

Maternal and Fetal Outcomes in Women with Anaemia Delivering at a Tertiary Care Centre of Rajasthan: A Cross-Sectional Observational Study

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Abstract: ***Background:** Anaemia complicates a large share of pregnancies in India and is an important contributor to maternal and perinatal morbidity. We studied the burden of anaemia at delivery and the maternal and fetal outcomes associated with it at a tertiary-care hospital serving a predominantly rural, low-income population. **Methods:** This hospital-based cross-sectional observational study enrolled 341 women who delivered after 28 weeks of gestation with anaemia (haemoglobin < 11 g/dL) at the time of delivery, over one year (October 2024 to September 2025). Anaemia was graded by WHO criteria. Sociodemographic details, severity of anaemia, and maternal and perinatal outcomes were recorded on a predesigned proforma and analysed in SPSS v24. **Results:** Total number of obstetric admissions during the one-year study period in one unit of our tertiary care centre was 3955, which included 1153 normal vaginal deliveries (NVD), 1609 lower segment cesarean sections (LSCS). The present cross-sectional observational study was conducted over a period of one year at a tertiary care centre and included a total of 2,762 women delivered after 28 weeks of gestation. Among these women, 1,575 were found to be anaemic, yielding an overall prevalence of anaemia of 62.1% in the study population. Among the 341 enrolled women, most had mild anaemia (76.83%); moderate-to-severe anaemia accounted for 23.17%. Two-thirds were unbooked (67.16%) and three-quarters were from rural areas. Caesarean section was the commonest mode of delivery (58.06%). Blood transfusion was required in 15.25%, fetal distress complicated 16.13% of labours, and 13.20% needed HDU/ICU care. Two maternal deaths occurred (0.59%), both in severe anaemia. Low birth weight affected 12.02% of neonates, NICU admission 14.08%, and there were 18 perinatal deaths (perinatal mortality 52.8 per 1,000). **Conclusion:** Anaemia at delivery, largely mild yet frequently occurring against a background of poor antenatal care, was associated with substantial maternal and perinatal morbidity, with the gravest outcomes concentrated in severe anaemia. Strengthening antenatal screening, iron supplementation, and timely referral remains essential.*

Keywords: anaemia in pregnancy; maternal outcome; perinatal outcome; low birth weight; blood transfusion; antenatal care

1. Introduction

Anaemia remains one of the most persistent public-health problems of the developing world, and pregnant women bear a disproportionate share of it. Global estimates put the prevalence in pregnancy at roughly 37%, with the heaviest burden in low- and lower-middle-income countries where poverty, poor dietary diversity, and limited access to health care converge [1]. India carries much of that weight: successive National Family Health Surveys have recorded anaemia in around half of all pregnant women, a figure that has improved only modestly over last two decades [2].

The reasons for the condition matters go well beyond a low haemoglobin reading. Anaemia reduces the oxygen-carrying capacity of the blood and, in pregnancy, is linked to preterm birth, hypertensive disorders, antepartum and postpartum haemorrhage, a greater need for transfusion, and maternal death, while the fetus is exposed to growth restriction, low birth weight, and perinatal loss. The World Health Organization grades severity by haemoglobin as mild (9–10.9 g/dL), moderate (7–8.9 g/dL), and severe (< 7 g/dL), and the risk of adverse outcome rises steeply as haemoglobin falls [3].

Much of this risk is preventable. Early booking, antenatal screening, iron and folate supplementation, and timely referral of severe cases can interrupt the pathway from nutritional deficiency to obstetric catastrophe. Yet in rural, low-resource settings these measures often reach women late or not at all, and many present for the first time in labour, already anaemic and unbooked. [4-6]

Against this background, we set out to document the prevalence of anaemia at delivery and the maternal and fetal outcomes associated with it in the population served by our institution- a tertiary-care hospital in Kota, Rajasthan, drawing largely on a rural, socioeconomically disadvantaged catchment. Describing the profile of these women and the outcomes they experience is a first step toward targeting the gaps in antenatal care that allow anaemia to persist.

