MATERNAL ANEMIA AND ITS ASSOCIATION WITH PREGNANCY OUTCOMES

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Abstract:

Objective:

To assess the frequency of adverse outcomes due to maternal anemia.

Methodology:

This was a retrospective, cohort study of singleton deliveries registered in a tertiary care hospital, in Karachi from 2021 to 2022. The concentration of Hemoglobin between 10.0 to 10.09 g/dl is considered as mild anemia, while 9.0 to 7.0 g/dl concentration indicates moderate anemia, and < 7.0 g/dl hemoglobin concentration is known as severe anemia (WHO).during antenatal investigations. SPSS 22 was used to analyze the data, Qualitative data was interpreted as mean and standard deviation while categorical data were presented in frequencies and percentages. The chi-Square test was used to assess significance with a p-value of ≤0.05 as significant.

Results:

A total of 328 participants were included in the study, with a mean age of 26.7 ± 8.5 Years. Only 5 (1.7%) stillbirths were documented, while emergency caesarian deliveries for current pregnancy were reported in 138 (46%) along with 17 (5.7%) instrumental deliveries. Excessive blood loss was determined as ≥ 700mL in normal vaginal deliveries while ≥ 1100 mL in the caesarian section. Reported adverse outcomes in anemic mothers were low birth weight 84(25.6%), IUGR 23 (7%), and Low Apgar at 1 min and 5 min 32(9.7%) and 24 (7.3%) respectively. Intrauterine fetal death was reported in 3(0.9%) patients.

Conclusion:

It is critical to identify at-risk women and ensure that enough and timely care is delivered. The emphasis should be on good and enough maternal nutrition, and women should be encouraged to seek frequent antenatal care.

Keywords:

Maternal Anemia, Prenatal complications, maternal mortality

Introduction:

Anemia or low hemoglobin levels is a very common sign or disease being faced in daily clinical practice. It is more common in females and can be divided based on cause and also on the appearance of red cells on the blood peripheral smear. The management of anemia differs according to the type and cause. The most prevalent type is iron deficiency anemia which is due to low iron in the body either due to low dietary intake or increased persistent blood loss like menorrhagia, melena, per rectal bleeding secondary to hemorrhoids, or any other obvious source. [1]

Anemia of chronic disease is also common and can be associated with any ongoing chronic disease, neoplastic disease, or granulomatous process. This could be a result of active internal bleeding, defective iron or heme production, or due to certain paraneoplastic reactions leading to anemia. Other forms of anemia also include megaloblastic anemia due to folic acid or Vitamin B12 deficiency which could be dietary or due to intrinsic factor deficiency. There are also congenital defects in hemoglobin that can cause anemia such as thalassemia and sideroblastic anemia. These require blood transfusion with or without chelation and cannot be corrected by dietary replacement. [2]

Anemia hinders daily activities and causes an individual to feel lethargic and tired. The patient is short of breath and pale in appearance. In severe cases, anemic failure can occur and the patient can present in a much-deteriorated condition. Likewise, anemia in pregnancy can significantly affect any woman going through the physiological process of pregnancy. Pregnancy, on its demands the maximum input from the female body, and a body with low stores of hemoglobin can find it hard to catch up with this phenomenon. The prevalence of anemia in pregnancy is 41.8%.[3]

Lower hemoglobin levels impair the oxygen provided to the fetus and can cause intrauterine growth retardation (IUGR), also affecting normal organogenesis and tissue growth. The rapidly dividing and developing fetal tissues with higher metabolic rates demand an ample supply of oxygen and when compromised, get prone to damage. The fetal brain, for example, is very sensitive, and fetuses with maternal anemia are at a higher risk of developing schizophrenia, cognition disorders, autism spectrum disorder, and demyelination disorders. Not only is the fetus affected acutely but the child after birth is also exposed to developing demyelination in adulthood. The fetus is also prone to get born preterm and also could face poor bonding relations with the mother due to compromised neuronal development. Severe uncorrected anemia can also lead to fetal demise.[4]

