miscarriage			0.031
1 Miscarriage	31(96.6%)	1(3.1%)	
>1Miscarriage	14(77.8%)	4(22.2%)	

The majority of the participants are 22-32 years of age(84.0%) and > 32 years of age (84.8%), with education in the IDA group than in the non-IDA group. The P-value is 0.28 which is nonsignificant. Only miscarriages in the maternal demographics related to IDA status were significant with a P-value of 0.031. Most participants are 22-32 years of age, 137(84.0%), in the IDA group, compared to 26(16.0%) in the non-IDA group. The majority of participants have bachelors 75(78.9%) in the IDA group than in 20(21.1%). The majority 94(83.9%) weighed 65-90 kg in the IDA group than in the non-IDA group 18(16.1%). The majority of the population 134(83.8%) have gestational age >220 days and in the IDA group than in the non-IDA group 26(16.3%). The majority are of third pregnancies 91(86.7%) in the IDA group than in the NON-IDA group 14(13.3%). These demographics are nonsignificant values having a p-value of more than 0.05. The majority of the participants have 1 miscarriage 31(96.6%) and more than 1 miscarriage 14(77.8%) in the IDA group than in the non-IDA group 1(3.4%) and 4(22.2%) respectively and are significant with P value(P=0.031).

Distribution of Anemia Severity

The figure 1 shows the distribution of severity of anemia, 15.9% of the participants were non-anemic (Hb >11 g/dl), while the majority were anemic: 41.9% had mild anemia (Hb 10-10.9 g/dl), 42.3% had moderate anemia (Hb 7-9.9 g/dl), and none had severe anemia (Hb <7 g/dl). This highlights a significant frequency of mild to moderate anemia among pregnant women.

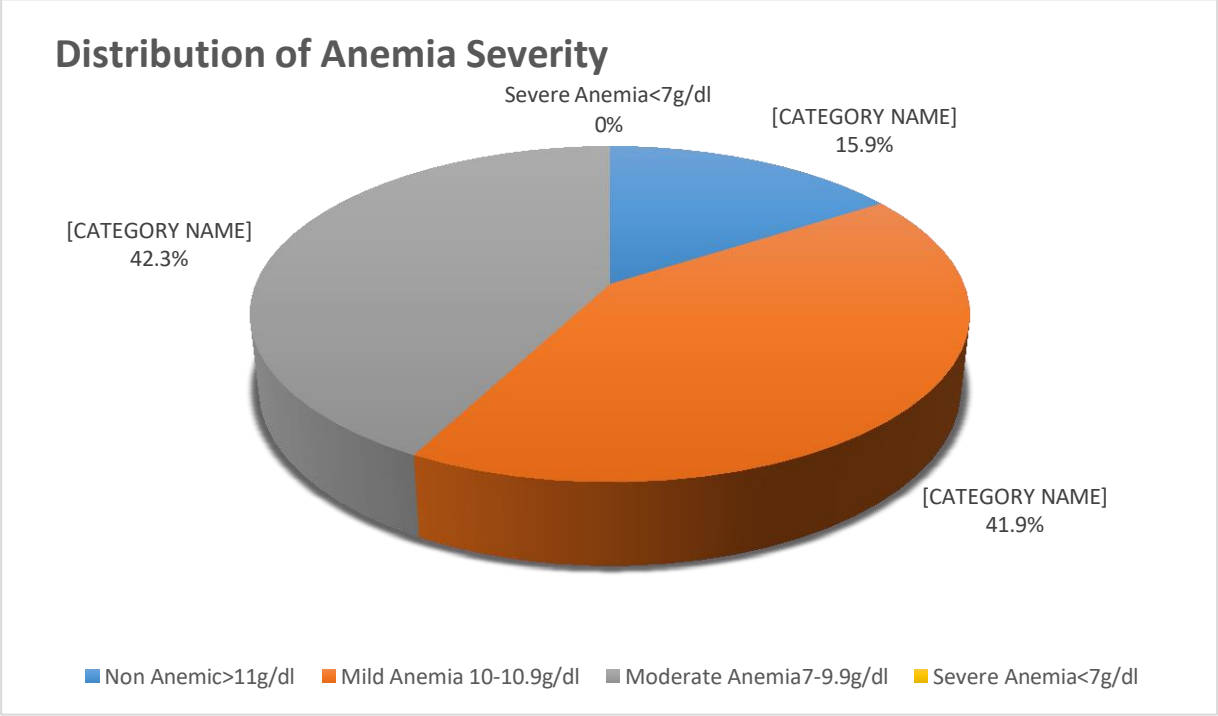

Figure 1: Birth weight comparison between neonates of IDA and non-IDA mothers (p = 0.016).