2. Materials and Methods

This hospital-based cross-sectional observational study was carried out in the Department of Obstetrics and Gynaecology, J. K. Lone Hospital, Government Medical College, Kota, over approximately one year (October 2024 to September 2025).

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The institution is a tertiary-care teaching hospital catering mainly to a rural, low-socioeconomic population. Ethical approval was obtained from the Institutional Ethics Committee, and written informed consent was taken from every participant.

The study population comprised women who delivered after 28 weeks of gestation during the study period. Those found to have anaemia of any grade (haemoglobin < 11 g/dL) at the time of delivery, and who met the eligibility criteria, formed the study sample. Women with co-existing medical disorders that could independently influence outcomes- cardiac disease, hypertension, or renal or hepatic disease- were excluded. Using the standard formula for a single proportion (with an expected adverse maternal outcome of 33.3%, 95% confidence, and 5% precision), the required sample size was 341, and this number of anaemic women was enrolled.

After consent, each woman was evaluated using a predesigned proforma capturing demographic, socioeconomic, dietary, and obstetric history, together with a full clinical examination. Investigations to grade and characterise the anaemia and to assess maternal and fetal status- complete blood count, peripheral film, reticulocyte count, liver and renal function, urine and stool examination, and ultrasonography as indicated -were performed. Anaemia was graded by WHO criteria as mild (9–10.9 g/dL), moderate (7–8.9 g/dL), or severe (< 7 g/dL) [3]. Socioeconomic status was assigned using the Modified Kuppaswamy scale.

Each woman was followed through her hospital stay. Maternal outcomes recorded were the need for blood transfusion, gestational age at delivery, induction of labour, mode of delivery, antepartum, intrapartum and postpartum complications, HDU/ICU admission, and mortality. Fetal and neonatal outcomes recorded were birth weight, five-minute Apgar score, perinatal complications, NICU admission, and perinatal death. Data were entered in Microsoft Excel and analysed in SPSS version 24. Categorical variables were summarised as frequencies and percentages and continuous variables as mean $\pm$ standard deviation, with the chi-square or Fisher's exact test used for associations and $p < 0.05$ taken as significant.

3. Results

Total number of obstetric admissions during the one-year study period in one unit of our tertiary care centre was 3955, which included 1153 normal vaginal deliveries (NVD), 1609 lower segment cesarean sections (LSCS). The present cross-sectional observational study was conducted over a period of one year at a tertiary care centre and included a total of 2,762 women delivered after 28 weeks of gestation. Among these women, 1,575 were found to be anaemic, yielding an overall prevalence of anaemia of 62.1% in the study population. Of these, 341 women were enrolled for detailed analysis.

The cohort was young, rural, and socioeconomically disadvantaged (Table 1). The mean age was 25.8 ± 5.9 years, with most women in the 21–25-year group. Three-quarters lived in rural areas, over half were illiterate, and about 52% belonged to the two lowest Kuppaswamy classes. Primigravidae formed the largest obstetric group, and two-

thirds of the women were unbooked at the institution, having received antenatal care elsewhere or been referred in.

Table 1: Sociodemographic and obstetric profile (n = 341)

Characteristic	Category	n	%
Age group (years)	21–25 (commonest)	126	36.95
	Mean 25.8 ± 5.9 years	—	—
Residence	Rural	256	75.07
Education	Illiterate	188	55.13
Socioeconomic class	Upper-lower + lower (Kuppaswamy)	177	51.91
Occupation	Housewife	218	63.93
Gravidity	Primigravida	136	39.88
Booking status	Unbooked at institution	229	67.16

Mean gravidity 2.1 ± 1.2 . Unbooked women received antenatal care at CHC/PHC (43.99%) or were referred from private hospitals (23.17%).

Most women had mild anaemia, though nearly a quarter fell into the moderate-to-severe range (Table 2). The mean gestational age at delivery was 38.2 ± 1.8 weeks, with preterm birth in 8.80%. Caesarean section was the predominant mode of delivery, performed in almost three in five women.

