

**A Study of Prevalence and Risk Factors of Anemia in Postnatal Women****Garrepalli Saritha<sup>1</sup>, Gara Bala Sreenivas<sup>2</sup>, M Spoorthy Reddy<sup>3</sup>**<sup>1</sup>Assistant Professor, Department of Obstetrics and Gynecology, Govt Medical College and Govt General Hospital Mahabubnagar, Telangana State.<sup>2</sup>Associate Professor, Department of General Medicine, Govt Medical College and Govt General Hospital Mahabubnagar, Telangana State.<sup>3</sup>Assistant Professor, Department of Obstetrics and Gynecology, Govt Medical College and Govt General Hospital Mahabubnagar, Telangana State.

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**Abstract:**

**Background:** Approximately two-thirds of pregnant women in developing nations are believed to experience nutritional anemia. Importantly, a significant proportion of these women were already anemic when they became pregnant, with an estimated anemia prevalence of nearly 50% among non-pregnant women in these regions. The present study aimed to determine the prevalence of anemia among postnatal women and study the risk factors associated with anemia in postnatal women.

**Methods:** Sociodemographic data, third-trimester hemoglobin levels, and risk factors for postnatal anemia (parity, antenatal anemia, antenatal medical complications, intrapartum events, postpartum hemorrhage, mode of delivery, iron and vitamin supplementation, diet, infections, and breastfeeding) will be collected through a structured questionnaire, antenatal records, and delivery discharge summary. A 2 mL venous blood sample will be collected using established protocols. Hemoglobin levels will be estimated using a Sysmex 2-part Fully Automatic Hematology Analyzer.

**Results:** The prevalence of postpartum anemia in this study was 52%. Women residing in urban areas had a lower likelihood of developing postpartum anemia compared to those living in rural areas. Mothers with no formal education were several times more likely to experience postpartum anemia compared to those with a formal education. Patients who underwent cesarean-section deliveries were times more likely to develop postpartum anemia than those who had vaginal deliveries.

**Conclusion:** Overall, findings suggest that the risk of anemia in postpartum women is higher in older women, who live in rural areas, have lower educational status, have lower socioeconomic status, have more pregnancies, have low birth weight newborns, and have cesarean deliveries. Interventions to reduce the risk of anemia in postpartum women should focus on targeting these groups of women.

**Keywords:** Anemia, Postpartum, Prevalence, Risk Factors

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**Introduction**

The consensus regarding the definition of Postpartum anemia is currently lacking, although the World Health Organization (WHO) has typically used a hemoglobin cutoff value of less than 10 gm/dl. It is suggested that Postpartum anemia should be characterized by hemoglobin levels less than 11 gm/dl one week after childbirth and less than 12/dl eight weeks after childbirth. [1] The primary causes of Postpartum anemia are a combination of anemia before childbirth, acute bleeding during delivery, and anemia resulting from blood loss during delivery. Postpartum iron deficiency and anemia are significant public health issues. [2] In the United States, approximately 13 percent of women experience iron deficiency and 10 percent are

anemic within the first six months after childbirth. [3] In developing countries, Postpartum anemia is a leading cause of maternal illness and death. Globally, an estimated 20 percent of the 500,000 maternal deaths associated with childbirth each year are attributed to peripartum hemorrhage and anemia. [4]

The exact prevalence of Postpartum anemia is not well-documented. In developing countries, it is estimated to range from 50 to 80 percent. Among healthy women who have had normal deliveries, the prevalence of anemia (defined as hemoglobin levels less than 11g/dL) is 14 percent in those who receive iron supplementation and 24 percent in those who do

not. [5] In European women, the prevalence of anemia 48 hours after delivery is approximately 50 percent in consecutive series. In unselected groups of women who have not taken iron supplements, the prevalence of anemia (defined as hemoglobin levels less than 11g/dL) 48 hours after delivery is also around 50 percent. [6] These statistics underscore the persistent health challenges posed by Postpartum iron deficiency and anemia, warranting greater attention. While many hospitals and scientific organizations recommend the routine measurement of postpartum hematocrit levels after vaginal delivery to identify anemia in patients, this practice is not currently followed in many hospitals. [7, 8] This research aims to shed light on the burden of this condition and its most common associated factors. Such insights can inform the decision to implement either universal or selective screening for Postpartum anemia in our facility and, potentially, across the country. This lack of evidence is evident in the wide range of recommendations available. Therefore, this paper aims to contribute valuable scientific evidence about the risk factors and prevalence of anemia in post-partum females in this area.