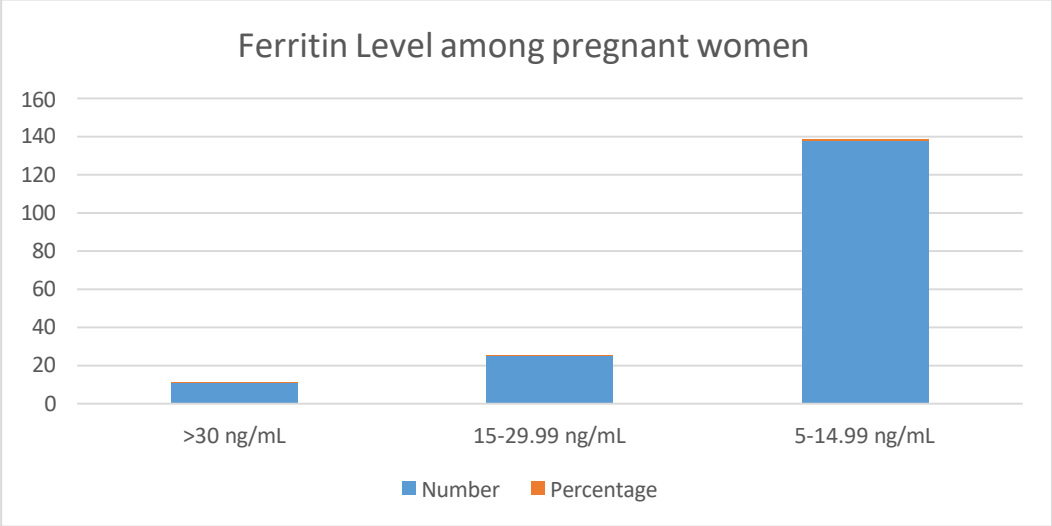

Figure 2: Ferritin level among pregnant women

Table 3: Maternal Outcomes during the third trimester and delivery

Maternal Factors	IDA n=187	Non-IDA n=38	P value
Symptoms			
Fatigue			0.059
None	15(78.9%)	4(21.1%)	
Mild	36(76.6%)	11(23.4%)	
Moderate	83(80.6%)	20(19.4%)	
Severe	53(94.6%)	3(5.4%)	
Weakness			0.001
None	18(58.1%)	13(41.9%)	
Mild	79(87.8%)	11(12.2%)	
Moderate	71(86.6%)	11(13.4%)	
Severe	19(86.4%)	3(13.6%)	
Paleness of skin			0.147
None	8(66.7%)	4(33.4%)	
Mild	64(83.1%)	13(16.9%)	
Moderate	99(82.5%)	21(17.5%)	
Severe	15(100%)	0(0.0%)	
Shortness of Breath			0.131
None	45(80.4%)	11(19.6%)	
Mild	72(85.7%)	12(14.3%)	
Moderate	70(83.3%)	14(16.7%)	
Severe	0(0.0%)	1(100.0%)	
Dizziness			0.018
None	57(77.0%)	17(23.0%)	
Mild	69(85.2%)	12(14.8%)	
Moderate	59(90.8%)	6(9.2%)	
Severe	0(0.0%)	1(100.0%)	
Gestational Age at Delivery			0.555
Preterm Labour	50(80.6%)	12(19.4%)	
Normal Labour	136(84.0%)	26(16.0%)	
Mode of delivery			0.076
Vaginal	61(89.7%)	7(10.3%)	
Cesarean Section	124(80.0%)	31(20.0%)	
Cesarean Section			0.255
1) Elective	50(75.8%)	16(24.2%)	
2) Emergency	74(83.1%)	15(16.9%)	
Stay in Hospital			0.96
<3 Days	62(86.1%)	10(13.9%)	
>3 Days	114(86.4%)	18(13.6%)	

