

**Maternal and Foetal Outcome of Anaemia in Pregnancy: A Study in Tertiary Care Hospital in South India.**Jenan M.<sup>1</sup>, Anasooya P.S.<sup>2</sup>, Sapna S.<sup>3</sup><sup>1</sup>Senior Resident, Department of Obstetrics and Gynaecology, Government T. D. Medical College, Alappuzha, India.<sup>2</sup>Associate Professor, Department of Obstetrics and Gynaecology, Government T. D. Medical College, Alappuzha, India.<sup>3</sup>Assistant Professor, Department of Obstetrics and Gynaecology, Government T. D. Medical College, Alappuzha, India.

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**Abstract**

**Introduction:** Anaemia in pregnancy is a public health problem. It is the most common medical problem complicating pregnancy. Socio-demographic factors are known to be associated with anaemia. Anaemia increases the risk of inter-current infections, preeclampsia, postpartum haemorrhage, low birth weight, preterm birth, sepsis, neonatal morbidity. Most common cause of anaemia in pregnancy is iron deficiency.

**Objective:** To find out the socio-demographic risk factors of anaemia in pregnancy and fetomaternal outcome in those pregnancies.

**Methods:** This is a hospital based prospective observational study among 180 antenatal patients diagnosed with anaemia in a tertiary care centre in India. After obtaining informed written consent, proforma was used for obtaining data from the subjects. Detailed clinical examination was done, and the patient was followed up till delivery and discharge from hospital to check whether there were any maternal, foetal, or neonatal complications.

**Results:** Parity, inter-pregnancy interval and socioeconomic status were found to be important risk factors. There was no correlation seen between BMI and anaemia, diet was not seen to be an influencing factor. 3.3% of subjects had not taken prophylactic oral iron which should be addressed. Antenatal anaemia is the most important risk factor for postpartum anaemia. 76% of subjects developed postpartum anaemia. Antenatal anaemia is a risk factor for preeclampsia, puerperal infections, PPH, blood transfusion requirement and increased NICU admission rates.

**Conclusion:** Sociodemographic factors such as Parity, Education, and socioeconomic status are associated with anaemia in pregnancy. Preeclampsia, puerperal infections, PPH, blood transfusion requirement, birth weight of the baby and NICU admission also shows association.

**Keywords:** Pregnancy; Anaemia; Risk factors; Morbidity.

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**Introduction**

Anaemia is a public health problem throughout the world especially in developing countries like India [1]. WHO estimate of global prevalence of anaemia - 2019 in non-pregnant women in reproductive age is 29.6% and in pregnancy

is 36.5% [1]. Prevalence of anaemia in pregnancy is 50.1% in INDIA according to WHO [2]. NFHS- 5 (National family health survey) conducted in 2019-2020 gives prevalence of anaemia in pregnancy as 52.2% in INDIA and the prevalence in

Kerala amounts to 31.4% [3]. The prevalence of anaemia in pregnancy was 22.6% in Kerala as per NFHS-4 conducted in 2015-2016 [4,5].

The most common cause of anaemia in pregnancy and puerperium is iron deficiency [6]. Other cause of anaemia includes vitamin and micronutrient deficiencies, acute and chronic infections, and hemoglobinopathies and haemolytic anaemia.

Centre for disease control and prevention (1998) defined anaemia in pregnant women using a cut-off of 11g/dL in first and third trimester and 10.5g/dL in second trimester. ICMR classifies anaemia as mild (10-10.9 g/dl), moderate (9-9.9g/dl), severe (4-6.9g/dl) and very severe anaemia (<4g/dl) according to severity.