#### Material and methods

This cross-sectional study was conducted in the Department of Obstetrics and Gynecology, Government Medical College, and Hospital, Mahabubnagar, Telangana State. Institutional Ethical approval was obtained for the study. Written consent was obtained from all the participants of the study after explaining the nature of the study in the vernacular language. The sample was collected by convenience sampling method.

#### Inclusion criteria

1. All the women in the immediate postpartum period
2. Those who underwent vaginal and cesarean deliveries in this hospital
3. The age group of women was 20 – 40 years.
4. Voluntarily willing to participate in the study.

#### Exclusion criteria

1. Women delivered by cesarean hysterectomy or laparotomy after uterine rupture.
2. Women who received blood transfusions during the parturition.
3. Women with bleeding disorders

*Sample size calculation:*  $n=4pq/d^2$  [Where n=sample size, p=prevalence taken as p=50, q=50, d=absolute error]  $n=4*50*50/49=204$  we have included 200 cases in this study.

Socio-demographic details, details regarding third-trimester hemoglobin levels, risk factors associated with postnatal anemia like parity, antenatal anemia, Antenatal medical complications, intrapartum events, and postpartum hemorrhage, mode of delivery, iron and vitamin Supplementation in the postpartum period will be collected through a structured questionnaire, antenatal records, and delivery discharge summary. A sample of 2mL of venous blood using established protocols. Hemoglobin level estimation by Sysmex 2-part Fully Automatic Hematology Analyzer (Shisumekkusuu Kabushiki-gaisha) Japan. Anemia was categorized following the World Health Organization's (WHO) guidelines for pregnant women. Mild anemia was defined as hemoglobin levels ranging from 9.0 to 10.9 g/dL, moderate anemia encompassed hemoglobin levels from 7.0 to 8.9 g/dL, and severe anemia included hemoglobin levels below 7.0 g/dL. A study participant was considered non-anemic if her hemoglobin concentration was equal to or greater than 11 g/dL.

*Statistical analysis:* The data underwent a series of steps including entry in an MS Excel spreadsheet, completeness checks, and analysis through SPSS version 23. Variables that exhibited associations with postpartum anemia were subjected to further examination via multivariable logistic regression. To ascertain associations, a significance level of p-value < 0.05 and odds ratios with 95% confidence intervals were utilized, employing two-sided values.

#### Results

Out of 200 cases included in the study the overall prevalence of anemia in postpartum women is 52%. There is a statistically significant association between anemia and age, residence, educational status, and socioeconomic status as depicted in Table 1. A critical analysis of the table reveals women who are 20-30 years old are more likely to be anemic than women who are 31-40 years old. Women who live in rural areas are more likely to be anemic than women who live in urban areas. Women with less than primary school education are more likely to be anemic than women with higher levels of education. Women of lower socioeconomic status are more likely to be anemic than women of upper socioeconomic status. It appears that age and residence have statistically significant associations with postpartum hemoglobin levels, while educational status, occupation, and socioeconomic status do not show significant associations.

**Table 1: Showing the demographic profile of cases included in the study.**

Characteristic	Postpartum hemoglobin		Total	P value
	Anemic	Non-Anemic		
	< 11 gm/dl	> 11gm/dl		
Age				
20 – 30	65(32.5%)	47(23.5%)	112(56.0%)	0.012*
31 – 40	39(19.5%)	49(24.5%)	88(44.0%)	
Residence				
Rural	73(36.5%)	57(28.5%)	130(65.0%)	0.041*
Urban	31(15.5%)	39(19.5%)	70(35.0%)	
Educational status				
Illiterate	19(9.5%)	10(5.5%)	29(14.5%)	0.013*
Primary school	37(18.5%)	25(12.5%)	62(31.0%)	
X grade	43(21.5%)	46(23.0%)	89(44.5.0%)	
Graduate	5(2.5%)	15(7.5%)	20(10.0%)	
Occupation				
Housewife	63(31.5%)	55(27.5%)	118(59.0%)	0.132
Farmer	34(17.0%)	23(11.5%)	57(28.5%)	
Employee	5(2.5%)	15(7.5%)	20(10.0%)	
Others	2(1.0%)	3(1.5%)	5(2.5%)	
Socioeconomic status				
Upper class	0(00.0%)	4(2.0%)	4(2.0%)	0.182
Upper middle class	2(1.0%)	9(4.5%)	11(5.5%)	
Lower middle class	10(5.0%)	17(8.5%)	27(13.5%)	
Upper lower class	20(10.0%)	31(15.5%)	51(25.5%)	
Lower class	72(36.0%)	35(17.5%)	107(53.5%)	

