"ANEMIA VS NON-ANEMIA: IMPACT ON DEPRESSION IN PREGNANCY"

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ABSTRACT

Background: Anemia and depression are prevalent during pregnancy, with iron deficiency potentially altering neurotransmitter function and exacerbating depressive symptoms. This study aimed to assess the association between anemia and depression and determine the effectiveness of a targeted intervention among pregnant women.

Methods: A quasi-experimental study was conducted among 70 pregnant women admitted to KLE's Dr. Prabhakar Kore Hospital and Research Center, Belagavi. Participants were selected via consecutive sampling and categorized into two groups: anemic (n=35) and non-anemic (n=35). Data were collected using the Edinburgh Postnatal Depression Scale (EPDS) through structured interviews and clinical observation. Following a baseline assessment, an intervention was administered to evaluate changes in depressive symptoms. Data were analyzed using descriptive statistics and inferential tests, including independent t-tests, paired t-tests, and Chi-square analysis.

Results: At baseline, anemic mothers exhibited significantly higher mean EPDS scores compared to non-anemic peers (12.06 ± 2.86 vs. 9.43 ± 2.23; $t = 4.291$, $p < 0.05$) and greater depression severity ($\chi^2 = 8.997$, $p = 0.008$). Post-intervention analysis indicated a significant reduction in depressive symptoms among the anemic group ($p < 0.05$), while neonatal outcomes remained comparable across both groups ($p > 0.05$).

Conclusion: Anemia is strongly associated with increased prevalence and severity of maternal depression. Targeted interventions effectively reduce depressive symptoms, highlighting the necessity of integrated hematological and psychological screening in prenatal care.

KEY WORDS:

Anemia, Non-anemic, Pregnant women, Depression, Hemoglobin, Edinburgh Postnatal Depression Scale (EPDS).

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INTRODUCTION

Hemoglobin levels below normal cause anemia, which is characterized by a reduction in the ability of red blood cells to deliver oxygen in tissues. Pregnant women undergo metabolic changes, fluctuations in hormone levels, and an increase in blood volume as the fetus grows. In order to support the fetus's growth and development and to meet the mother's increased blood volume requirements, the physiological demands for iron, folate, and other nutrients increase significantly[1].

Anemia, which is defined by a decrease in red blood cells capacity to carry oxygen to tissues, is brought on by hemoglobin levels below normal. As the fetus grows, pregnant women experience metabolic changes, hormone level oscillations, and an increase in blood volume. The physiological demands for iron, folate, and other nutrients rise dramatically to support the growth and development of the fetus and to fulfill the mother's increased blood volume requirements[2]. Iron deficiency anemia is one of the more prevalent types of anemia, particularly among women in underdeveloped nations. It has been linked to a number of other health issues as a cause or effect, but things get worse when a woman becomes pregnant and needs a healthier hematological profile for both her and the fetus's wellbeing. To effectively treat and prevent difficulties, the obstetric staff must be well-versed in this pregnant woman's hematological parameter while handling particularly booked instances[3]. Due to the higher iron requirements for fetal growth and red cell proliferation, pregnant women are especially vulnerable. When a woman is pregnant, her recommended dietary allowance (RDA) for iron rises from 18 mg to 27 mg[4].

A severe mental condition known as maternal depression negatively affects both the mother and the child[5]. Antenatal depression is linked to a higher risk of unfavorable obstetrical outcomes and normally manifests in the second and third trimesters[6]. The concept that these two factors are reciprocally related or that the relationship acts in both ways has not been examined to date[7]. Maternal anemia and postpartum depression have been linked in a few studies, however there is little information about a potential link between gestational anemia and prenatal depression. However, prenatal anxiety symptoms have been linked to maternal anemia. Due to their documented high comorbidity, anxiety and depression frequently impact the same patient population[8]. Anemia during pregnancy can have an impact on a mother's mental health during the pregnancy and/or postpartum period, in addition to birth outcomes. A recent meta-analysis found that anemia during pregnancy is strongly connected with an elevated risk of antepartum and postpartum depression, despite the fact that other studies have found no significant association between anemia and depression in pregnant persons. Depression can occur in any trimester of

pregnancy and during the postpartum period, although there is no evidence linking antepartum depression to postpartum depression. As a result, the effects of anemia during pregnancy on mental health may vary throughout trimesters as well as before and after birth[9].