Not only does the anemia impact the fetus but also adversely affects the mother. It is found to be associated with early fatigability, decreased physical activities, poor cognition, and depressive mood. Postnatally it can even cause decreased or inhibited lactation[5]. The mother can go into early labor and is at a higher risk of developing infections (chorioamnionitis) during pregnancy which can inevitably lead to premature rupture of membranes, the associated IUGR can also further depress the mother emotionally. Small gestational age is another independent risk factor of maternal anemia. [6]

Anemia is also found to be associated with the risk of developing pregnancy-induced hypertension, preeclampsia, insulin resistance, and gestational diabetes. Associated active blood losses secondary to placenta previa or per rectal bleeding from concomitant hemorrhoids can further aggravate the situation. [7] Any pre-existing coagulopathy or patients on blood thinners should be closely monitored to sharply pick any source of hemoglobin loss. However, declined body mass index also influences the pregnancy outcome including SGA.[8]

As pregnancy-associated anemia is iron deficiency anemia, iron supplementation is the mode of treatment for building up hemoglobin levels. Iron can be given in form of iron sucrose complex along with the advice of a high intake of "blood-forming" food. Iron sucrose can be given orally or intravenous serial supplementation with a check on Hemoglobin levels.[9] Keeping in mind, the hemodilution state during the second trimester due to water retention, a sudden drop in hemoglobin levels is observed. In this case, adequate food intake and oral supplementation are enough to sustain healthy hemoglobin for the continuation of pregnancy. [10] Aim of this study is to assess the effects of maternal anemia on fetal health and pregnancy outcomes.

Methodology:

This was a retrospective, cohort study of singleton deliveries registered in a tertiary care hospital, in Karachi from 2021 to 2022. No intervention for study purposes was done, however, all pregnant females admitted to the hospital for deliveries and who had low hemoglobin levels were included in the study. Mothers with diagnosed diabetes mellitus, pregnancy-induced hypertension, renal or cardiac anomalies, hemoglobinopathies, and/or multiple gestations were excluded from the study. A total of 1500 deliveries were recorded within 1 year of which 300 meet the inclusion criteria and enrolled in the study as per the diagnosis of maternal anemia, further divided into three subcategories of mild, moderate, and severe anemia. The concentration of Hemoglobin between 10.0 to 10.09 g/dl is considered as mild anemia, while 9.0 to 7.0 g/dl concentration indicates moderate anemia, and < 7.0 g/dl hemoglobin concentration is known as severe anemia (WHO).during antenatal investigations. The required information was gathered from medical records, including antenatal follow-up details, fetal development, mode of delivery, pregnancy outcomes, and fetal outcomes.

For pregnancy outcomes, emergency c-sections, preterm delivery, excessive blood loss, Placental abruption, the requirement of blood transfusion, and premature rupture of membranes were considered adverse outcomes. For fetuses, low birth weight, intrauterine growth restriction, neonatal intensive care transfer, infections, and small for gestational age were considered adverse outcomes. Statistical package for social sciences (SPSS) version 22 was used to analyze the data, Qualitative data was interpreted as mean and standard deviation while categorical data were presented in frequencies and percentages. The chi-Square test was used to assess significance with a p-value of ≤ 0.05 as significant.

Results:

A total of 328 participants were included in the study, with a mean age of 26.7 ± 8.5 Years. The most prevalently reported education was up to grade 10 with a frequency of 187 (57%) in

mothers, while intermediate with a frequency of 162 (49.3%) in fathers. 261 (79.5%) mothers were housewives and 289 (88.1%) lived in extended families. The most frequently reported monthly income was < 20,000 PKR. Mean gravida was 3.1 ± 1.4, including 39 (13%) previously reported miscarriages and/or abortions. (Table 01)

