A Mixed Method Study to Assess the Prevalance of Persistent Anemia Among the Third Trimester Mother Attending Antenatal Clinics in Tertiary Care Hospital Puducherry

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Abstract:-

➢ **Introduction**

World Health Organization (WHO)/World Health Statistics data shows that 40.1% of pregnant women worldwide were anemic in 2016. India ranks 170 out of 180 countries for anaemia among women, according to global nutrition survey, 2016. Anemia during pregnancy affects both mother's and her child's health.

➢ **Objective**

To find out the proportion of persistent anemia and its associated factors and also to explore the reasons for persistent anemia among the 3rd trimester mothers attending antenatal clinics in tertiary care hospital, Puducherry

➢ **Methodology**

A mixed method study was designed to collect data from 217 by using purposive sampling technique. A validated self-structured questionnaire was used to assess the reasons for persistent anemia comprising of socio-demographic, obstetrics factors, health related factor, and adherence factors. Chi square test was used to find association between socio-demographic variables with other associated factors.

➢ **Results**

Among 217,around 69.8 % of study subjects were anemic in 1st trimester and 71.5% were anemic in the second trimester.The prevalence of anemia among third trimester pregnant mothers was 61.3% (54.4-67.3). Among the third trimester anemic mother 67% were found to have persistent anemia (p<0.001). There was significant association between education, (p<0.001), occupation (p<0.001), anemia in 1st trimester (p0.02), anemia in 2nd trimester (p<0.001). The reasons behind persistent anemia were found to be knowledge deficit, forgetfulness of tablets, low socio-economic status, less knowledge on iron inhibitors and enhancers, bitterness and side effects of tablets.

➢ **Conclusion**

The proportion of persistent anemia among 3rd trimester pregnant women was high in our study and also seen is various studies in different parts of the country. This continuing high burden of anemia could be mainly due to lack of education and uncorrected anemia in their pregnancy which resulted into persistent anemia.

Keywords:- Antenatal Mothers, Haemoglobin, Third Trimester.

I. INTRODUCTION

Anemia is a major public health problem throughout the world, especially in developing countries than the developed countries, especially pregnant women are mainly the vulnerable population due to increased nutrient demand during the pregnancy[1, 2]. Anemia in pregnancy affects not only the health of the mother but also the outcome of the pregnancy, the health of the baby, leading to an intergenerational cycle of anemia, malnutrition, etc., and other comorbidities[3.]

Anemia is a condition in which the number of red blood cells or the hemoglobin concentration within them is lower than normal[2]. Hemoglobin is an important component and is required to carry oxygen in the body and if you have not enough hemoglobin or too few abnormal red blood cells then there will be a decreased capacity of the blood to carry oxygen to the body's tissues[3]. This can result in symptoms such as fatigue, vomiting, weakness, dizziness, and shortness of breath, among others[3].

World Health Organization expert group's guidelines proposed that anemia is considered to exist when hemoglobin level is below 11gm/dl in pregnant women[4.] Since the iron demand reaches 6.6 mg/day in the third trimester pregnancy, most of the reported cases of anemia are seen in this period[5]. In the third trimester there is an increase in plasma volume and red cell mass. But the disproportionate increase in plasma volume causes haemodilution and it lowers the haemoglobin level[5.]

World Health Organization (WHO)/World Health Statistics data shows that in 2016 40.1% of pregnant women worldwide were anemic[6]. India ranks 170 out of 180 countries for anemia among women, according to a global nutrition survey, 2016[6]. Anemia is more prominent in

Southeast Asian countries, about half of all global maternal deaths are seen to be due to anemia and India contributes to about 80% of the maternal death due to anemia[6]. India has the highest prevalence of anemia in pregnancy and is the home of the largest number of anemic pregnant women in the world[1]. There was seen to be a decrease in the prevalence of anemia in pregnant women in India from 58% in the NFHS-3(National Family Survey- 2005-6) to 50% in the NFHS-4 survey (2015-2016) and 46.4 % in the 2019 NFHS-5 survey (2019-2020) the first phase of NFHS-5 was conducted before the novel coronavirus disease (covid-19) lockdown, though there was a 10% increase in the prevalence of anemia in India from NFHS-2(49%) to NFHS-3(58%).NFHS-2,3,4 reported a relatively lower prevalence of anemia compared to DLHS.[6,7]

The prevalence of anemia scales from 33-89% among pregnant women and is more than compared to women from 60%[8,9]. Anemia in pregnancy has a multifactorial etiology, among which iron deficiency is the most common cause, due to poor intake and absorption of iron in the diet and also due to recurrent menstrual loss [5]. Especially in the third trimester there is seen to be an increase in plasma volume and red cell mass. But an unequal increase in plasma volume lowers the hemoglobin level and causes haemodilution which is further aggravated by other factors such as early pregnancy, repeated pregnancies, short spacing between pregnancies, and poor access to antenatal care and iron supplementation[10]

Under RMNCH+A services the Ministry of Health and Family Welfare, Government of India has given importance to prevent anemia[10]. National Health Policy 2017 also discussed about malnutrition and micronutrient deficiencies intervention. To combat the public health challenge of Iron deficiency anemia (IDA) prevalence across the life cycle, a comprehensive strategy "National Iron plus Initiative" was launched in 2013[11]. Under the Ministry of Women and Child Development, a mission that is National nutrition mission was been setup up that aims to reduce anemia among reproductive age by one-third of NFHS-4 levels by 2022 [11].