Socio-demographic factors such as age of conception, education, socioeconomic status, dietary preferences, and inter-pregnancy interval are found to have influence on the prevalence of anaemia and thereby morbidity and mortality caused by same. Anaemia during pregnancy is associated with several maternal and foetal complications. It reduces the woman's ability to tolerate bleeding during pregnancy and after childbirth and makes her prone to infections thus increasing maternal morbidity. The incidence of PPH is much higher in India compared with the rest of the world and the Registrar General of India attributes this to the high prevalence of anaemia among pregnant women [7]. Anaemia during pregnancy also has been associated with increased risk of intra uterine growth restriction, premature delivery, low birth weight (LBW) [8]. But there is variation in anaemia prevalence in many states and districts in India. There is a need to conduct studies and design interventions at local levels based on the gaps and needs, hence this study is intended to find out the socio-demographic risk factors and to assess the foetal and maternal outcome of anaemia in pregnancy in a tertiary care centre in Alappuzha. Alappuzha is a district in south India,

situated in coastal belt. Main source of income is from agriculture, fishing, and cottage industries with population literacy rate of 96.2%.

### Materials and Method

This is a hospital based prospective observational study conducted in the inpatients of antenatal ward and labour room under Department of Obstetrics and Gynaecology in Government T. D. Medical College, Alappuzha for 1 year period from July 2020 to June 2021. Antenatal women who were diagnosed with anaemia and who had given informed written consent for the study were included. Anaemia in pregnancy was defined as haemoglobin less than 11g/dL in first and third trimester, less than 10.5g/dL in second trimester and less than 10g/dL in postpartum. Haemoglobin was assessed using automated haemoglobin analyser. Prevalence of anaemia in pregnant women in Alappuzha district is 35.3% according to NFHS-4[4]. Hence, taking the prevalence rate to be 35.3% and assuming error of  $\pm 5\%$ , at 95 % confidence interval, the minimal sample size required is 180. The level of significance was assumed to be 5%.

The purpose of the study was explained to the participants and informed written consent was taken from them prior to administering the questionnaire and data collection. Pre-prepared proforma was used for obtaining data from the subjects such as Age, Education, Socioeconomic status, Occupation, Parity and Interpregnancy interval, Height, Weight and BMI, Diet - Vegetarian /Mixed, Early Registration of pregnancy, Antenatal care visits, Prophylactic oral iron intake.

A detailed clinical examination was done during the hospital stay to look for pallor, cardiovascular status, and obstetric findings. Laboratory findings were recorded to assess severity of anaemia, type of anaemia, and aetiology. The patient was followed up till delivery to look for complications including Preeclampsia, infections, intrauterine growth restriction,

postpartum haemorrhage, and need for blood transfusion, Gestational age at delivery, Birth weight of baby, need for NICU admissions. Outcomes were compared between two groups 1) women who remained anaemic in third trimester, 2) women in whom anaemia was corrected by third trimester, and statistical association was checked using Chi Square test.

Data was compiled in Microsoft excel sheet 2021 version and was analysed using statistical package for the social science system (SPSS) version 27 (IBM, Armonk, NY, USA). Qualitative variables were expressed as proportions and percentages and quantitative variables as mean with standard deviation. Significance of difference between proportions of both groups was assessed by Chi-square test and p value of <0.05 was considered statistically significant.

#### Ethical considerations

Institutional ethics committee approval was

obtained. Written informed consent was obtained from participants after proper information sharing. Confidentiality about patient details was ensured and maintained throughout the study.

#### Results

In this study 180 pregnant women with anaemia were included. 81.1% of the women belong to age group 20-30yrs. Majority of the study population 83.9% are educated up to school level and there were no illiterate women in the study. 81.7% were below poverty line. 62.2% were multipara. Among the multiparous women, 81.25% were having inter-pregnancy interval of more than 2yrs. 21 women were having low BMI. 176 women in the study consume mixed diet. Six women did not take the iron tablets in antenatal period. 66.1% of the study subjects had reduced serum ferritin levels and 35% had microcytic hypochromic blood picture. Socio demographic data of the study population is summarized in Table/Figure 1.

