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A Correlation between Maternal Anemia and Pregnancy and Neonatal Outcomes: A Longitudinal Study among the Pregnant Women of the Below Poverty Line in Ajmer City

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ABSTRACT

Objective of the study: To study the anemic conditions among the pregnant women belonging to below poverty line, which make a huge population coming to government hospitals.
Method: A structured questionnaire was used to analyse the corelation between anemia and birth outcomes in the pregnant women of below poverty line of the urban population in the city of Ajmer. The study was precisely empirical, longitudinal and prospective kind.
Result: A total of 658 women were encountered out of which 339 women fell under the inclusive criteria belonging to the poor strata and were considered for the research. Out of these, 339 belonging to the poor strata, they were classified under anemic and non-anemic. There were 286 poor pregnant women who were anemic
Conclusion: There was a strong corelation between the various grades of anemia among the pregnant women of below poverty line, the severely affected ones were those having moderate and severe anemia

KEYWORDS: Anemia, pregnant women, apgar, Below Poverty line, birth-weight, neonates, pregnancy-outcome.

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INTRODUCTION

Globally, the most world-wide impediment occurring during pregnancy is due to anemia. World Health Organization (WHO) estimates that 40% of the non-pregnant women and 50% of the pregnant women of in developing countries are anemic (Oliver, E., & Olufunto, K., 2012).

The peri and post conceptional period are the most vital and crucial period of pregnancy. It is the time that all the fetal programming can be achieved. During pregnancy, the umbilical cord supplies the fetus with the nourishment which includes maternal nutrients. Because of this the periconceptional and postconceptional period of pregnancy are known as the 'Critical Window of the Pregnancy'. When requirements diverge from optimal and recommended levels, severe consequences can result. Thus, if the appropriate and necessary steps are taken to check anemia in a new-born infant at this ideal time, several risk

factors related to their health conditions can be corrected and altered (Banjari, I., 2018).

In order to accept and support the developing fetus in the mother's body, the mother's body has to undergo a number of physiological changes (Kalma., 2019). There is a significant correlation between anemia and age and parity of the pregnant women. In these cases, the young adolescent pregnant girls must bear, therefore, an extra nutritional burden as they are in the prime demand for the additional iron for their own ongoing growth processes, while their insufficient nutrient reserve must be shared with the developing embryo.

Furthermore, maternal nutrition has a complex relationship with the fetal development outcomes. According to the hierarchy, the fetus prioritizes over the maternal iron stores, regardless of the iron stores in the mother. Because the placenta traps maternal transferrin, the maternal iron stores remain low throughout pregnancy because the fetus obtains iron from it. As maternal iron stores decreases, the iron stores of these fetuses also will decrease over the time. Nonetheless, iron reserves are still needed by the mother for lactation and for future pregnancies. Thus, in India which comes under the developing nations, for vast majority of the women, where proper dietary procedures are not taken into consideration during pregnancy, this results in an elevated incidence of maternal mortality, post-partum complication and also neonatal morbidity and neonatal mortality.

Repeated abortion, frequent fetal loss, congenital abnormalities, and neonatal and maternal mortalities are other varied consequences of anemia (Haas, J. D., & Fairchild, M. W.,1989). Mental and motor formation related issues are seen in children (McCann, J. C., & Ames, B. N., 2007). Preterm labour, reduced birth weight (Rasmussen, K. M., 2001), increased child and maternal mortality (Brabin, B. J., Premji, Z., & Verhoeff, F., 2001) are also associated with anemia, especially in severe anemic cases. Anemic mothers deliver babies with small gestational age, pre-term babies increase along with perinatal mortality. Even the mean weight, Apgar score, hemoglobin level after 3 months and birth weight are also drastically influenced. Maternal and neonatal mortality both are accelerates by anemia in pregnancy (Balarajan, Y. *et al*., 2011).

METHODOLOGY

A structured questionnaire was used to analyse the corelation between anemia and birth outcomes in the pregnant women of below poverty line of the urban population in the city of Ajmer. The study was precisely empirical, longitudinal and prospective kind. The four target hospitals of the city were visited for the sample collection. Help was also sought through the Asha sahyoginis working at different PHC's within the Ajmer city, to scrutinise and maintain interactions with the pregnant women. However, all the deliveries occurred in the given two government hospitals and two private hospitals namely St. Francis Hospital (private), Holy Family Hospital (private), Janana Hospital (Government), Satellite Hospital (Government).

We monitored the pregnant women specifically from her second trimester until delivery, and we notified also the outcome of the delivery. The variables used in the research were designed meticulously and classified as independent and dependent, were also grouped as primary and secondary data, considering all areas of the research work.