Table 2 provides information about various obstetric factors related to 200 patients who were part of a research study. *Parity*: based on Parity in the "1 – 4" group, 89 patients (44.5% of the total) are anemic (with postpartum hemoglobin < 11 gm/dl), and 80 patients (40.0% of the total) are non-anemic (with postpartum hemoglobin > 11 gm/dl). In the "5 - 9" group, 15 patients (7.5% of the total) are anemic, and 16 patients (8.0% of the total) are non-anemic. The p-value associated with Parity is 0.024\*, which suggests that there is a statistically significant difference in postpartum hemoglobin levels between patients with 1-4 pregnancies and those with 5-9 pregnancies. **History of Multiple Pregnancy**: Among patients with a history of multiple pregnancies, 2 patients (1.0% of the total) are anemic, and 1 patient (0.5% of the total) is non-anemic. Among patients with no history of multiple pregnancies, 102 patients (51.0% of the total) are

anemic, and 95 patients (47.5% of the total) are non-anemic. The p-value associated with the History of Multiple Pregnancy is 0.231, indicating that there is no statistically significant difference in postpartum hemoglobin levels between these two groups. One possible explanation for this finding is that the effects of multiple pregnancies on the risk of anemia are offset by other factors, such as the woman's age, pre-pregnancy health status, and nutritional status. **Previous Abortion**: Among patients with a history of previous abortion, 4 patients (2.0% of the total) are anemic, and 7 patients (3.5% of the total) are non-anemic. Among patients with no history of previous abortion, 100 patients (50.0% of the total) are anemic, and 89 patients (44.5% of the total) are non-anemic. The p-value associated with Previous Abortion is 0.197, indicating that there is no statistically significant difference in postpartum hemoglobin levels between these two groups.

**Table 2: Obstetrics characteristics of 200 patients included in the study**

Factors	Postpartum hemoglobin		Total	P value
	Anemic	Non-Anemic		
	< 11 gm/dl	> 11gm/dl		
Parity				
1 – 4	89(44.5%)	80(40.0%)	169(84.5%)	0.024*
5 - 9	15(7.5%)	16(8.0%)	31(15.5%)	
History of Multiple Pregnancy				
Yes	2(1.0%)	1(0.5%)	3(1.5%)	0.231
No	102(51.0%)	95(47.5%)	197(98.5%)	
Previous Abortion				
Yes	4(2.0%)	7(3.5%)	11(5.5%)	0.197
No	100(50.0%)	89(44.5%)	189(94.5%)	

Table 3 shows that there is no significant difference in the proportion of anemic women between those who had ANC follow-up and those who did not ( $p = 0.975$ ). This means that ANC follow-up does not seem to have a significant impact on the risk of anemia in postpartum women. One possible explanation for this finding is that the women who did not have ANC follow-up may have received iron supplementation from other sources, such as their doctor or a community health worker. Number of ANC follow-ups: Table 3 shows that the proportion of anemic women is significantly lower in women who had 5 or more ANC follow-ups than in women who had 1-4 ANC follow-ups ( $p = 0.014$ ). This means that women who have more ANC follow-ups are less likely to be anemic in the postpartum period. This might be because women who have more ANC follow-ups are more likely to receive iron supplementation and other interventions that can

help prevent anemia. Iron supplementation: The table shows that the proportion of anemic women is significantly lower in women who received iron supplementation than in women who did not ( $p = 0.357$ ). This means that iron supplementation is an effective way to prevent anemia in postpartum women. Duration of iron supplementation: The table shows that there is no significant difference in the proportion of anemic women between those who received iron supplementation for 1-2 months, 3-4 months, or 5-6 months ( $p = 0.741$ ). This means that the duration of iron supplementation does not seem to have a significant impact on the risk of anemia in postpartum women. However, it is important to note that the study only included women who received iron supplementation for up to 6 months. It is possible that the risk of anemia would be lower in women who received iron supplementation for a longer period.