Table 2: Severity of anaemia, gestational age and mode of delivery (n = 341)

Variable	Category	n	%
Anaemia severity (WHO)	Mild (9–10.9 g/dL)	262	76.83
	Moderate (7–8.9 g/dL)	55	16.13
	Severe (< 7 g/dL)	24	7.04
Gestation at delivery	Preterm (< 37 weeks)	30	8.8
	Term / late term	311	91.2
Mode of delivery	Caesarean section	198	58.06
	Vaginal	143	41.94

Moderate-to-severe anaemia together accounted for 79 women (23.17%). Mean gestational age 38.2 ± 1.8 weeks.

Maternal morbidity was considerable and spread across all three phases of delivery (Table 3). Fetal distress was the commonest intrapartum event, and the need for blood transfusion the commonest postpartum one. Forty-five women (13.20%) required HDU or ICU care, most often for severe anaemia needing transfusion. There were two maternal deaths (0.59%)- one from postpartum haemorrhage and one from septicaemia- both in women with severe anaemia.

Table 3: Maternal complications, critical-care need and mortality (n = 341)

Phase	Complication	n	%
Antepartum	Preterm labour	35	10.26
	Preeclampsia / PIH	24	7.04
	IUGR	19	5.57
	Antepartum haemorrhage	12	3.52
Intrapartum	Fetal distress	55	16.13
	Prolonged active first stage	44	12.9
	Failed induction / progress	28	8.21
Postpartum	Blood transfusion required	52	15.25
	Postpartum haemorrhage	29	8.5
	Puerperal sepsis	8	2.35
Critical care	HDU / ICU admission	45	13.2
Mortality	Maternal death	2	0.59

Percentages are of the total cohort (N = 341); a woman may have had more than one complication, so column totals exceed 100%. Both maternal deaths occurred in severe anaemia (Hb < 7 g/dL).

Perinatal outcomes are shown in Table 4. Although most neonates were of normal birth weight, low birth weight affected one in eight, and a low five-minute Apgar score one in twelve. NICU admission was needed in 14.08%. There were 18 perinatal deaths- 4 intrauterine deaths, 6 stillbirths and 8 early neonatal deaths- giving a perinatal mortality rate of 52.8 per 1,000 births, with most deaths clustering among the babies of severely anaemic mothers.

Table 4: Perinatal outcomes (n = 341)

Outcome	Category	n	%
Birth weight	Normal (≥ 2500 g)	300	87.98
	Low birth weight (< 2500 g)	41	12.02
Apgar at 5 min	Low (< 7)	28	8.21
NICU admission	Required	48	14.08
Perinatal death	Intrauterine death	4	1.17
	Stillbirth	6	1.76
	Early neonatal death	8	2.35
	Total perinatal deaths	18	5.28

Mean birth weight 3198.5 ± 395.8 g. Perinatal mortality rate 52.8 per 1,000 births.

The specific perinatal complications underlying this morbidity are summarised in Table 5, spanning antepartum, immediate and early-neonatal events.

Table 5: Perinatal complications by phase (n = 341)

Phase	Complication	n	%
Antepartum (fetal)	Fetal distress on CTG	42	12.32
	SGA / FGR	22	6.45
	Congenital malformation	5	1.47
Intrapartum / immediate	Birth asphyxia (Apgar < 7)	28	8.21
	Meconium aspiration syndrome	18	5.28
Early neonatal	Neonatal jaundice	35	10.26
	Hypoxic-ischaemic encephalopathy	25	7.33
	Hypothermia	18	5.28
	Hypoglycaemia	14	4.11
	Hyaline membrane disease / RDS	12	3.52

Individual neonates could have more than one complication; percentages are of the total cohort (N = 341).

4. Discussion

This study documents a heavy burden of anaemia at delivery-present in 62.1% of women delivering after 28 weeks — and describes the maternal and perinatal morbidity that accompanies it in a rural tertiary-care population. The profile of the affected women is telling in itself: young, largely rural, poorly educated, economically disadvantaged, and predominantly unbooked. These are the classic social determinants of maternal anaemia, and they recur across the Indian literature. Devi et al and Makka et al described almost identical socioeconomic and educational patterns among their anaemic cohorts, and Lin et al confirmed the association of anaemia with rural residence and low income in a large multicentre study [4,5,6].