Figure 2 shows that the most of pregnant women (60.8%) had low ferritin levels (5-14.99 ng/mL), indicating iron deficiency and 23.3% had very low ferritin levels (<4.99 ng/mL), further emphasizing significant iron deficiency. Only 4.8% of women had normal ferritin levels (>30 ng/mL), and 11.0% were in the borderline range (15-29.99 ng/mL). This indicates that significant number of expected mothers have iron deficiency anemia.

Table 3 Shows the Comparison of Maternal Outcomes during the third trimester and at the time of delivery with Iron deficiency Anemic women and Non-Iron deficiency Anemic women. Fatigue, Weakness, and Dizziness were among maternal outcomes that showed significant results. Women with Iron deficiency anemia appeared with symptoms of Fatigue, Weakness, and Dizziness. In the present study, the majority of participants shows moderate fatigue 83(80.6%), moderate paleness of skin99 (82.5 %), mild shortness of breath 72(85.7%), body pain 47(82.5%) in the IDA group than non-IDA group moderate fatigue 20(19.4%), moderate paleness of skin 21 (17.5 %), mild shortness of breath 12(14.3%), body pain 10(17.5%). These variables are non-significant having values greater than 0.05. The majority

of the participants have mild weakness 79(87.8%) mind dizziness 69(85.2%) in the IDA group than in the non-IDA group mild weakness 11(12.2%) mild dizziness 12(14.8%), these variables are significantly having a p-value less than 0.05 (p=0.001 for weakness and p=0.018 for dizziness).In our study, the majority of participants from IDA group 50 (80.6%) out of 62 have preterm labor as compared to non-IDA having 12 (19.4%), out of 155 participants 124 (80.0%) undergone caesarian section, in the IDA group as in non-IDA group 31 (21.0%). Our study also reveals that participants stayed in the hospital for < 3 days 62 (86.1%) and> 3 days 114 (86.4%) in the IDA group as compared to the non-IDA group 10(13.9%) and 18 (13.6%) respectively all mentioned variables are non- significant as p-value greater than 0.05.

Table 4 Shows the Comparison of Neonatal Outcomes with Iron deficiency anemic women and Non-Iron deficiency anemic women. Neonatal Birth weight was the only neonatal factor that differed significantly between iron-deficiency anemic women and non-iron deficiency anemic women. Neonates having mothers with Iron deficiency anemia during pregnancy appeared with low birth weight. In our study fetal factors such as low birth weight 40 (72.7%), abnormal length 52 (88.1%), preterm birth 50 (80.6%) {early preterm birth 3 (60 %) and late preterm birth 47 (82.5%)}, Apgar 1 minute <7 168(84.4%), Apgar 5 minutes < 7 21(95.5%) in the IDA group as compared to non IDA group low birth weight 15 (27.3%), abnormal length 7 (11.9 %), preterm birth 12 (19.4 %) {early preterm birth 2 (40.0 %) and late preterm birth 10 (17.5%)}, Apgar 1 minute <7 31(15.6%), Apgar 5 minutes < 7 1(4.5%) respectively. Only the low-birth-weight variable is significant having a p-value (p= 0.016)

Table 5 Shows the Comparison of before-delivery iron deficiency anemic women and noniron deficiency anemic women with severity of Anemia in After-delivery anemic women. Women with IDA were more likely to have mild or moderate anemia compared to those in the nonanemic group. Out of the 227patients 187 lay in the IDA group and 38 lay in the non-IDA group among before-delivered pregnant women, from the Ida group 75 (40.5 %) were mildly anemic, 69 (37.5 %) were moderately anemic, 0 (0.0%) severe anemic, and 40 (21.7%) are normal .p value (p= 0.037) suggests that there is an association between before delivery anemic pregnant women and after delivery for anemic women.