The increased demand for nutrients due to decreased bioavailability during pregnancy cannot be met through diet alone [12]. Because of the nonspecific clinical features of anemia, it goes undiagnosed for a long time although the diagnosis of anemia is relatively simple. [13]. The possibility of having IDA is high if the mothers are not given IFAS during pregnancy [14]. The recent 2018 WHO recommendations on IFAS during pregnancy are part of the new ANC guidelines which recommends a daily oral intake of IFAS to prevent maternal anemia, and there is a provision of weekly supplementation in areas where maternal anemia prevalence is found to be <20%[15]. 70% risk of all types of maternal anemia and 57% of iron deficiency anemia can be reduced if the mothers take daily IFAS during her pregnancy [15]. Incongruent with the WHO recommended dosage, a daily dose of IFAS starting from the 2nd trimester followed throughout the pregnancy (Minimum 180days during pregnancy) is recommended by Anemia Mukt Bharat. Each of the tablets contains 60mg element iron+ 500mcg Folic acid [16].

➢ *Objectives of the Present Study*

- *Among Mothers in their Third Trimester Attending Antenatal Care in Tertiary Care Hospital, Puducherry:*

✓ *To find out the proportion with anemia.*
✓ *To find out the proportion with persistent anemia.*
✓ *To find out the association between anemia and its associated factors.*
✓ *To explore the perceived reasons for persistent anemia.*

- *Among the Health Personnel Involved in the Management of Anemia in Antenatal Mothers*
  To explore the reasons for persistent anemia in the third-trimester mother.

➢ *Research Approach*
For the current study, a Hospital based mixed method design-convergent explanatory study design is used.

➢ *Research Design*
Explanatory Mixed methods study (cross-sectional study design was used for quantitative part and descriptive for the qualitative part).

➢ *Sample*
The sample of the present study comprises of all Antenatal mothers >28 weeks of gestation attending antenatal care in WCH OPD, JIPMER.

➢ *Sampling Technique*

- *The sampling technique used was consecutive sampling for quantitative part. Among antenatal mothers more than 28 weeks gestation registered in Obstetrics and Gynecology OPD on all six days of the week, approximately 10 mothers were enrolled per day due to covid-19.*
- *For the qualitative part purposive sampling was done among mothers who were having persistent anemia. A consultant, 3 senior resident, 2 junior resident, sister in charge, 1 senior nursing officer were approached for key-informant interviews.*

➢ *Sample Size Calculation*

- *Objective 1,2,3,4(Quantitative Component)*
  Assuming the proportion of anemia among third trimester mothers as 83%(Anticipated prevalence from previous study in Pondicherry [3],5%alpha error, 95% confidence interval, absolute precession of +/-5%,the required Sample size is 217 is calculated by using Open epi software version3.

Among the third trimester anemic mothers, 10 mothers who had persistent anemia, few Open ended questions were being conducted for them using an interview guide.

- *Objective 5 (Qualitative Component)*
  8 key informant interviews were done among health personnel. A consultant, 3 senior residents, 2 junior residents, 1 sister in charge, 1 senior nursing officer was approached for key-informant interviews.

➤ *Criteria for Sample Selection*
  Inclusion Criteria:

- *Objective (i-iv)*

✓ All antenatal mothers >28weeks of gestation attending antenatal OPD in WCH (Women & Child Hospital), JIPMER.
✓ All antenatal mothers who have at least one record of Hb concentration at first or second visit were eligible to participate in the study.

- *Objective (v)*

✓ Health personnel involved in the management of Anemia among the antenatal mothers in the antenatal OPD , who were willing to take part in the study.

- *Exclusion Criteria:*

✓ Antenatal mothers who are not willing to take part in the study.
✓ Mothers who develops complications at the time of visit.
✓ Mothers with hematological and other blood related disorder.

➤ *Description of the Data Collection Instrument*

- *Quantitative Part-*
  It consists of three sections

✓ Section A: Sociodemographic profile
✓ Section B: obstetric factors and factors associated with anemia
✓ Section C: Adherence factors

- *Qualitative Part-*

✓ *Section 1-for Pregnant Women*
  Open ended questions

✓ *Section 2- for Key Informants*
  Open ended question

➤ *Data Collection Procedure*
  After approval from Nursing Research Monitoring Committee (NRMC), JIPMER and the Institute Ethical Committee (IEC) JIPMER, an informed written consent was obtained from the study participants. The researcher obtained permission from the sister incharge of Antenatal OPD, consultant of the particular unit who is having their OPD on the particular day of the week. The samples were selected based on inclusion and exclusion criteria. A pretested, semi-structured, validated questionnaire was used for the study purpose. The interview was conducted at a pre- defined allotted time. The purpose of the study was explained to the participants beforehand. For the open ended questions 10 mothers who were having persistent anemia were been selected. After the interview the recordings were transcribed into the language of record and then translated to English. Important themes and statements were noted. Completeness and accuracy was ensured at the end of each day.