**Table 1: Socio-demographic characteristics of subjects**

	Number of subjects
<b>1.Age</b>	
<=20years	9 (5%)
20-30years	146 (81.1%)
30 – 40years	21 (11.7%)
>=40 years	4 (2.2%)
<b>2.Education</b>	
School level	151(83.9%)
Graduate	26(14.4%)
Postgraduate	3(1.7%)
<b>3.Socioeconomic status</b>	
BPL <sup>a</sup>	147(81.7%)
APL <sup>b</sup>	33(18.3%)
<b>4.Occupation</b>	
Working	7(3.9%)
Not working	173(96.1%)
<b>5.Parity</b>	
Primigravida	68(37.8%)
Multigravida	112(62.2%)
<b>6.Interpregnancy interval</b>	
<=2years	21(18.75%)
>2years	91(81.25%)
<b>7.BMI</b>	

<=18	21(11.7%)
18-25	68(37.8%)
>25	91(50.5%)
<b>8.Booking status of pregnancy</b>	
Booked	156(86.7%)
Unbooked	24(13.3%)
<b>9.Diet</b>	
Vegetarian	4(2.2%)
Mixed diet	176(97.8%)
<b>10.Prophylactic oral iron intake</b>	
Taken	174(96.7%)
Not taken	6(3.3%)

<sup>a</sup>BPL: Below Poverty Line

<sup>b</sup>APL: Above Poverty Line

Antenatal anaemia is the most important risk factor for postpartum anaemia as 76% of subjects developed postpartum anaemia. Maternal and foetal outcomes studied are summarized in Table/Figure2.

**Table 2: Foetomaternal outcome of pregnancies with anaemia**

	Number of subjects
Preeclampsia	32(17.8%)
Urinary tract infection	70(38.9%)
Respiratory tract infection	9(5.0%)
Puerperal infections	37(20.6%)
PPH <sup>c</sup>	31(17.2%)
Need for Blood transfusion	14(7.8%)
Caesarean delivery	93(51.7%)
Vaginal delivery	87(48.3%)
Underweight baby	41(22.8%)
Preterm deliveries	41(22.8%)
NICU <sup>d</sup> admissions	14(7.8%)

<sup>c</sup> Postpartum haemorrhage

<sup>d</sup> Neonatal Intensive Care Unit

82.2% of anaemic women had preeclampsia and it showed statistically significant association with a p value of <0.001 (Table 3).

**Table 3: Association between Preeclampsia and anaemia (3<sup>rd</sup> trimester)**

			Anaemia class		p value
			Anaemic	Anaemia Corrected	
Preeclampsia	Yes	Frequency	13	19	<0.001
		%	40.6%	59.4%	
	No	Frequency	116	32	
		%	78.4%	21.6%	

38.9% of women had urinary tract infection and 5% had respiratory tract infection in antenatal period but there was no statistically significant association. At the same time puerperal infections had statistically significant association (Table 4).

**Table 4: Association between Puerperal infection and anaemia (3<sup>rd</sup> trimester)**

			Anaemia class		p value
			Anaemic	Anaemia corrected	
Puerperal infection	Yes	Frequency	37	0	<0.001
		%	100.0%	0.0%	
	No	Frequency	92	51	
		%	64.3%	35.7%	

31 of the study subjects had PPH and 14 of them needed blood transfusion which was statistically significant with p value of 0.014 (Table 5).

**Table 5: Need for blood transfusion vs anaemia (3<sup>rd</sup> trimester)**

			Anaemia class		P value
			Anaemic	Anaemia corrected	
Need for blood transfusion	Yes	Frequency	14	0	0.014
		%	100.0%	0.0%	
	No	Frequency	115	51	
		%	69.3%	30.7%	

51.7% had caesarean section delivery and 48.3% had vaginal delivery. According to the study 22.8% had underweight baby (<2.5kg). Incidence of preterm delivery was 22.8%, however no statistically significant association was found. 7.8% babies needed NICU admissions, and it was found statistically significant with a p value of 0.014 (Table 6).