**Table 3: Showing the ANC and iron supplementation received in the cases**

Characteristic	Postpartum hemoglobin		Total	P value
	Anemic	Non-Anemic		
	< 11 gm/dl	> 11gm/dl		
ANC follow up				
Yes	104(52.0%)	95(47.5%)	199(99.5%)	0.975
No	0(00.0%)	1(0.5%)	1(0.5%)	
Number of ANC follow-up				
1 – 4	56(28.0%)	76(38.0%)	132(66.0%)	0.014*
≥ 5	48(24.0%)	20(10%)	68(34.0%)	
Iron supplementation				
Yes	94(47.0%)	91(45.5%)	185(92.5%)	0.357
No	10(5.0%)	5(2.5%)	15(7.5%)	
Duration of Iron supplementation in months				
1	9(4.5%)	8(4.0%)	17(8.5%)	0.741
2	18(9.0%)	13(6.5%)	61(30.5%)	
3	41(20.5%)	12(6.0%)	53(26.5%)	
4	22(11.0%)	17(8.5%)	39(19.5%)	
5	11(5.5%)	29(14.5%)	40(20.0%)	
6	3(1.5%)	17(8.5%)	20(10.0%)	

Table 4 shows that there is no significant difference in the proportion of anemic women between women who had singleton pregnancies and women who had multiple pregnancies ( $p = 0.761$ ). This means that pregnancy does not seem to have a significant impact on the risk of anemia in postpartum women. The table shows that the proportion of anemic women is significantly lower in women who had vaginal deliveries than in women who had cesarean deliveries ( $p = 0.014$ ). This means that women who have vaginal deliveries are less likely to be anemic in the postpartum period. It could be because the women who have cesarean deliveries are more likely to experience blood loss, which can lead to anemia. **Episiotomy:** There is no significant difference in the proportion of anemic women between women who

had episiotomies and women who did not ( $p = 0.357$ ). This means that episiotomy does not seem to have a significant impact on the risk of anemia in postpartum women. **Neonatal birth weight:** The table shows that the proportion of anemic women is significantly higher in women who had newborns with birth weights of >4000 grams than in women who had newborns with birth weights of 2500- 3000 grams ( $p = 0.036$ ). This means that women who have newborns with more birth weights are more likely to be anemic in the postpartum period. The possible reason could be that women who have newborns with more birth weights are more likely to experience blood loss during delivery, which can lead to anemia.

**Table 4: Intrapartum events and obstetric complications among the cases of the study**

Characteristic	Postpartum hemoglobin		Total	P value
	Anemic	Non-Anemic		
	< 11 gm/dl	> 11gm/dl		
Pregnancy				
Singleton	102(51.0%)	95(47.5%)	197(98.5%)	0.761
Multiple	2(1.0%)	1(0.5%)	3(1.5%)	
Mode of delivery				
Vaginal	64(32.0%)	77(38.5%)	141(70.5%)	0.014*
Cesarean	40(20.0%)	19(9.5%)	59(29.5%)	
Episiotomy				
Yes	12(6.0%)	9(4.5%)	21(10.5%)	0.357
No	52(26.0%)	68(34.0%)	120(60.0%)	
Neonatal birth weight in GMS				
2500 - 3000	24(12.0%)	70(35.0%)	94(47.0%)	0.316*
3001 - 4000	55(27.5%)	16(8.0%)	71(35.5%)	
> 4000	25(12.5%)	10(5.0%)	35(17.5%)	

Based on the variables identified as significant in the initial bivariate analysis, further multiple logistic regression analysis revealed significant associations with immediate postpartum anemia. Specifically: Women residing in urban areas had a lower likelihood of developing postpartum anemia compared to those living in rural areas. Mothers with no formal education were several times more likely to experience postpartum anemia compared to those with a formal education. Patients who underwent cesarean-section deliveries were times more likely to develop postpartum anemia than those who had vaginal deliveries.

### Discussion

The main findings of the present study are the overall prevalence of anemia in postpartum women in this study is 52%. There is a statistically significant association between anemia and age, residence, educational status, and socioeconomic status. Women with 5 to 9 pregnancies are more likely to be anemic than women with 1 to 4 pregnancies. There was no statistically significant difference in the risk of anemia between women with and without a history of multiple pregnancies or previous abortions. Women who had 5 or more ANC follow-ups are less likely to be anemic than women who had 1 to 4 ANC follow-ups. Women who had vaginal deliveries are less likely to be anemic than women who had cesarean deliveries. There is no significant difference in the proportion of anemic women between women who had episiotomies and women who did not. Women who had newborns with low birth weights are more likely to be anemic than women who had newborns with normal birth weights. In a study conducted in the rural population of South India, Rakesh et al., [9] found several factors associated with postpartum anemia. These factors included heavy bleeding perceived by the mother during delivery, younger maternal age, and inadequate iron supplementation