In addition, key informants were identified among the health personnel for the interview. They were personally met/ called up asking for their willingness for an in-depth interview. An informed written consent was obtained from them. In- depth interview was conducted only for those who gave consent for the study, at a time convenient to them. After the in-depth interview the recordings were transcribed into the language of record and then translated to English. Important themes and statements were noted.

II. STATISTICAL TESTS USED FOR DATA ANALYSIS

➤ *Micro-soft Excel used for data entry and fined the percentages, means, standard deviation, and confidence interval of various quantitative variables measured by SPSSpackage version 20 was used.*

- Continuous variables like age, number of children, and hemoglobin level were summarized as mean and standard deviation (SD) or Median and Inter Quartile Range (IQR). Categorical variable such as religion, residence, educational status, gravida status, socioeconomic status, occupation and H/o anemia are expressed as proportions.
- Adherence is expressed as proportion with 95% confidence interval. Association of socio-demographic and obstetric variables with reasons was assessed using chi square test and PR with 95% CI. A p value of less than 0.05 was considered as statistically significant.
- For qualitative data analysis, audio recorded interviews were transcribed verbatim and translated to English and then back translated to the language of record on the same day of interview. Manual content analysis was caried out using inductive approach. Finally, similar categories were grouped to form sub–themes followed by themes to explore the participant's experiences. Similarly, manual coding was done for patients' responses and categories were grouped to form sub–themes followed by themes to explore on compliance.

After completion of quantitative and qualitative analyses, data were compared to elucidate patterns, address discrepancies and qualify the descriptions. Hence qualitative data was used to expand the depth of quantitative results.

➤ *Data Confidentiality and Anonymity of Mothers*
  Data confidentiality and anonymity of mothers were maintained throughout the research by allotting code number to participants.

➢ *Ethical Consideration*

The study was approved by Nursing Research Monitoring Committee, JIPMER and the Institute Ethical Committee **Human Studies. Reg No.JIP/CON/IEC/M.Sc/2019/CHN/3** JIPMER. Informed written consent was obtained from all the participants. Informed consent was taken by the investigator, just before the interview, in their local language after giving an explanation about the purpose of the study. Privacy and confidentiality, personal identity, as well as the results were not revealed to anybody. Information thus collected was kept confidential.

➢ *Results of the Study will be Discussed Under the following Headings-*

- *Section I: Socio-demographic and obstetric characteristics of study participants.*
- *Section II: Proportion of anemia and persistent anemia*
- *Section III: Severity of anemia*
- *Section IV: Association of the socio-demographic and obstetric factors and health service factors with the anemia status of the study participants.*
- *Section V: Reasons for persistent anemia among the antenatal Mothers and health care workers attending antenatal clinics in 3rd trimester pregnancy.*

- *Section I : Socio-demographic and obstetric characteristics of study participants.*

Table 1 Distribution of Socio-Demographic Characteristics of Antenatal Mothers Attending a Tertiary Care Centre, Puducherry 2021

Variables	Category	Frequency (%)
Age	18-23	50 (23.1)
	24-29	109 (50.5)
	>30	57 (26.4)
Education	Undergraduate	52 (24.0)
	Graduate	165 (76.0)
Occupation*	Housewife	177 (81.1)
	Government job	09 (4.1)
	Private job	17 (7.8)
	Health care professionals	15 (7.0)
Socio-economic status*	< 1050	77 (35.5)
	1051-2101	23 (10.6)
	2102-3503	38 (17.5)
	3504-7007	43 (19.8)
	>7008	37 (16.6)
Residence	Puducherry	69 (31.8)
	Villupuram	31 (14.3)
	Cuddalore	102 (47.0)
	others	15 (6.9)
Religion	Hindu	208 (95.9)
	Muslim	04 (1.8)
	Christian	04 (1.8)

Among the total 217 patients the Mean (SD) age of the antenatal mothers was 26.8 (4.6) years.
*BG Prasad Socio-economic status classification (Indian Journal of community health/vol 31/ issue no 01 / Jan - Mar 2019. [19]
*Health care professionals includes nurses and doctors working in hospitals

Table 2 distribution of obstetric and health service related characteristics of antenatal mothers attending a tertiary care centre, Puducherry 2021

Variable	Category	Frequency (%)
Gravida	Primi	91 (42.1)
	Multi	124 (57.4)
Abortion	0	162 (74.7)
	1	43 (19.8)
	>2	12 (5.5)
Number of children	0	115 (3.8)
	1	89 (84.0)
	>2	13 (12.3)
Taking IFAS	Yes	213 (98.2)
	No	04 (1.8)
Form of iron supplement	Tablet	201 (94.4)