Primary date included general information of the pregnant woman **(**name, present age, EDD, religion/caste). Specific information of the pregnant woman (age at marriage, age at first delivery, total number of gravida, total number of children, number of present pregnancy, family type and number of members in the family). Specific information of the pregnant woman with respect to Socio-Economic and Demographic Variables (educational status, occupation and income of the pregnant woman and her husband, overall yearly family income, health insurance, Income tax payer, monthly per capita expense on food, availability of BPL card, Bhamashah card, housing type, electricity, water supply, availability of lavatory and bathrooms).

Secondary data included Prevalence and frequency of anemia (frequency of mild, moderate, and severe anemia in the study group). Maternal Outcome (Consisted of maternal morbidity which included

type of delivery, complication associated during the delivery and infections. While shock /coma, eclampsia, and death came under maternal mortality. Fetal Outcome (Live birth, IUD or still birth). Neonatal Outcome (neonatal morbidity which included anthropometric measurement of the neonate i.e., sex, weight, crown heel length, and Apgar score at 1 and 5 minutes. Other components of neonatal morbidity were gestational age, prematurity and IUGR).

Inclusion Criteria had all expecting women with single pregnancies and who belonged to the poor that is below poverty line category coming to Janana Hospital, Satellite Hospital, St. Francis Hospital, and Holy Family Hospital, and were willing to participate in the study. Exclusion Criteria were expecting women with multiple pregnancy and pregnant women suffering serious health conditions like chronic hypertension and diabetes mellitus, certain sickness like sickle cell anemia which comes under hemoglobinopathies and women having increased level of bilirubin in their report were also excluded. A total of 658 women were studied of which 339 fell under the inclusion criteria.

A quantitative and nominal type of data collection is done. Data collection tenure is from November 2018 to January 2022. Data processing included preparing the data collected with necessary changes for data analysis, the final process. Data processing includes coding, editing, entering the preparation of charts and tables. A statistical code was first applied to the data to maintain the secrecy and confidentiality. All the data was categorised and arranged under various groups to make logical sense. To facilitate further analysis and comparison, it was presented in a tabular format. Based on the final tabulation, the various statistical computation was also feasible. A diverse range of graphs and visuals supported the data.

A descriptive and inferential statistics type of data analysis was done. Percentage, simple frequency and arithmetic mean fall under the descriptive tools. One sample 't' test was used to ascertain the impact of anemia on the pregnancy outcome on the pregnant women of below poverty line. The probability value p when <0.05 was considered as statistically significant. Statistical analysis on the data was undertaken by Statistical Package for Social Sciences (SPSS) software version 22 (Nie, N. H. *et a*l., 1975).

RESULT AND OBSERVATION

A total of 658 women were encountered out of which 339 women fell under the inclusive criteria belonging to the poor strata and were considered for the research. Out of these, 339 belonging to the poor strata, they were classified under anemic and non-anemic. There were 286 poor pregnant women who were anemic.