**Table 6: Association between NICU admissions and anaemia (3<sup>rd</sup> trimester)**

			Anaemia class		p value
			Anaemic	Anaemia corrected	
NICU admissions	Yes	Frequency	14	0	0.014
		%	100.0%	0.0%	
	No	Frequency	115	51	
		%	69.3%	30.7%	

## Discussion

Despite achievements in maternal and child health-related programs over the past decade, anaemia remains a key health problem in pregnant women in India. In this study, foetomaternal outcome was studied in 180 antenatal females with anaemia. Sociodemographic factors considered were age, education, socioeconomic status, occupation, Parity, inter-pregnancy interval, BMI, Diet, booking status, and Prophylactic oral iron intake. Age distribution showed majority subjects in group of 20-30yrs, and it reflects the majority age group seeking antenatal care in the study setting. Major study population

was educated up to school level. Study conducted by Urvashi Miglani, Priya Bhangadia, V. K. Kadam, and Poonam Laul in 2018 showed statistically significant association between education & occupation with prevalence of anaemia [9]. In the present study, there was no statistically significant association found between education and anaemia, probably because there were no illiterate subjects, owing to high literacy rate in Kerala. Majority of the study population (81%) was below poverty line, and it shows a statistically significant association with anaemia. 96% of study population were

unemployed. At the same time study by J. Vindhya *et al* showed association of age, education, occupation with anaemia, but association of socio-economic status with anaemia was nonsignificant on bivariate analysis [10].

In the present study, 62.2% were multiparous. Parity is associated with anaemia as repeated pregnancies with shorter inter-pregnancy interval do not give adequate time to replenish the iron stores and restore the haemoglobin status. In a study by Archana Mishra, Sheeba Marwah, Pragati Divedi, Rupali Dewan, Himani Ahluwalia they found that multigravida patients were more prone to developing anaemia than primigravida patients [11]. However, in the present study, there was no significant association between parity and anaemia, owing to adequate inter pregnancy interval in the sample.

In the present study around 96.7% of subjects had taken prophylactic oral iron tablets and 3.3% did not take the tablets. Study by Hugara Siddalingappa, Narayana Murthy M. R., Ashok N. C. found that there were three times higher mothers in anaemic category than non-anaemic in those consuming less than 100 IFA tablets [12]. 35% of the women had microcytic hypochromic picture and 66.1% had a low ferritin value pointing towards the major aetiology as iron deficiency.

In the study 76% of subjects developed postpartum anaemia thereby increasing the postnatal morbidity. Postpartum anaemia is associated with poor quality of life, palpitation, higher incidence of infections, fatigue, reduced cognitive ability, emotional instability, and postpartum depression [13].

32 women in the present study had preeclampsia and it shows a statistically significant association with anaemia. Study by Urvashi Miglani, Priya Bhangadia, V. K. Kadam, and Poonam Laul in 2018 showed statistically significant association between preeclampsia and anaemia [9].

Even though there is higher incidence of maternal infections like urinary tract infection and respiratory infection in anaemia, no statistical association was found in the present study. At the same time puerperal infections have shown statistical association with anaemia.

PPH and need for blood transfusion is found to be associated with anaemia as expected in the study and more seen in cases with moderate anaemia. No association is found in study with mode of delivery and gestational age at delivery, but at same time birth weight of the baby and need for NICU admissions found to have a significant association. Study conducted by Shweta kumara *et al* found that preterm birth and LBW proportion was associated with maternal anaemia [14].

This study is limited to locality and women seeking maternity services in particular hospital, so cannot be generalized to other communities. There were no subjects with severe anaemia because of which severe outcomes like cardiac failure could not be studied. Confounding factors like other comorbidities are not taken into consideration for maternal and foetal outcome.