	Injection	01 (0.5)
	Both	11 (5.2)
IFAS commencement	1st Trimester	178 (82.4)
	2nd Trimester	26 (12.0)
	3rd Trimester	12 (5.6)
Deworming tablets	Taken	64 (29.5)
	Not taken	153 (70.5)
Anemia status in 1st trimester	Anemic	97 (69.8)
	Non- Anemic	42 (30.2)
Anemia status in 2nd trimester	Anemic	133 (71.5)
	Non- Anemic	53 (28.5)
Anemia status in 3rd trimester	Anemic	133 (61.3)
	Non- Anemic	84 (38.7)
Persistent anemia	Yes	73 (67.0)
	No	36 (33.0)
Side effects	Present	24 (11.1)
	Absent	192 (88.9)
Confirmation of pregnancy	Government hospital	141 (65.0)
	Private hospital	76 (35.0)
Taking proper nutrition	Yes	206 (94.9)
	No	11 (5.1)
Consultation cost	<1000	28 (12.9)
	1001-3000	91 (41.9)
	3001-5000	56 (25.8)
	>5001	42 (19.4)

Among the 24 participants who had side effects, the most common side effects were vomiting (37.5%), nausea (25%) and black stools (12.5%) Around three fourth (70.8%) of them reported it to their physician. About (44.4%) of the doctors have counselled about the timing and (22.2%) have given medication to manage the side effects.

Majority of the antenatal mothers (95%) were taking proper nutrition and more than half (55.5%) of them had made changes in their diet to improve their health. The reasons stated for not taking proper nutrition were no knowledge about iron rich foods (65%), no money (17.3) and did not feel it as important (17.3%).

Among the total participants 98.2% of them are taking IFA supplements and their behavior related adherence status was captured using Morisky 4-item scale, 41.9% were non adherent due to unintentional reasons. The proportion of antenatal mothers who were anemic in the third trimester was 61.3% (54.4-67.3).

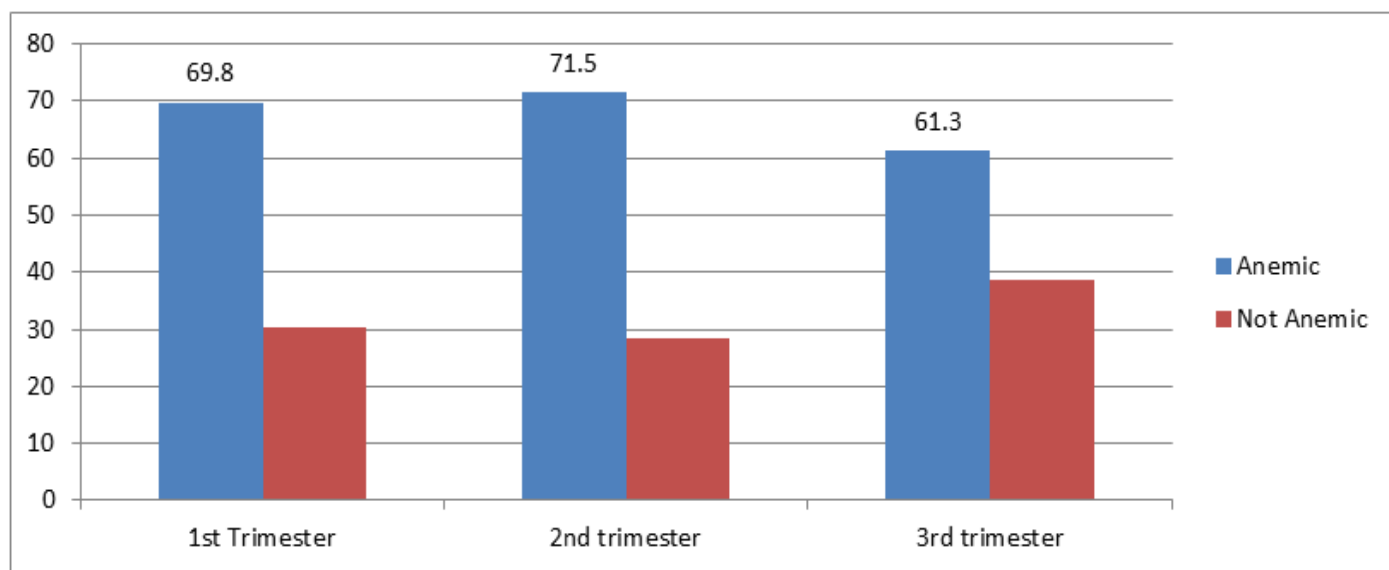- *Section II: Proportion of Anemia and Persistent Anemia*

Fig 1 Distribution of Proportion of Anemia in 1st Trimester, 2nd Trimester, 3rd Trimester