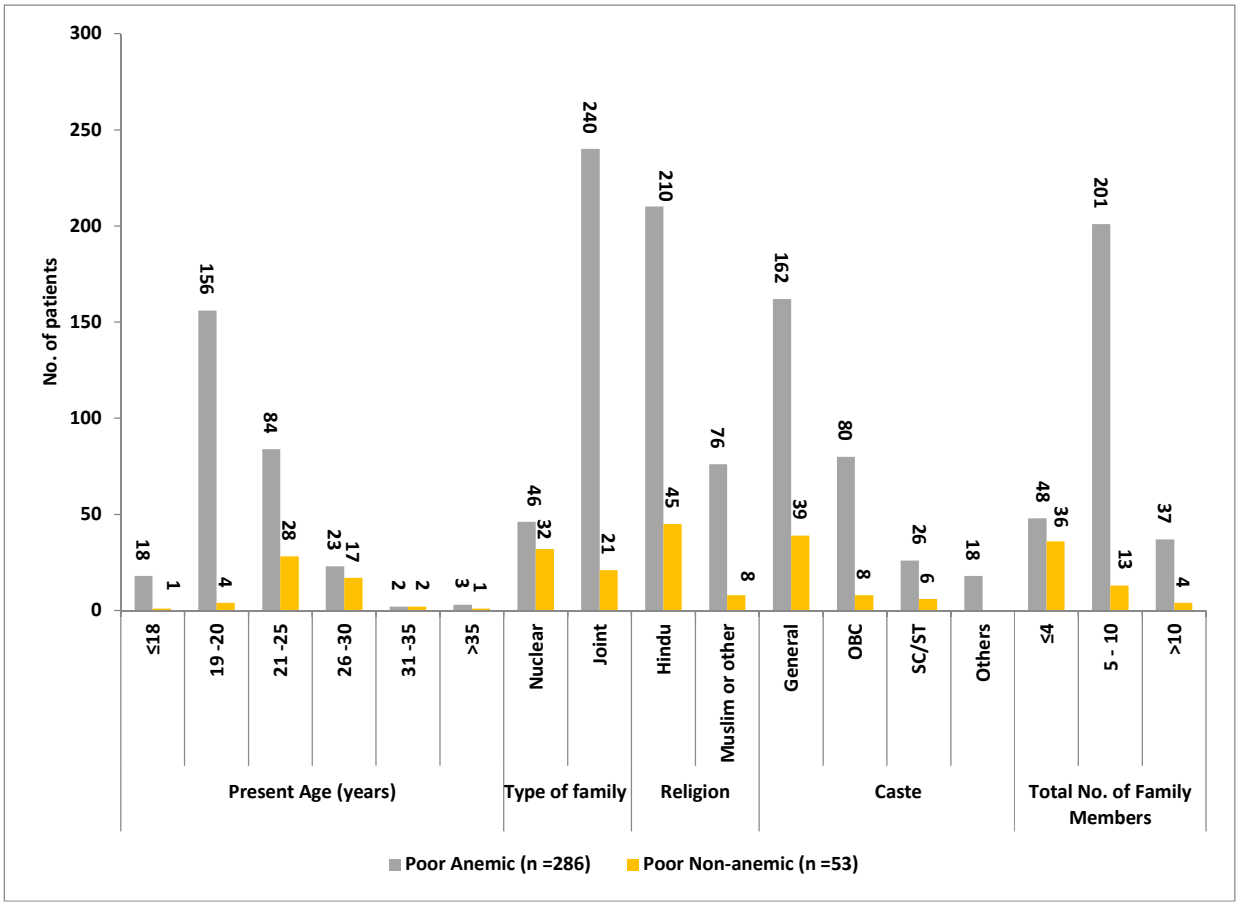
General Information of the Pregnant Woman: It was observed that among the anemic poor women 6.29%, 54.55%, 29.37%, 8.04%, 0.70% and 1.05% women were found to be in the age group of ≤18, 19-20, 21-25, 26-30, 31-35 and >35 years of age respectively, however, considering the non-anemic poor pregnant women there were 1.89%, 7.5%, 52.8%, 32.08%, 3.77% and 1.89% women who fell in the age group of ≤18, 19-20, 21-25, 26-30, 31-35 and >35 years of age respectively.

Type of family was the next criteria, it was found that, for the anemic women belonging to below poverty line, 83.92% lived in joint families with 12.94% having more than 10 members while 70.28% having 5-10 members in their family.

The next criteria were caste and religion. It was noted that in anemic women of below poverty line, 73.43% were Hindus and 26.57% were either Muslim or any other religion, while, among the non-anemic poor it was seen that 84.91% were Hindus and 15.09% belonged to other religions. Among the poor anemic women 9.09% were SC/ST, 27.97% were OBC and 56.64% came from general class. While, considering the poor non-anemic women 15.09% were OBC and the rest belonged to SC/ST and general class.

Table 1: General Information of the Pregnant Woman of below Poverty Line

General Information	Poor (Total= 339)			
	Anemic (n =286)		Non-anemic (n =53)	
	Number	%	Number	%
Present Age (years)				
≤ 18	18	6.29	1	1.89
19 -20	156	54.55	4	7.5
21 -25	84	29.37	28	52.8
26 -30	23	8.04	17	32.08
31 -35	2	0.70	2	3.77
>35	3	1.05	1	1.89
Type of family				
Nuclear	46	16.08	32	60.38
Joint	240	83.92	21	39.62
Religion				
Hindu	210	73.43	45	84.91
Muslim or other	76	26.57	8	15.09
Caste				
General	162	56.64	39	73.58
OBC	80	27.97	8	15.09
SC/ST	26	9.09	6	11.32
Others	18	6.29		
Total No. of Family Members				
≤4	48	16.78	36	67.92
5 - 10	201	70.28	13	24.53
>10	37	12.94	4	7.55