That two-thirds of our women were unbooked at the institution is the single most actionable finding. It mirrors the 67.4% unbooked rate reported by Devi et al and the excess of unbooked women in the anaemic group noted by others [4]. Booking status is not merely an administrative label; it is a proxy for whether a woman received antenatal screening, iron

supplementation, and the chance of early referral. Its strong presence here signals exactly where the preventive system is failing.

Most of our cohort had mild anaemia (76.83%), a milder distribution than the moderate-predominant series of Makka et al and Upadhyay et al which is expected given that we enrolled anaemia of any grade rather than severe anaemia alone [5,7]. Even so, nearly a quarter had moderate-to-severe anaemia, and it was this subgroup that drove the most serious outcomes. The caesarean rate of 58.06% is high, reflecting both the referral character of the hospital and the frequency of fetal distress and failed progress in a compromised population.

The maternal morbidity we observed- transfusion in 15.25%, postpartum haemorrhage in 8.50%, hypertensive disease in 7.04%, and HDU/ICU admission in 13.20%- is consistent in direction with the wider evidence, even where absolute rates differ with case-mix. Ruchika Singh et al found preterm labour and hypertensive disorders significantly commoner in anaemic women, and Nair et al reported a nearly ten-fold adjusted odds of postpartum haemorrhage in severe anaemia [8,9]. Mahmood et al described markedly higher rates of hypertension, haemorrhage and transfusion in their anaemic group [10]. Our two maternal deaths, both in severe anaemia, give a mortality of 0.59%- lower than the 4.7% of Rani et al but in keeping with the concentration of maternal death in the severest cases seen by Vasanthamani et al and by the large cohort of Shi et al [11,12,13].

The perinatal picture followed the same logic. A low-birth-weight rate of 12.02% and a mean birth weight of about 3,199 g sit close to the values of Alizadeh et al, while our low-Apgar rate of 8.21% is almost identical to theirs [14]. Studies that specifically graded severity- Sekhvat et al, Kumar et al, and Suman M et al- all found birth weight to fall and low-birth-weight and preterm rates to rise as maternal haemoglobin declined, and the meta-analytic estimate of Figueiredo et al put the adjusted risk of inadequate birth weight at 1.38 [15,16,17,18]. Our perinatal mortality of 52.8 per 1,000, with deaths clustering in severe anaemia, echoes the steeply raised perinatal-death odds reported by Nair et al and Shi et al in severe disease [9,13].

The study has limitations inherent to its design. As a cross-sectional observational study without a non-anaemic comparison group, it describes associations rather than proving causation, and it cannot separate the effect of anaemia from that of the poverty and poor antenatal care that accompany it. Haemoglobin was assessed at delivery, so the duration and antenatal trajectory of anaemia are unknown, and the single-centre, referral-weighted sample limits generalisability. A severity-stratified analysis with formal testing would strengthen the inferences and is a natural next step. Its strengths are a clearly defined population, a calculated sample size, and outcomes recorded against standard operational definitions.

Taken together, the findings reinforce a familiar but unfinished message. Anaemia at delivery in this setting is common, socially patterned, and associated with real maternal and perinatal harm that falls hardest on the small severe-anaemia subgroup. The levers are well known-

antenatal booking, screening and iron-folate supplementation, dietary improvement, and prompt referral of severe cases- and the persistence of the problem argues for their more determined application rather than for new remedies.

5. Conclusion

Anaemia was present in nearly two-thirds of women delivering at this tertiary-care hospital, most commonly in mild form but frequently against a background of rural residence, illiteracy, poverty, and absent antenatal booking. It was associated with substantial maternal morbidity- a high caesarean rate, frequent transfusion, haemorrhage and critical-care need- and with meaningful perinatal loss, both concentrated in the severe-anaemia subgroup. Strengthening antenatal screening, universal iron and folate supplementation, and timely referral of severe cases remains the most effective route to reducing this preventable burden.