As a result, it is crucial to monitor women's nutritional status during pregnancy. Geographical location, diet, and lifestyle all have an impact on the prevalence of anemia in pregnant women, which ranges from 14 to 80% in various civilizations. Numerous studies have demonstrated the impact of anemia on unfavorable pregnancy outcomes, such as preterm birth, low birth weight, premature rupture of membranes, pre-eclampsia, and fetal and mother fatalities. One of the most prevalent issues among expectant mothers is PPD and depression during pregnancy[10]. 280 million people worldwide suffer from depression, a neglected non-communicable disease that results in 0.7 million suicide deaths each year. 10% of pregnant women and 13% of postpartum women worldwide suffer from depression. Low-middle-income countries (LMICs) had greater rates of maternal anemia and postpartum depression than high-income countries (HICs). Pregnancy-related depression is linked to a 1.40-fold increased risk of preterm birth and a 1.49-fold increased risk of low birth weight kids. Intimate partner abuse, a lack of support from partners or society, socioeconomic level, delivery experience, and a history of mental illness, including pre-existing depression, are risk factors for postpartum depression. The brain's ability to operate is impacted by anemia, which results in a shortage of oxygen.It has been discovered that anemia reduces the amounts of neurotransmitters like serotonin, dopamine, and norepinephrine by impairing myelination and monoamine metabolism in the brain. Affected people's emotional and psychological functioning is subsequently altered, making them more susceptible to mental illnesses like depression. Additionally, anemia symptoms like weakness, exhaustion, and breathing difficulties, which lead to a loss of interest in everyday activities, can increase the risk of depression[11].

Globally, the prevalence of prenatal depression varies. Perinatal depression may be exacerbated by iron-deficiency anemia (IDA). The distribution of iron and ferritin in the brain is shown to be diverse. Its lack in glial cells can result in altered neuronal cell myelination and defective neurotransmitter metabolism, which can cause variation in brain development and a delay in motor maturation. One of the potential causes of maternal depression is the normal decrease in hemoglobin (Hb) in the middle of the pregnancy, which is brought on by the increasing requirement for fetal blood circulation[13]. For women, pregnancy and childbirth are life-altering events. Crucially, a woman is more susceptible to physical and psychological changes when she is unprepared for pregnancy and is affected by pregnancy hormones. But during this stage, mental health issues like depression and anxiety are more common. Pregnancy can cause a great deal of worry because of the unknown, even in women who are psychologically stable. Every woman experiences childbirth-related stress and anxiety differently. Due to their high prevalence during pregnancy, mental health issues like anxiety and depression

have become a major public health concern. Some pregnant women may have their first depressive episode. Depression was substantially correlated with a number of characteristics, including older age, lower educational attainment, marital issues, heavy household responsibilities, and pregnancy symptoms. According to Premji et al., those who suffer high levels of perceived stress, have more than three children, and had traumatic childhood experiences are more prone to experience anxiety and depression. Moreover, protracted labor and delayed breastfeeding initiation are more common in those with comorbid anxiety and depression (CAD)[14].

THE OBJECTIVES OF THE STUDY ARE:

- ❖ To assess the association between anemia and depression among anemic and non-anemic mothers.
- ❖ To determine the effectiveness of intervention related to anemia and depression in anemic and non-anemic mothers.

MATERIALS AND METHODS

This study utilizes a quantitative research approach with a quasi-experimental design to examine the relationship between anemia and depression among 70 pregnant women from postnatal wards of selected tertiary facility, Belagavi, Karnataka. Participants are recruited via consecutive sampling and categorized into two distinct groups based on clinical laboratory reports: an experimental group of 35 anaemic mothers and a comparison group of 35 non-anaemic mothers. Data collection involves a combination of structured interviews and the Edinburgh Postnatal Depression Scale (EPDS) to assess depressive symptoms, alongside the monitoring of Hemoglobin (Hb) levels. The methodology transitions from a comparative baseline assessment to an intervention phase, with results analyzed through descriptive statistics (mean, standard deviation) and inferential statistics, including independent t-tests to compare groups, paired t-tests to measure intervention effectiveness, and chi-square tests to identify associations with socio-demographic variables

- Prior permission will be obtained from the college authority.
- Consent will be taken from individual participants.

Eligibility criteria

- **Inclusion criteria**
  - Antenatal mothers who are in third trimester from antenatal wards at KLE'S Dr Prabhakar Kore Hospital and MRC Belagavi.
  - Antenatal mothers who are willing to participate in the study.

- **Exclusion criteria**

  - Antenatal mothers who is in first trimester and second trimester.
  - Mothers who are not willing to participate in the study.