Figure 3 shows that there is a increase level of anemic mothers in all the trimester of pregnancy. 69.8% were anemic in the 1st trimester, 71.5% were anemic in the 2nd trimester, 61.3% were anemic in the 3rd trimester.
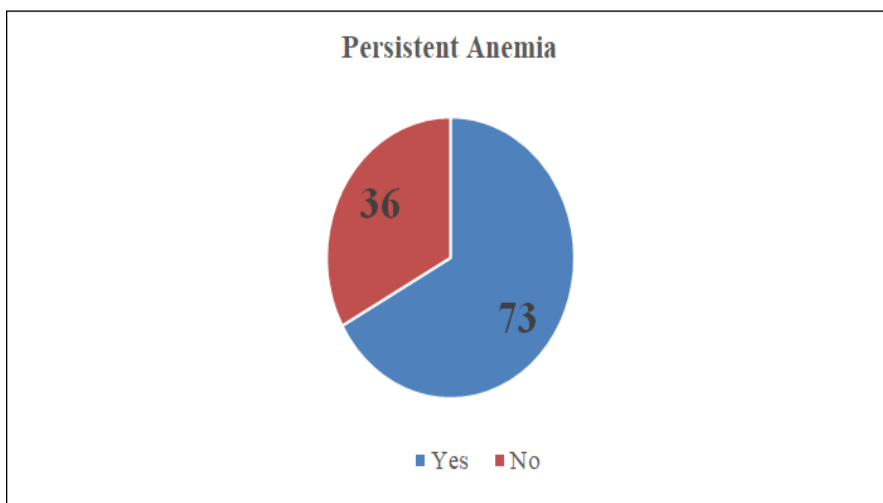
Fig 2 Distribution of Persistent Anemia Among the Antenatal Mothers Attending a Tertiary Care Centre Puducherry 2021

Figure shows among the antenatal mothers the proportion of persistent anemia from first trimester till the third trimester as 73%.
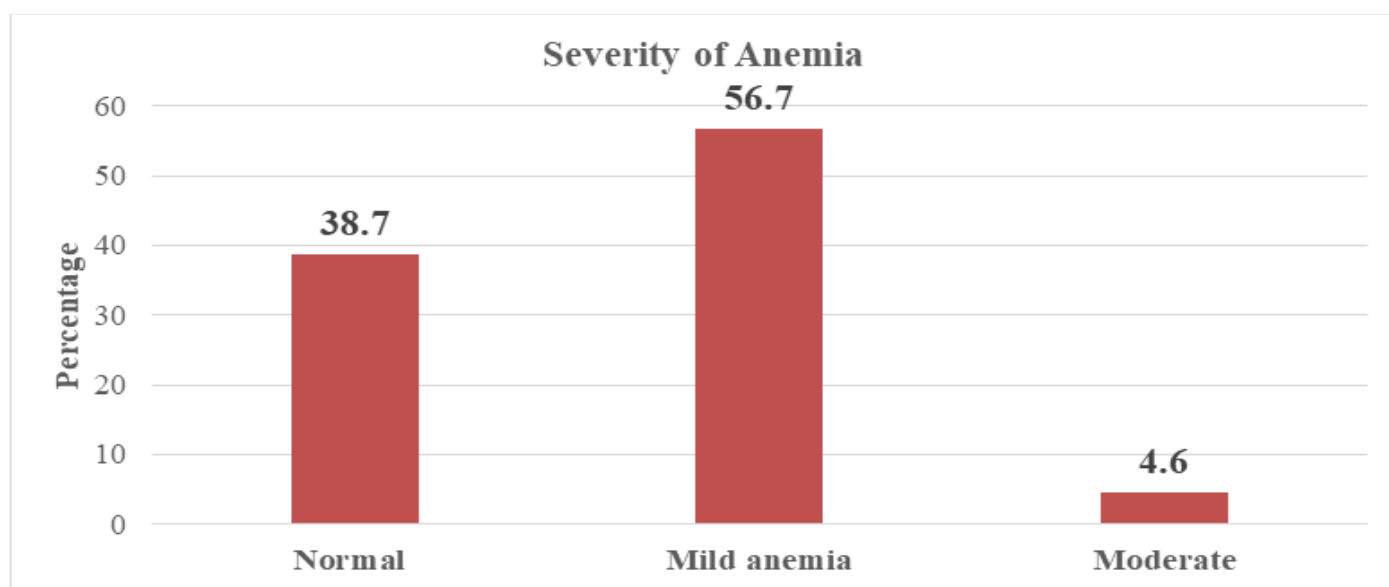
- *Section III: Severity of Anemia*

Fig 3 Distribution of Severity of Anemia (WHO Classification) Among the Antenatal Mothers Attending a Tertiary Care Centre Puducherry 2021

Figure 3 shows that 56.7 % were having mild anemia, 38.7 were having normal values while 4.6% were having moderate anemia and none of them were having severe anemia.