Table 4: Neonatal Outcomes

Fetal factors	IDA n=187	Non-IDA n=38	P value
Birth Weight			0.016
LBW	40(72.7%)	15(27.3%)	
Normal Birth Weight	144(86.7%)	22(13.3%)	
Length			0.239
Normal Length>47	127(81.4%)	29(18.6%)	
Abnormal length<47	52(88.1%)	7(11.9%)	
Preterm Birth			0.555
Normal Birth	136(84%)	26(16%)	
Preterm Birth	50(80.6%)	12(19.4%)	0.369
1) Early Preterm Birth	3(60.0%)	2(40.0%)	
2) Late Preterm Birth	47(82.5)	10(17.5%)	
Apgar 1 Min			0.2
Apgar>7	17(73.9%)	6(26.1%)	
Apgar<7	168(84.4%)	31(15.6%)	
Apgar 5 Min			0.102
Apgar>7	165(81.7%)	37(18.3%)	
Apgar<7	21(95.5%)	1(4.5%)	

Table 5: Comparison of Before IDA women and after Delivery Anemic women

Before Delivery Women	Severity of Anemia After Delivery				P Value
	Mild Anemia 10-10.9g/dl	Moderate Anemia 7-9.9g/dl	Severe Anemia <7g/dl	Normal >11g/dl	0.037
1) **Non IDA** 2) **n=38**	13(35.1%)	10(27.0%)	1(2.7%)	13(35.1%)	
3) **IDA** 4) **n=187**	75(40.5%)	69(37.5%)	0(0.0%)	40(21.7%)	

Overall, the findings of this study underscore the significant impact of maternal iron deficiency anemia (IDA) on both maternal well-being and neonatal outcomes during the third trimester. Statistically significant associations were observed between IDA and symptoms such as weakness (p = 0.001) and dizziness (p = 0.018), highlighting the clinical burden on pregnant women. Furthermore, low birth weight in neonates was significantly more prevalent in the IDA group (p = 0.016), indicating compromised fetal growth. Although variables like cesarean section rates, preterm birth, and APGAR scores were more frequent in anemic mothers, they did

not reach statistical significance. Notably, a significant relationship (p = 0.037) was found between anemia status before and after delivery, suggesting the persistence of iron deficiency postpartum. These results emphasize the need for early detection, nutritional support, and consistent monitoring of anemia in pregnancy to improve maternal and neonatal health outcomes.

DISCUSSION

227 pregnant women were included in our study which fulfills the inclusion criteria, In the present study, the majority of the participants lay 22-32 years of age 137(84.0%) in the IDA group than in the non-IDA group 26(16.0%) and had bachelors 75(78.9%) of participants in the IDA group than in 20(21.1%). The majority 94(83.9%) have a weight of 65-90kg in the IDA group than in the non-IDA group 18(16.1%) and the majority of the population 134(83.8%) have gestational age >220 days and in the IDA group than in the non-IDA group 26(16.3%) are with the study. The majority are of third pregnancies 91(86.7%) in the IDA group than in the NON-IDA group 14(13.3%), which is comparable with Sruor et al .[11] These demographics are nonsignificant values having a p-value of more than 0.05, and consistent with Rammohan et al[7] reported weight and gestational age were not associated with IDA. The majority of the participants have 1 miscarriage 31(96.6%) and more than 1 miscarriage 14(77.8%) in the IDA group than in the non-IDA group 1(3.4%) and 4(22.2%) respectively and were significant having P value =0.031.

In the present study, the majority of participants shows moderate fatigue 83(80.6%), moderate paleness of skin 99 (82.5 %), mild shortness of breath 72 (85.7%), body pain 47 (82.5%) in the IDA group than non-IDA group moderate fatigue 20(19.4%), moderate paleness of skin 21 (17.5 %), mild shortness of breath 12(14.3%), body pain 10(17.5%). These variables are nonsignificant having values greater than 0.05 contrasting with the findings Drukker et al.[9] The majority of the participants have mild weakness 79(87.8%) mind dizziness 69(85.2%) in the IDA group than in the non-IDA group mild weakness 11(12.2%) mild dizziness 12(14.8%), these variables are significant having p-value less than 0.05 (p = 0.001 for weakness and p = 0.018 for dizziness) consistent with the study Breymann[5] reported that fatigue, weakness, and dizziness were the most common symptoms among pregnant women with IDA. In our study, the most of participants from IDA group 50 (80.6%) out of 62 have preterm labor as compared to non-IDA having 12 (19.4%), out of 155 participants 124 (80.0%) undergone caesarian section, in the IDA group as in non-IDA group 31 (21.0%) align with the findings Gonidapaggari and Burwick.[19] Our study also reveals that participants stayed in the hospital for < 3 days 62 (86.1%) and > 3 days 114 (86.4%) in the IDA group as compared to the non-IDA group 10(13.9%) and 18 (13.6%) respectively all mentioned variables are nonsignificant as p-value greater than 0.05. However, the nonsignificant findings of hospital stays (<3 days or >3 days) in our study contrasted with findings from Tort et al.[10]