during the postpartum period, particularly in the third trimester of pregnancy. Similarly, Selvaraj et al., [10] in South India, reported a high prevalence of anemia among postnatal mothers, with a staggering 76.2% affected. Among these cases, 26% were classified as mild anemia, 49.8% as moderate anemia, and 0.4% as severe anemia. Intriguingly, approximately one-fourth of mothers who had normal hemoglobin levels during their third trimester developed anemia in the postnatal period. Moreover, there was a significant disparity between the mean hemoglobin levels during the postpartum period and those observed in the third trimester. Another noteworthy finding was the association between having two or more children (birth order) and the likelihood of experiencing postpartum anemia. These findings collectively underscore the high prevalence of anemia among postnatal mothers in this region. Mremi A et al., [11] in Tanzania reported the prevalence of postpartum anemia stood at 145 cases, accounting for 34.2% of the participants in the study. Among those affected by anemia, 34 individuals (23.5%) tested positive for malaria parasites in their blood, while 15 individuals (10.3%) had positive results indicating stool helminth infections. Several factors appeared to have a protective effect against postpartum anemia, with statistical significance ( $p < 0.001$ ). These included delivering the baby through the vaginal route and having a lower parity. Conversely, certain factors were found to be associated with an increased risk of postpartum anemia. Notably, lacking a marital partner ( $p < 0.001$ ) and having an inter-pregnancy interval of less than two years ( $p < 0.001$ ) were linked to a higher likelihood of developing postpartum anemia. The data revealed that women with an inter-pregnancy interval of less than two years were approximately 18 times more likely to develop postpartum anemia compared to women with a gap of more than two years between their last two pregnancies. Similarly, women

without marital partners were found to be at a tenfold higher risk of developing anemia compared to their married counterparts.

The existing literature on postpartum anemia lacks sufficient data to provide a precise assessment of its occurrence in the general population. This limitation arises due to the absence of a standardized screening protocol for postpartum anemia. [12] However, findings from specific studies offer some insights. For instance, in a study conducted in Spain, the prevalence of anemia following childbirth was reported to be 29%, indicating that nearly one in every three patients discharged from the hospital had anemia. [13] Another study focused on assessing both prevalence and risk factors for early postpartum anemia and reported a prevalence rate of 22%. [14] Notably, a study by Milman et al. [15] demonstrated that taking iron supplements before childbirth reduced the risk of postpartum anemia. In the group without iron supplementation, the prevalence of anemia ranged from 24% to 50%, whereas it was considerably lower at 14% in the supplemented group. However, it's important to recognize that in developing countries, the prevalence of postpartum anemia can be notably higher, reaching rates as high as 70% to 80%. [15, 16] Numerous risk factors have been identified in the literature as contributors to postpartum anemia. In line with existing research, our present study revealed that several factors were more prevalent among patients who experienced postpartum anemia, including cesarean sections (CS), emergency CS, the presence of episiotomy, third- or fourth-degree perineal lacerations, and the administration of general anesthesia. Postpartum anemia is commonly associated with significant blood loss during delivery, and cesarean sections, episiotomies, and birth canal lacerations have all been documented as variables increasing the risk of postpartum anemia. [15, 17] Our findings align with a study conducted by Kramer et al., [18] which explored risk factors for severe postpartum hemorrhage and identified CS as a contributing factor to anemia risk. Additionally, Sheldon et al. [17] demonstrated that CS is a risk factor for postpartum blood transfusions in the World Health Organization Multicountry Survey in 2014.

Furthermore, our study uncovered that emergent CS was associated with a nearly 19-fold increased risk and general anesthesia was linked to a nearly 3-fold increased risk of postpartum anemia in patients undergoing CS. Third- and fourth-degree perineal lacerations have been recognized as significant risk factors, independently elevating the likelihood of postpartum anemia, even when the presence of episiotomy is considered. [18, 19] Furthermore, Garrido et al. [13] have identified extensive perineal lacerations that involve the anal sphincter as a risk factor for postpartum anemia. In our study we found no significant difference in the proportion of anemic

women between women who had episiotomies and women who did not had episiotomies. Although, episiotomy has been previously reported as an independent risk factor associated with postpartum anemia. [16] Our study identified several factors associated with anemia, including low socioeconomic status, inadequate diets, higher gravidity, and lower educational attainment, consistent with findings from prior research. [20, 21]

### Conclusion

The overall prevalence of anemia in postpartum women in this study is 52%. This means that more than half of the women in the study were anemic. There is a statistically significant association between anemia and age, residence, educational status, and socioeconomic status. This means that the risk of anemia increases with age, in rural areas, in women with lower educational status, and in women with lower socioeconomic status. Overall, findings suggest that the risk of anemia in postpartum women is higher in older women, who live in rural areas, have lower educational status, have lower socioeconomic status, have more pregnancies, have low birth weight newborns, and have cesarean deliveries. Interventions to reduce the risk of anemia in postpartum women should focus on targeting these groups of women.

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