- *Section IV: Association of the socio-demographic and obstetric factors and health service factors with the anemia status of the study participants.*

Table 3 Distribution of anemia in either 1st or 2nd trimester associated with persistent anemia among antenatal mothers attending a tertiary care centre, Puducherry 2021. (N= 217)

Variable	Total N		Persistent anemia	
	109		Yes	No
Anemia in either 1st or 2nd trimester	Present	91	73 (80.3)	18 (19.7)
	Absent	18	0 (0)	18 (100)

Table 3 represents 80.3 % of mothers who were having persistent anemia till their third trimester were also having anemia either in 1st or 2nd trimester of their pregnancy.

Table 4 Distribution of anemia in either 1st or 2nd trimester associated with anemia in 3rd trimester among antenatal mothers attending a tertiary care centre, Puducherry 2021. (N= 217)

Variable	Total	N	Anemia in 3rd trimester		Prevalence Ratio with 95% CI	P value
	109		Present	Absent		
Anemia in either 1st or 2nd trimester	Present	91	58 (63.7)	33 (36.2)	4.5 (1.5-15.2)	0.006
	Absent	18	5 (27.8)	13 (72.2)	1	-

Table 4 shows that 63.7 % mothers who were having anemia in third trimester were also having anemia either in 1st or 2nd trimester of their pregnancy. The p value is 0.006 which shows that there is association between anemia in either 1st or 2nd trimester with anemia in 3rd trimester.

Table 5 Distribution of Sociodemographic factors associated with Anemia among antenatal mothers attending a tertiary care centre, Puducherry 2021. (N= 217)

Category	Variables	Total	Anemia		Prevalence Ratio 95% CI	p-value
			Present (%)	Absent (%)		
			133 (61.3)	84 (38.7)		
Age	18-23	50	33 (24.8)	17 (20.5)	1.31 (0.59-2.92)	0.50
	24-29	109	66 (49.6)	43 (51.8)	1.03 (0.53-2.00)	0.90
	>30	57	34 (25.6)	23 (27.7)	1	-
Education	Undergraduate	52	34 (25.6)	18 (21.4)	2.81 (1.47-5.50)	**<0.001**
	Graduate	165	66 (78.6)	99 (74.4)	1	-
Occupation	Housewife	177	62 (73.8)	114 (85.7)	1.71 (0.28-11.25)	0.56
	Government Job	09	6 (7.1)	3(2.3)	0.78 (0.18-3.26)	0.72
	Private Job	17	8 (9.5)	9 (6.8)	0.35 (0.18-0.677)	<00.1
	Nurse	16	8 (9.5)	7 (5.3)	1	1
Socio-economic status	> 1050	77	34 (40.5)	43 (32.2)	1	1
	1051-2101	23	3 (3.6)	20 (15.0)	0.47 (0.157-1.42)	0.18
	2102-3503	38	12 (14.3)	26 (19.5)	0.58 (0.25-1.32)	0.20
	3504-7007	43	18 (21.4)	25 (18.8)	0.91 (0.42-1.94)	0.81
	>7008	36	17 (20.2)	19 (14.3)	1.13 (0.50-2.52)	0.76
Residence	Puducherry	70	34 (25.6)	35 (41.7)	0.85 (0.26-2.68)	0.78
	Villupuram	31	24 (18.0)	7 (8.3)	2.92 (0.76-11.55)	0.11
	Cuddalore	102	67 (50.4)	35 (41.7)	1.66 (0.53-5.12)	0.36
	Others	15	8 (6.0)	7 (8.3)	1	

Table 5 shows that 49.6% of the mothers were anemic in the age group of 24-29 years, 25.6 % anemic mothers were undergraduate which is highly significant p<0.001. 73.8% of anemic mothers were house wife and 40.5% anemic mothers belong to low socio-economic status (BG Prasad socio-economic scale) but there was no significant association was found. Therefore it shows association between anemia and low education level. There was no significant association found between anemia with other demographic variables.

Table 6 Distribution of obstetric and health service related factors associated with Anemia among antenatal mothers attending a tertiary care centre, Puducherry 2021. (N= 217)

Variables	Total	Anemia		Prevalence Ratio 95% CI	p-value
		Present (%)	Absent (%)		
		133 (61.0)	**85 (39.0)**		
Gravida					
Primi	91	59 (44.7)	32 (38.1)	1	
Multi	124	73 (55.3)	51 (60.7)	0.77 (0.44-1.36)	0.37
Abortion					
0	163	101 (75.9)	61 (72.6)	1.65 (0.48-5.64)	0.41
1	43	26 (19.5)	17 (20.2)	1.51 (0.39-5.78)	0.53
>2	12	6 (7.1)	6 (7.1)	1	
Number of children					
0	115	74	41	0.80 (0.23-2.70)	0.75
1	89	51	39	0.58 (0.14-2.01)	0.41
>2	13	9	4	1	-
Taking IFAS					