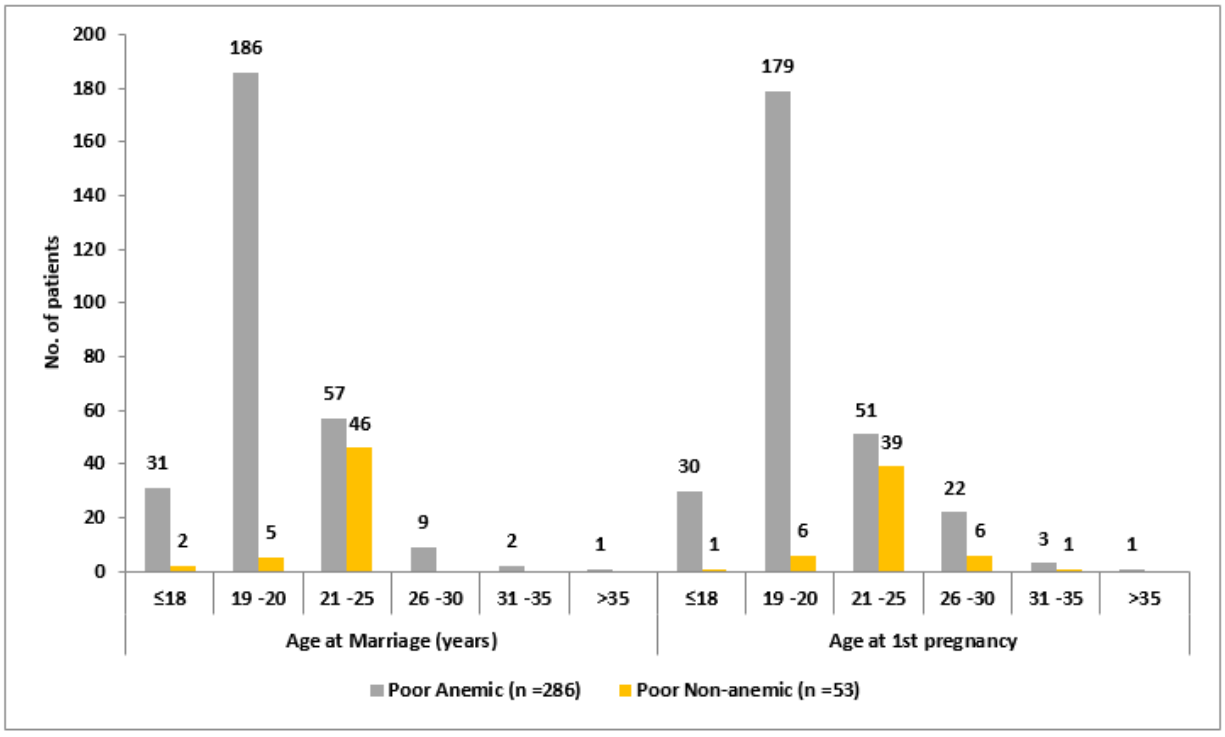


Graph 1: Graph showing the General Information of the Pregnant Woman of below Poverty Line

Particular Information of the Pregnant Woman of below Poverty Line: It was seen that among the anemic section of below poverty line, 10.84% of women married off before they could attain the marriageable age of age of 18 years. Most married women were between the age of 19 and 20 years, with a striking percentage of 65.03%. Within these, women under the age group of 18 years and between 19-20 years who gave birth to their first child made up to 10.49% and 62.59% respectively. The mean age of marriage for the pregnant women of below poverty line was 19.61 years while, the mean age for 1st delivery was 20.03 years. For anemic pregnant women's age belonging to below poverty line at marriage was highly associated with their age at first delivery.

Table 2: Particular Information of the Pregnant Woman of Below Poverty Line

Specific Information	Poor (Total= 339)			
	Anemic (n =286)		Non-anemic (n =53)	
	Number	%	Number	%
Age at Marriage (years)				
≤ 18	31	10.84	2	3.77
19 -20	186	65.03	5	9.4
21 -25	57	19.93	46	86.8
26 -30	9	3.15	0	0.00
31 -35	2	0.70	0	0.00
>35	1	0.35	0	0.00
Age at 1st pregnancy				
≤ 18	30	10.49	1	1.89
19 -20	179	62.59	6	11.32
21 -25	51	17.83	39	73.58
26 -30	22	7.69	6	11.32
31 -35	3	1.05	1	1.89
>35	1	0.35	0	0.00