References

- [1] World Health Organization. Anaemia. Geneva: World Health Organization; 2023.
- [2] International Institute for Population Sciences (IIPS) and ICF. National Family Health Survey (NFHS-4), 2015–16: India. Mumbai: IIPS; 2017.
- [3] World Health Organization. Haemoglobin concentrations for the diagnosis of anaemia and assessment of severity. WHO/NMH/NHD/MNM/11.1. Geneva: WHO; 2011.
- [4] Devi NB, Varalaxmi B, Jyothirmayi T, Lahari N. Maternal outcome in pregnancy with severe anaemia: a prospective study in a tertiary care hospital in Andhra Pradesh. *IOSR J Dent Med Sci*. 2015;14:6–10.
- [5] Maka SS, Tondare SB, Tondare MB. Study of impact of anaemia on pregnancy. *Int J Reprod Contracept Obstet Gynecol*. 2017;6(11):4847–50.
- [6] Lin L, Wei Y, Zhu W, Wang C, Su R, Feng H, et al. Prevalence, risk factors and associated adverse pregnancy outcomes of anaemia in Chinese pregnant women: a multicentre retrospective study. *BMC Pregnancy Childbirth*. 2018;18(1):111.
- [7] Upadhyay C, Upadhyay N. Effect of anaemia on pregnancy outcome: a prospective study at a tertiary care hospital. *Int J Reprod Contracept Obstet Gynecol*. 2017;6(12):5379–83.
- [8] Singh R, Gupta M, Saini V. Women with severe anaemia in labour: adverse clinical outcomes. *Int J Innov Res Med Sci*. 2019;4(1):8–12.
- [9] Nair M, Choudhury MK, Choudhury SS, Kakoty SD, Sarma UC, Webster P, et al. Association between maternal anaemia and pregnancy outcomes: a cohort study in Assam, India. *BMJ Glob Health*. 2016;1(1):e000026.
- [10] Mahmood T, Rehman AU, Tserenpil G, Siddiqui F, Ahmed M, Siraj F, et al. The association between iron-deficiency anaemia and adverse pregnancy outcomes: a retrospective report from Pakistan. *Cureus*. 2019;11(10):e5854.
- [11] Rani R, Memon N, Sheikh F, Soomro N. Severity of maternal anaemia and foeto-maternal outcome at a tertiary care hospital. *J Pharm Res Int*. 2021;33(30B):112–7.
- [12] Vasanthamani P, Thiruvankideswary B, Meena TS, Padmanaban S. Maternal and fetal outcome in anaemia complicating pregnancy. *Int J Clin Obstet Gynaecol*. 2019;3(2):210–3.
- [13] Shi H, Chen L, Wang Y, Sun M, Guo Y, Ma S, et al. Severity of anemia during pregnancy and adverse maternal and fetal outcomes. *JAMA Netw Open*. 2022;5(2):e2147046.
- [14] Alizadeh L, Raoofi A, Salehi L, Ramzi M. Impact of maternal haemoglobin concentration on fetal outcomes in adolescent pregnant women. *Iran Red Crescent Med J*. 2014;16(8):e19670.
- [15] Sekhavat L, Davar R, Hosseini-dezoki S. Relationship between maternal haemoglobin concentration and neonatal birth weight. *Hematology*. 2011;16(6):373–6.
- [16] Kumar KJ, Asha N, Murthy DS, Sujatha MS, Manjunath VG. Maternal anemia in various trimesters and its effect on newborn weight and maturity: an observational study. *Int J Prev Med*. 2013;4(2):193–9.
- [17] Suman M, Büyük M, Suman K, Bütün Z. The effect of third-trimester maternal haemoglobin value on fetal weight and birth week. *Med Res Rep*. 2022;5(2):62–7.
- [18] Figueiredo ACMG, Gomes-Filho IS, Batista JET, Orrico GS, Porto ECL, Cruz Pimenta RM, et al. Maternal anaemia and birth weight: a prospective cohort study. *PLoS One*. 2019;14(3):e0212817.