Yes	213	129 (97.0)	84 (100)	0	-
No	04	4 (3.0)	0	1	
Form `of iron supplement					
Tablet	200	119 (93.0)	81 (96.4)	0.55 (0.11-2.08)	0.41
Injection	01	1 (0.8)	0	0	-
Both	11	8 (6.3)	3 (3.6)	1	-
IFAS commencement					
1st Trimester	177 (82.4)	106 (80.9)	71 (84.5)	0.74 (0.19-2.56)	0.66
2nd Trimester	26 (12.0)	17 (13.0)	9 (10.7)	0.94 (0.19-41)	0.95
3rd Trimester	12	8 (6.1)	4 (4.8)	1	
Deworming tablets					
Taken	64	40 (30.1)	24 (28.6)	1.07 (0.58-1.98)	0.81
Not taken	153	93 (69.9)	60 (71.4)	1	
Anemia status in 1st trimester					
Anemic	97	66 (76.7)	31 (58.5)	2.37 (1.10-4.94)	0.02
Non- Anemic	43	20 (23.3)	22 (41.5)	1	
Anemia status in 2nd trimester					
Anemic	133	96 (87.3)	37 (48.7)	7.1 (3.5-15.0)	**<0.001**
Non- Anemic	53	14 (12.7)	39 (51.3)	1	-
Persistent anemia					
Yes	73	5 (7.9)	31 (67.4)	0.04 (0.01-1.12)	**<0.001**
No	36	58 (92.1)	15 (32.6)	1	
Side effects					
Present	23	14 (10.6)	9 (10.8)	0.987 (0.40-2.46)	0.94
Absent	192	118 (89.4)	74 (89.2)	1	-
Confirmation of pregnancy					
Government hospital	141	92 (69.2)	49 (53.3)	1.59 (0.90-2.83)	0.10
Private hospital	76	41 (30.8)	35 (41.7)	1	-
Taking proper nutrition					
Yes	206	125 (94.0)	81 (96.4)	0.58 (0.12-2.18)	0.45
No	11	8 (6.0)	3 (3.6)	1	-
Consultation cost					
<1000	28	20 (15.0)	8 (9.5)	1.59 (0.54-4.47)	0.42
1001-3000	91	58 (43.6)	33 (39.3)	1.08 (0.50-2.30)	0.83
3001-5000	56	29 (21.8)	27 (32.1)	0.66 (0.28-1.50)	0.32
>5001	42	26 (19.5)	16 (19.0)	1	-

Table 6 shows that 55.3% of multigravida mothers were anemic in the third trimester though it was not significantly tested. 97% mothers who were taking IFAS were having anemia in the third trimester but there was no significant association found. 43.6% women were spending around Rs 3000 for their private consultation and scans due to decrease in the number of appointment's in the OPD due to Covid-19   There was no significant association found in this study between obstetric and health related factors with anemia.

- *Section V: Reasons for Persistent Anemia Among the Third Trimester Mothers and Health Care Workers.*

  A total of 10 in-depth interviews and 8-key informant interviews were conducted among the antenatal mothers and healthcare providers including 5 senior resident,3 junior resident ,2 senior nursing officer. Several themes and codes were identified from the interviews using manual content analysis.

➢ *Factors Associated with Persistent Anemia in Antenatal Mothers*

- *THEME A : Knowledge related to anemia*
   Subtheme

✓ Lack of awareness on anemia
✓ Lack of knowledge related to nutrition rich in iron.

- *THEME B : Social factors*
   Subtheme

✓ Low socio-economic status and poor affordability to iron rich and protein rich foods
✓ Social factors

- *THEME C : Reproductive and pregnancy related factors*
   Subtheme

✓ Pregnancy related factors
✓ Reproductive factors

- *THEME D : Behavioural factors*
  Subtheme

✓ Distorted perception and experiences

- *THEME E : Iron and folic acid supplementation*
  Subtheme

✓ Adherence to IFAS
✓ Enhancers and inhibitors of IFAS

- *THEME F : Facilitating factors*
  Subtheme

✓ Health education
✓ Drug quality

III. DISCUSSION

➢ *The first objective was to find out the proportion with anemia among the mothers in third trimester attending antenatal care in tertiary care hospital, Puducherry.*

A total of 217 antenatal mothers were included in this study and the mean (±SD) age of the participants was 26.8 (±4.6) years. Around 69.8% women were anemic in 1st trimester, 71.6% participants in the 2rd trimester and 61.3% participants in the 3rd trimester. According to the NFHS-5 report the anemia prevalence among pregnant women is 57.2 % and Prevalence of anemia in India is among the highest in the world despite the rigorous efforts put by the government to counteract this situation. Among the third trimester mother who were anemic 67% was found to have persistent anemia.