## Conclusions

Anaemia in pregnancy remains major public health problem with poor maternal and foetal outcomes, steps taken to correct anaemia in pregnant women and females planning for pregnancy can have far reaching influences on maternal and perinatal morbidity.

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## References

1. World health organization. Anaemia in women and children [WHO website]. [https://www.who.int/data/gho/data/the-mes/topics/anaemia\\_in\\_women\\_and\\_children](https://www.who.int/data/gho/data/the-mes/topics/anaemia_in_women_and_children). Accessed October 10, 2022.

2. World health organization. Prevalence of anaemia in pregnant women (aged 15-49) (%). [https://www.who.int/data/gho/data/indicators/indicator-details/GHO/prevalence-of-anaemia-in-pregnant-women-\(-\).](https://www.who.int/data/gho/data/indicators/indicator-details/GHO/prevalence-of-anaemia-in-pregnant-women-(-).) Accessed October 10, 2022.
3. Ministry of Health and Family Welfare; Government of India. National Family Health Survey - 5 2019-2021. [http://rchiips.org/nfhs/NFHS-5\\_FCTS/India.pdf](http://rchiips.org/nfhs/NFHS-5_FCTS/India.pdf). Accessed October 10, 2022.
4. Ministry of Health and Family Welfare; Government of India. National Family Health Survey- 4 2015-16, state fact sheet Kerala. [http://rchiips.org/nfhs/pdf/NFHS4/KL\\_FactSheet.pdf](http://rchiips.org/nfhs/pdf/NFHS4/KL_FactSheet.pdf). Accessed October 10, 2022.
5. Ministry of Health and Family Welfare; Government of India. National Family Health Survey - 5 2019- 2021, state fact sheet Kerala. [http://rchiips.org/nfhs/NFHS-5\\_FCTS/Kerala.pdf](http://rchiips.org/nfhs/NFHS-5_FCTS/Kerala.pdf). Accessed October 10, 2022.
6. Anemia in Pregnancy: ACOG Practice Bulletin Summary, Number 233. *Obstetrics & Gynecology*: August 2021 - Volume 138 - Issue 2 - p 317-319
7. 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; 1:0000026.
8. National Health Portal of India. Anaemia during pregnancy (Maternal anaemia). <https://www.nhp.gov.in/disease/gynaecology-and-obstetrics/anaemia-during-pregnancy-maternal-anemia>. Accessed October 10, 2022.
9. Miglani U, Bhangadia P, Kadam VK, Laul P. Anaemia in term pregnancy: influence on maternal and perinatal outcome and role of demographic factors. *Int J Reprod Contracept Obstet Gynecol*. 2018;8(1):251-257.
10. Vindhya J, Nath A, Murthy GVS, Metgud C, Sheeba B, Shubhashree V, Srinivas P. Prevalence and risk factors of anemia among pregnant women attending a public-sector hospital in Bangalore, South India. *J Family Med Prim Care*. 2019 Jan;8(1):37-43.
11. Mishra A, Marwah S, Divedi P, Dewan R, Ahluwalia H. A Cross-Sectional Study of Barriers in Prevention of Anemia in Pregnancy. *Cureus*. 2021 Jan 20;13(1): e12802.
12. Siddalingappa, Hugara, Narayana Murthy M. R., & Ashok N. C. Prevalence and factors associated with anaemia among pregnant women in rural Mysore, Karnataka, India. *International Journal of Community Medicine and Public Health*. 2016;3.9.
13. Abebaw A, Gudayu TW, Kelkay B. Proportion of Immediate Postpartum Anaemia and Associated Factors among Postnatal Mothers in Northwest Ethiopia: A Cross-Sectional Study. *Anemia*. 2020 Jun 16; 2020:8979740
14. Kumari S, Garg N, Kumar A, Guru PKI et al. Maternal and severe anaemia in delivering women is associated with risk of preterm and low birth weight: A cross sectional study from Jharkhand, India. *One Health*. 2019 Aug 19.