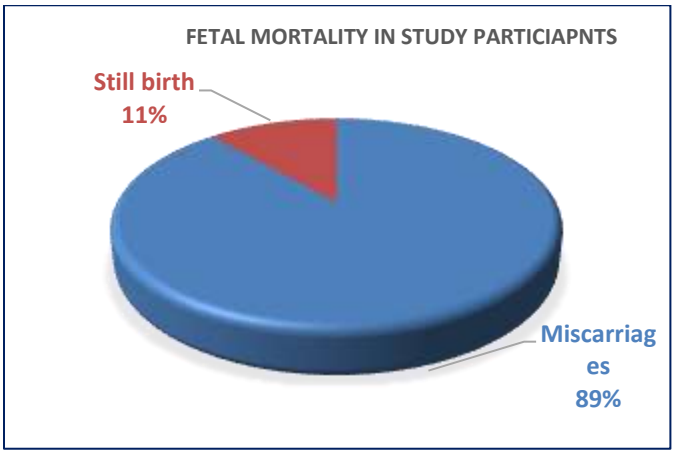
Table 01: Demographic details of study participants.

Variables	Frequency (%)
Age	26.7 ± 8.5
Maternal education	
Up to Grade 10	187 (57%)
Intermediate	54 (16.4%)
Graduation or Higher	87 (26.5%)
Paternal education	
Up to Grade 10	124 (37.8%)
Intermediate	162 (49.3%)
Graduation or Higher	42 (12.8%)
Employment status of mothers	
Employed outside home	67 (20.4%)
Housewife	261 (79.5%)
Family structure	
Nuclear	39 (11.8%)
Extended	289 (88.1%)
Monthly income (PKR)	
< 20 000	104 (31.7%)
20 000-30 000	97 (29.5%)
30 000-50 000	74 (22.5%)
> 50 000	53 (16.1%)

Only 5 (1.7%) stillbirths were documented, while emergency caesarian deliveries for current pregnancy were reported in 138 (46%) along with 17 (5.7%) instrumental deliveries.

Excessive blood loss was determined as ≥ 700mL in normal vaginal deliveries while ≥ 1100 mL in the caesarian section. (Figure 1)

Fig 1: Fetal mortality ratio in study participants



Reported adverse outcomes in anemic mothers were low birth weight 84(25.6%), IUGR 23 (7%), and Low Apgar at 1 min and 5 min 32(9.7%) and 24 (7.3%) respectively. Intrauterine fetal death was reported in 3(0.9%) patients. Similarly, adverse pregnancy outcomes were pre-mature delivery 89 (27.1%), Placental abruption 2 (0.6%), Premature rupture of membrane 21 (6.4%) while 29 (8.8%) required blood transfusion. Upon assessing relative risk with a confidence interval of 95%, adverse outcomes with anemia only negative risk were determined with placental abruption, however, the remaining risks had a positive risk of the outcome. The highest risk of prenatal adverse outcomes was reported in low birth weight with 3.8 RR and 2.4 – 6.3 lower to upper case CI. While the pre-mature birth rate had the highest positive relative risk with 4.1 RR and 2.4-8.7 lower to upper case CI. (Table 02)

Table 02: Frequency and relative risk estimation of maternal and prenatal adverse outcomes reported by study participants

Variables	Frequency (%)	Relative Risk	95% CI
Prenatal adverse outcomes			
Low birth weight	84 (25.6%)	3.8	2.4-6.3
IUGR	23 (7%)	2.1	1.3-3.7
Low Apgar at 1 min	32 (9.7%)	1.7	1.1-3.3
Low Apgar at 5 min	24 (7.3%)	2.8	0.7-5.8
Intrauterine fetal death	3 (0.9%)	2.4	1.4-5.2
Perinatal mortality	5 (1.5%)	1.7	0.8-3.2
Maternal adverse outcomes			
Premature birth	89 (27.1%)	4.1	2.4-8.7
Blood transfusion	29 (8.8%)	1.9	1.1-5.2
Placental abruption	2 (0.6%)	0.9	0.4-2.7
Emergency caesarian	107 (32.6%)	2.7	1.5-4.1
Premature rupture of membrane	21 (6.4%)	1.8	1.1-2.9
Maternal mortality	8 (2.4%)	1.1	0.8-2.5