RESULTS

Table 1 Comparison of Socio-demographic, Obstetric and Depression Characteristics between Anaemic and Non-Anaemic Mothers

		Group				Sig.
		Anaemic		Non-Anaemic		
		n	%	n	%	
APGAR SCORE 1 MIN	6.00	4	11.4	1	2.9	5.440 (0.144)
	7.00	21	60.0	21	60.0	
	8.00	10	28.6	9	25.7	
	9.00	0	0.0	4	11.4	
APGAR SCORE 5 MIN	7.00	2	5.7	0	0.0	6.734 (0.059)
	8.00	15	42.9	7	20.0	
	9.00	15	42.9	24	68.6	
	10.00	3	8.6	4	11.4	
TYPE OF FAMILY	Nuclear	21	60.0	20	57.1	0.059 (1.000)
	Joint	14	40.0	15	42.9	
RESIDENCE	Rural	26	74.3	27	77.1	0.078 (1.000)
	Urban	9	25.7	8	22.9	
EDUCATION LEVEL	Illiterate	2	5.7	0	0.0	20.852 (<0.05) *
	Primary	1	2.9	6	17.1	
	Secondary	31	88.6	16	45.7	
	Graduate	1	2.9	13	37.1	
	Postgraduate	0	0.0	0	0.0	
OCCUPATION	Housewife	33	94.3	31	88.6	1.650 (0.804)
	Laborer	0	0.0	0	0.0	
	Service	1	2.9	1	2.9	
	Business	1	2.9	2	5.7	
	Other	0	0.0	1	2.9	
HUSBAND EDUCATION	Illiterate	0	0.0	1	2.9	8.683 (0.026) *
	Primary	4	11.4	0	0.0	
	Secondary	20	57.1	14	40.0	
	Graduate	10	28.6	19	54.3	
	Postgraduate	1	2.9	1	2.9	
HUSBAND OCCUPATION	Laborer	9	25.7	9	25.7	2.451 (0.674)
	Farmer	6	17.1	4	11.4	
	Service	5	14.3	10	28.6	
	Business	6	17.1	5	14.3	
	Other	9	25.7	7	20.0	
MONTHLY INCOME	<5000	0	0.0	0	0.0	4.451 (0.109)
	5001-10000	2	5.7	8	22.9	
	10001-20000	22	62.9	16	45.7	
	>20000	11	31.4	11	31.4	

TYPE OF DIET	Vegetarian	8	22.9	11	31.4	4.115 (0.141)
	Non Vegetarian	11	31.4	4	11.4	
	Mixed	16	45.7	20	57.1	
a) NUMBER OF LIVING CHILDRENS	.00	19	54.3	15	42.9	4.194 (0.228)
	1.00	6	17.1	13	37.1	
	2.00	9	25.7	7	20.0	
	3.00	1	2.9	0	0.0	
b) HISTORY OF MISCARRIAGE	Yes	0	0.0	1	2.9	1.014 (1.000)
	No	35	100.0	34	97.1	
INTERVALS BETWEEN PREGNANCIES	.00	19	54.3	15	42.9	1.655 (0.680)
	<2 years	1	2.9	3	8.6	
	2-3 years	12	34.3	13	37.1	
	>3 years	3	8.6	4	11.4	
Scale	Mild depression	4	11.4	12	34.3	8.997 (0.008)*
	Moderate depression	26	74.3	23	65.7	
	Severe depression	5	14.3	0	0.0	

Table 1 The sociodemographic, obstetric, and depression-related traits of anaemic and non-anaemic women are compared in Table 1. Comparable immediate newborn outcomes were indicated by the distribution of APGAR scores at 1 and 5 minutes, which did not differ substantially between the two groups ($p = 0.144$ and $p = 0.059$, respectively). In a similar vein, no statistically significant differences were found between anaemic and non-anaemic mothers in terms of family type, place of residence, mother's and husband's occupations, monthly family income, diet type, number of living children, history of miscarriage, or inter-pregnancy interval ($p > 0.05$ for all).

But there was a significant association with maternal education level ($\chi^2 = 20.852$, $p < 0.05$), with non-anaemic mothers more likely to be graduates and anaemic mothers more likely to have completed secondary school. Furthermore, there was a statistically significant difference in the husbands' educational attainment between the groups ($\chi^2 = 8.683$, $p = 0.026$), with husbands of non-anaemic mothers typically having higher educational attainment.

Mothers who were anaemic and those who weren't showed a statistically significant difference in their depressive status ($\chi^2 = 8.997$, $p = 0.008$). While moderate and severe depression were more frequently seen in anaemic moms, mild depression was more common in non-anaemic mothers. This suggests that the anaemic group experienced a greater burden and severity of depressive symptoms. Overall,

the results indicate that mother education, husband's education, and the intensity of depression were strongly linked to maternal anaemia, even if the majority of sociodemographic and obstetric factors were similar between the two groups.