In our study fetal factors such as low birth weight 40 (72.7%), abnormal length 52 (88.1%), preterm birth 50 (80.6%) {early preterm birth 3 (60 %) and late preterm birth 47 (82.5%)}, Apgar 1 minute <7 168(84.4%), Apgar 5 minutes < 7 21(95.5%) in the IDA anemic women as compared to non IDA women low birth weight 15 (27.3%), abnormal length 7 (11.9 %), preterm birth 12 (19.4 %) {early preterm birth 2 (40.0 %) and late preterm birth 10 (17.5%)}, Apgar 1 minute <7 31(15.6%), Apgar 5 minutes < 7 1(4.5%) respectively. Only the low birth weight variable is significant having a p-value (p = 0.016) which is aligns with the findings by Algarin et al[12] mentioned adverse newborn outcomes including (LBW) low birth weight and low APGAR score due to maternal IDA.

Out of 227 participants, 187 were in the IDA group and 38 were in the non-IDA group among before-delivered pregnant women,75 (40.5 %) were mildly anemic, 69 (37.5 %) were moderate anemic, 0 (0.0%) were severely anemic and 40 (21.7%) were normal. The p-value (p= 0.037) suggests an association between before-delivery for anemic pregnant women and after-delivery for anemic women.

This study has a few important limitations. First, the limited number of participants and the fact that only one hospital was used for the study, make it difficult to apply the results to a larger, more diverse group of people at a multicenter. It was just a six months study and thus we could have overlooked changes in the rates of anemia which occurs with changes in seasons. We also used anticipated female to provide information such as their education and possible miscarriages in the past which is prone to mistake as people may not remember certain things. We did not consider some of the variables such as the diet status, income, or other health problems which may influence iron deficiency anemia (IDA). Finally, we did not follow mothers closely or in the period after delivery in order to determine the nature of the impact of IDA on the development of babies, and that restricts our insights about the longer-term consequences. The research of the future needs to incorporate a larger sample size and multicentrism in the data collection procedure as well as a more rigorous follow-up phase to determine the long-term effect of IDA on the maternal and neonatal health.

CONCLUSION

This study highlights how much iron deficiency anemia (IDA) may influence the health of both mothers and the babies during final trimester of pregnancy. Women with IDA were also more prone to such issues as experiencing tiredness, weakness, and dizziness, preterm delivery, and low birth weight babies. Another common factor was a history of miscarriage, which was associated with an increased IDA risk, whereas the gestational age and duration of mother's hospital stay were not.

Our findings emphasize the need to ensure the regular check-ups during pregnancy and prescribe iron supplements when needed to minimize the risks of IDA. Early screening, improved nutrition education and postpartum care programs are significant public health programs. In the future, the aim of the subsequent research must be to make up the drawbacks of this study through the involvement of more respondents, examining greater scope of factors, and tracking of mothers and babies over a more distinguished timeline to have the capacity to see and lead the methodology of addressing IDA more proficiently.

DECELARATION

Funding
No external funding was received for the conduct of this study.

Conflict of Interest
The authors declare no conflict of interest.

Ethical Approval
This study was approved by the Technical and Ethical Review Committee (TERC) of Shaikh Zayed Medical Complex, Lahore, under TERC ID: TERC/SC/INT/2025/420, Reference No. 02-TERC/NHRC-SZH/INT-SCI/770.