Discussion:

Maternal anemia is a prevalent problem that gynecologists and obstetricians face around the world, particularly in developing nations. In this study, we discovered a link between anemia during pregnancy and poor mother and newborn outcomes. While this study sheds insight on the issue in a developing country, the findings cannot be generalized because they are focused on instances at a single facility. It lacks demographic diversity, and its retroactive nature increases the likelihood of missing/incomplete data. Several investigations have produced comparable findings to ours. Another study analyzed a large retrospective cohort of pregnant women in India, finding that 35% had moderate-to-severe anemia [11-12]. According to this study, anemic women were nine times more likely to have PPH. The risk increased 17-fold in anemic women who had an IOL and 19-fold in anemic women who had infections [13]. The following newborn outcomes were connected with anemia: LBW, SGA, and perinatal mortality [14-16]. Several studies from India have also revealed SGA, LBW, and preterm birth.

Other developing countries, such as Sudan, Tanzania, and Bangladesh, have experienced similar developments. Low placental weight, LBW/very LBW, poor APGAR score, SGA, birth asphyxia, fetal anemia, stillbirth, and premature delivery are all related to maternal anemia in these countries [17-21]. Preeclampsia, PPH, CS delivery, and infections are among the maternal unfavourable outcomes documented in the literature. Although the prevalence of nutritional anemia in pregnancy is modest and continues to fall in developed nations, it is nevertheless linked to poor mother outcomes [22].

Maternal anemia was found to increase the risk of antepartum hemorrhage, severe obstetric hemorrhage, the requirement for blood transfusion, postpartum infection, and maternal death in a Scottish retrospective cohort. Presently, no defined recommendations regulate the care of labor and delivery in women with moderate-to-severe anemia [23]. According to this study, the prevalence of anemia in the third trimester is on the higher side (38%). It is associated with a high risk of adverse maternal and fetal outcomes. Further data and high-quality protocols on optimal management of women with moderate-to-severe anemia throughout labor, delivery, and the postpartum period are urgently needed. We feel that this study has brought to light the prevalence and implications of prenatal anemia in Pakistani women [24-25]. There is a compelling need to improve maternal nutrition and women of reproductive age's overall health. Further interventional studies with larger samples at an epidemiological level and anemias of varied aetiologies are desperately needed. Research must be conducted to determine the benefit of treating anemia as an independent risk factor in predicting pregnancy outcomes. There should be a greater emphasis on raising awareness about the benefits of appropriate micronutrient replenishment on the health of both the mother and the newborn [26].

Multiparity, mother age, and education all play a role in managing nutritional demands throughout pregnancy to minimize anemia; participants with multiple gestations were anemic [27]. Although numerous research has been undertaken to determine the root cause of anemia in pregnancy, prevalence rates remain high, and the associated risks to mother and fetal health are severe [28]. A study conducted in Sindh province, Pakistan indicated the alarming incidence of anemia in young girls, stating the necessity for intervention at a younger age as well as in pregnant females, indicating that governmental efforts are constant in managing the health pandemic [29]. To sustain the complications of SGA after delivery, neonatal and infant follow-up, and guidance has been examined in national 26 studies indicating the importance of the first 1000 days of life following SGA delivery. These variables can be controlled by raising public knowledge about the nutritional relevance of reproductive-aged females [30-32].

Conclusion:

Maternal anemia is linked to poor maternal and newborn outcomes. It is critical to identify at-risk women and ensure that enough and timely care is delivered. Awareness programs must be launched to educate women about the need of maintaining their health and well-being during pregnancy to have healthy babies. The emphasis should be on good and enough maternal nutrition, and women should be encouraged to seek frequent antenatal care. Proper prenatal care will aid in the reduction of potentially harmful consequences such as third-trimester anemia. All women of childbearing age should be taught about the significance of good maternal nutrition, and awareness programs should not be limited to pregnant women.

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