Currently the Government of India launched Anemia Mukth Bharat under the umbrella programme POSHAN Abhiyaan in March 2018 with a target to reduce 3 percentage points in the prevalence of anemia among women in the reproductive age group (15–49 years), adolescents and children by the year 2018 to 2020.[9]

The proportion of antenatal mothers who were anemic in the third trimester in the current study was 61.3% (54.4-67.3).which is similar to the study conducted by V. Sridevi, S.Viswanathan which was found to be 66.7% in third trimester regarding the prevalence and associated risk factors of anemia among pregnancy in a tertiary care rural hospital, Chidambaram. Major factors responsible were multiparty, inadequate spacing between pregnancies which findings were almost similar.[8]

The prevalence of anemia was found to be 67.53 % in the current study which is similar to study conducted by Shwetha, Prasad K where 68.6% was found be anaemic in pregnancy. Also a study by Mangla M et al. in rural area of Haryana consisted of maximum number of pregnant women in the age group of 20–29 years and more than 70% of them were literates. The age group and literacy status of pregnant women were similar to the findings of our study [13-14]

A survey by the Indian Council of Medical Research has shown, more than 50% of adolescents, children, and pregnant women are anemic. Suryanarayana et al. conducted a study in Kolar district and showed prevalence of 63% among pregnant women. The prevalence of anemia in our study (67.53%) was similar to that in Kolar. [17]

The total prevalence of anemia was 67.53 which is more than the cross-sectional study done by Rajamouli J,Ravinder A et all which was found to be 58.36% including mild, moderate and severe. [2]

➢ *The second objective was to find out the proportion with persistent anemia among the third trimester mothers.*
A similar cross-sectional study conducted by Balasubramaiann T where High prevalence of anemia was found to be 64% among the third trimester mothers which is similar to this study ,where the prevalence of antenatal mothers who were anemic in the third trimester were 61.3% . The study reveals the lack of knowledge among antenatal mothers regarding anemia and its complications. Socio-economic status influence Hb level directly which is statistically proven in the study [15] which is similar to current study where the reasons stated for not taking proper nutrition were no knowledge about iron rich foods (65%), no money (17.3)

The prevalence of anemia was found to be higher in second and third trimester in this study which is consistent with study done by Raj PBU, Mangaduli V. where prevalence of anemia was found to be 85.2% among them prevalence is more in second and third trimester. [18]

➢ *The third objective was to find out the association between anemia and its associated factors.*
A study in rural area of Mysore, 64.2% of pregnant women were anemic and there was a significant association between anemia and factors such as, socio-demographic characteristics, and parity. Similar findings were observed in our study, with prevalence rate of 67.53% and significant association was seen with anemia and spacing.

Educated pregnant women have better income and eat nutritious food and hence do not get nutritional anaemia [20]. A study in Ethiopia also reported higher prevalence of anaemia among pregnant women who had no education [21].

➢ *The fourth and fifth objective was to explore the perceived reasons for persistent anemia.*
The qualitative data revealed that the Knowledge and health system related factors which include the awareness and understanding of the importance of anemia, IFA tablets, diet, early initiation of IFAS, low adherence to medicines, family support and proper attention to subside the side effects will facilitate anemia and improve the health. Similar findings were observed in a study conducted in Saudi says that there is need for public health strategies to educate the population for need of healthy diet and IFAS at the beginning of pregnancy. Other recommendation during pregnancy aims to early detect and treat the anemia before delivery[22].

Furthermore women with co-morbidities and previous abortions are given more emphasis to anemia during the counseling which makes them more adherent compared to women without any complications. Persistent anemia was mainly due to side effects, myths and misconceptions and low motivation related factors.

Women with no previous abortions were more likely to be non-adherent compared with women previous abortions. This might be because antenatal mothers who had a history of abortion may have a fear that abortion can happen again. The qualitative data implies the same by the statement given by a staff nurse "*Women with previous abortions adhere better than other pregnant mothers*". Furthermore; this may encourage the pregnant women to give more emphasis to their antenatal care and the supplement too. Also, the health care provider may give more emphasis to mothers with previous abortions during counseling.

Reasons like forgetfulness perceived or experienced side effects and not being able to take the tablets while traveling are the salient patient factors influencing the adherence to IFAS. Antenatal mothers have reported forgetfulness as an important factor for non-adherence. Similar results were seen in a study conducted in Mangalore and Pakistan [23,24].

IV. CONCLUSION

The prevalence of anemia among pregnant women was high in our study and also seen is various studies in different parts of the country. This continuing high burden of anemia could be mainly due to lack of spacing between the pregnancies and lack of utilization of the services provided by the government to combat the problem. Although our study did not show a significant association between hemoglobin status and various socio-demographic characteristics, various studies have shown a significant association between the same. Accessing the knowledge regarding anemia, nutrition, availability of various free governmental services, and importance of spacing between the pregnancies on health of the mother and the baby and educating about the same may improve prevalence of the anemia.

The factors like anemia in the 1st trimester, 2nd trimester, abortions in the previous pregnancy, were associated with anemia among antenatal women. The antenatal mothers had a low level (71.2) of adherence towards IFA tablets in pregnancy. Findings from this study reveal that factors that emphatically influenced IFAS adherence were health education and counseling on IFAS, knowledge about anemia and IFAS and supportive supervision by the health care worker and also the family members.

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