Informed Consent
Written informed consent was obtained from all participants prior to their inclusion in the study.

Authors' Contributions
All authors contributed equally to the conception, design, data collection, analysis, interpretation, and drafting of the manuscript. All authors read and approved the final version of the manuscript.

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REFERENCES

1. Saboor M, Zehra A, Hamali HA, Mobarki AA. Revisiting Iron Metabolism, Iron Homeostasis and Iron Deficiency Anemia. Clinical Laboratory. 2021(3).
2. UNICEF GoPa. National nutrition survey UNICEF; 2018 [Available from: https://www.unicef.org/pakistan/reports/national-nutrition-survey-2018-full-report-3-volumes-key-findings-report.
3. Organization WH. WHO Global Anaemia estimates, 2021 Edition 2021 [Available from: https://www.who.int/data/gho/data/themes/topics/anaemia_in_women_and_children.
4. Organization WH. Anemia [Available from: https://www.who.int/health-topics/anaemia#tab=tab_1.
5. Breymann C, editor Iron deficiency anemia in pregnancy. Seminars in hematology; 2015: Elsevier.
6. Crichton RR, Danielson BG, Geisser P. Iron therapy with special emphasis on intravenous administration: Uni-Med Verlag; 2008.
7. Rammohan A, Awofeso N, Robitaille M-C. Addressing Female Iron-Deficiency Anaemia in India: Is Vegetarianism the Major Obstacle? International Scholarly Research Notices. 2012;2012(1):765476.
8. Di Renzo GC, Spano F, Giardina I, Brillo E, Clerici G, Roura LC. Iron deficiency anemia in pregnancy. Women's Health. 2015;11(6):891-900.
9. Drukker L, Hants Y, Farkash R, Ruchlemer R, Samueloff A, Grisaru-Granovsky S. Iron deficiency anemia at admission for labor and delivery is associated with an increased risk for Cesarean section and adverse maternal and neonatal outcomes. Transfusion. 2015;55(12):2799-806.
10. Tort J, Rozenberg P, Traoré M, Fournier P, Dumont A. Factors associated with postpartum hemorrhage maternal death in referral hospitals in Senegal and Mali: a cross-sectional epidemiological survey. BMC pregnancy and childbirth. 2015;15:1-9.
11. Srour MA, Aqel SS, Srour KM, Younis KR, Samarah F. Prevalence of anemia and iron deficiency among Palestinian pregnant women and its association with pregnancy outcome. Anemia. 2018;2018(1):9135625.
12. Algarin C, Karunakaran KD, Reyes S, Morales C, Lozoff B, Peirano P, et al. Differences on brain connectivity in adulthood are present in subjects with iron deficiency anemia in infancy. Frontiers in aging neuroscience. 2017;9:54.
13. Annamraju H, Pavord S. Anaemia in pregnancy. British Journal of Hospital Medicine. 2016;77(10):584-8.
14. Georgieff MK. Iron deficiency in pregnancy. American journal of obstetrics and gynecology. 2020;223(4):516-24.
15. German KR, Juul SE. Iron and neurodevelopment in preterm infants: a narrative review. Nutrients. 2021;13(11):3737.
16. Joshi M, Gumashta R. Weekly iron folate supplementation in adolescent girls–an effective nutritional measure for the management of iron deficiency anaemia. Global journal of health science. 2013;5(3):188.
17. Milman N, Taylor CL, Merkel J, Brannon PM. Iron status in pregnant women and women of reproductive age in Europe. The American journal of clinical nutrition. 2017;106:1655S-62S.
18. Organization WH. Iron deficiency anaemia: assessment, prevention and control. 2001. https://www.who.int/publications/m/item/iron-children-6to23--archived-iron-deficiency-anaemia-assessment-prevention-and-control
19. Govindappagari S, Burwick RM. Treatment of iron deficiency anemia in pregnancy with intravenous versus oral iron: systematic review and meta-analysis. American journal of perinatology. 2019;36(04):366-76.
20. Igbinosa I, Berube C, Lyell DJ. Iron deficiency anemia in pregnancy. Current Opinion in Obstetrics and Gynecology. 2022;34(2):69-76.