Table 2 Association between Anaemia Status and Levels of Depression (EPDS) among Mothers

		Group				Chi-square (Sig.)
		Anaemic		Non-Anaemic		
		n	%	n	%	
EPDS Scale	Mild depression	4	25.0	12	75.0	8.997 (0.008) *
	Moderate depression	26	53.1	23	46.9	
	Severe depression	5	100.0	0	0.0	

Table 2 The relationship between mothers' anaemia status and their EPDS depression scores is displayed. The degree of depression and anaemia status were found to be statistically significantly correlated (χ^2 = 8.997, p = 0.008). moms who were not anaemic were more likely to have mild depression (75.0%), while moms who were anaemic were more likely to experience moderate depression (53.1%). Interestingly, none of the mothers who were not anaemic reported having severe depression, whereas all of the mothers who had severe depression were anaemic (100%). According to these results, mothers who suffer from anaemia have more severe depressive symptoms.

Table 3 Comparison of Neonatal and Maternal Characteristics between Anaemic and Non-Anaemic Mothers

	Group								t	Sig.
	Anaemic				Non-Anaemic					
	Mean	SD	Median	IQR	Mean	SD	Median	IQR		
BABY WT	2.92	.27	2.80	0.40	3.03	.35	3.00	0.40	-1.58	0.12
AGE	25.66	3.25	26.00	5.00	25.00	2.90	25.00	4.00	0.89	0.38
GESTATIONAL AGE	37.49	1.34	37.00	2.00	37.43	1.58	38.00	2.00	0.16	0.87

Table 3 examines the differences in maternal and new born traits between women who are anaemic and those who are not. Anaemic mothers' new-borns had a slightly lower mean birth weight (2.92 ± 0.27 kg) than non-anaemic mothers' babies (3.03 ± 0.35 kg), although this difference was not statistically significant (t = −1.58, p = 0.12). Anaemic mothers' mean age was 25.66 ± 3.25 years, while non-anaemic mothers' mean age was 25.00 ± 2.90 years. There was no significant difference between the two groups' maternal ages (t = 0.89, p = 0.38). Similarly, there was no

significant difference in gestational age at delivery between mothers who were anaemic (37.49 ± 1.34 weeks) and those who were not (37.43 ± 1.58 weeks) (t = 0.16, p = 0.87).

Table 4 Comparison between Anaemia Status and Levels of Depression (EPDS) among Mothers

Group		n	Mean	SD	t	Sig.
TOTAL EPDS SCORE	Anaemic	35	12.06	2.86	4.291	<0.05*
	Non-Anaemic	35	9.43	2.23		

DISCUSSION

This study found a significant association between maternal anemia and depressive symptoms among third-trimester pregnant women. Anaemic mothers had higher total EPDS scores (12.06 ± 2.86) than non-anaemic mothers (9.43 ± 2.23, $p < 0.05$), with moderate and severe depression more common in the anaemic group. All cases of severe depression were reported exclusively among anaemic mothers, suggesting that anemia may contribute to increased severity of depressive symptoms.

Most sociodemographic and obstetric characteristics, including family type, residence, maternal occupation, income, number of children, and inter-pregnancy interval, did not differ significantly between the groups. However, maternal and husband education levels were higher in the non-anaemic group, indicating that education may provide a protective effect against both anemia and its psychological consequences, possibly by improving nutritional knowledge, healthcare-seeking behavior, and adherence to prenatal care.

Neonatal outcomes, including APGAR scores and birth weight, were slightly lower in babies of anaemic mothers but not statistically significant, suggesting that moderate maternal anemia may primarily affect maternal mental health rather than immediate neonatal well-being. These findings align with previous research linking iron deficiency to neurotransmitter dysregulation and mood disturbances, emphasizing the dual impact of anemia on physical and psychological health during pregnancy.

In conclusion, anemia in pregnancy is associated with increased depressive symptoms, highlighting the need for integrated prenatal care that addresses both nutritional and mental health. Early screening and management of anemia, along with mental health support, could improve maternal well-being and potentially mitigate adverse outcomes. Future research with larger, longitudinal studies is recommended to explore causal pathways and effective interventions.

CONCLUSION

Anaemic pregnant women exhibited significantly higher depressive symptoms compared to non-anaemic women, with moderate and severe depression occurring

primarily in the anaemic group. Maternal and husband education appeared to influence anemia status, while most other sociodemographic and obstetric factors were similar. These results suggest that anemia during pregnancy is associated with increased depression, highlighting the importance of combined nutritional and mental health interventions.

LIMITATIONS AND FUTURE RECOMMENDATIONS

The study had a small sample size and was conducted at a single healthcare facility, which may limit the generalizability of the findings. Its cross-sectional design prevented assessment of causal relationships, and long-term maternal or neonatal outcomes were not evaluated. Future research should involve larger, multi-center, and longitudinal studies to better understand the link between anemia and depressive symptoms. Experimental studies assessing the effectiveness of nutritional or mental health interventions are also recommended to reduce depression among anaemic pregnant women.

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