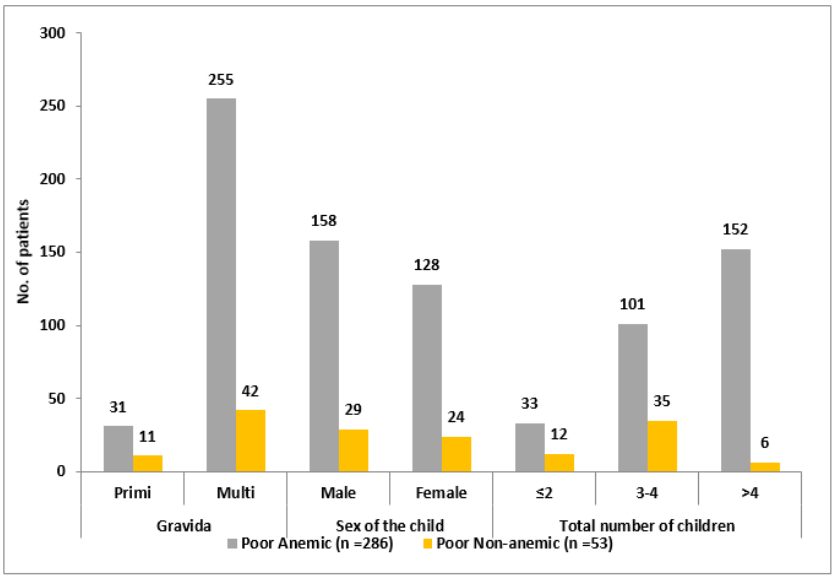
Graph 2: Graph showing the Particular Information of the Pregnant Woman of below Poverty Line

Distribution According to Perinatal Record in the Present Study: Pregnant women's perinatal records are shown in the table that follows. It was seen that for the anemic pregnant women of below poverty line, for 10.84% of them, it was their first gravida while 89.16% of them, it was their multiple pregnancy, while, for the poor non-anemic women, 20.75% were witnessing their first child and 79.25% women it was their multiple pregnancy.

There were 35.31% and 53.15% who had 3-4 and > 4 children respectively in the anemic pregnant women of below poverty line. However, the poor non-anemic women there were 22.64% there were with ≤ 2 children.

Table 3: Distribution According to Perinatal Record in the Study Groups

Perinatal Record	Poor (Total= 339)			
	Anemic (n =286)		Non-anemic (n =53)	
	Number	%	Number	%
Gravida				
Primi	31	10.84	11	20.75
Multi	255	89.16	42	79.25
Sex of the child				
Male	158	55.24	29	54.72
Female	128	44.76	24	45.28
Total number of children				
≤2	33	11.54	12	22.64
3-4	101	35.31	35	66.04
>4	152	53.15	6	11.32

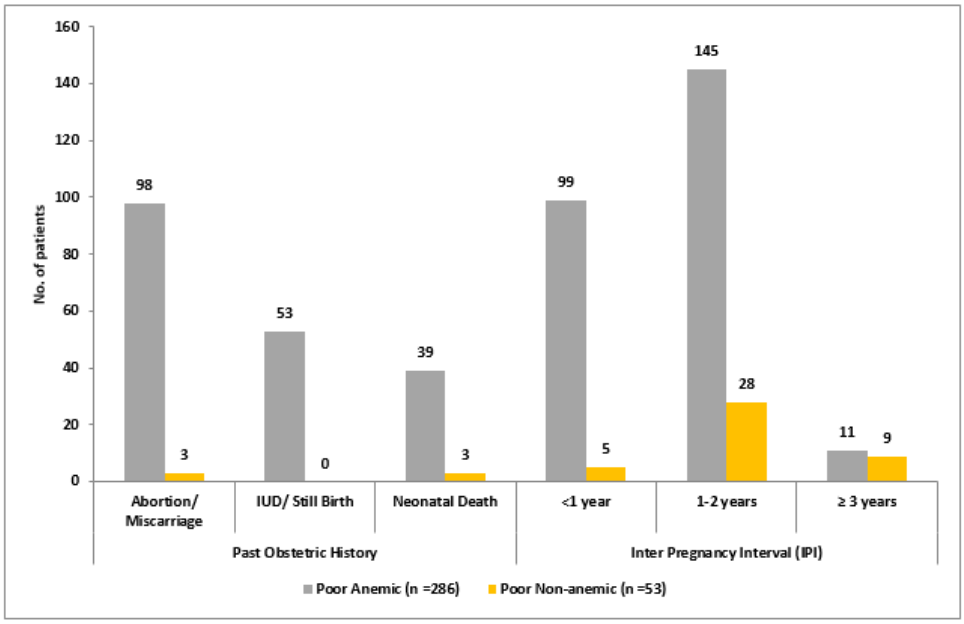


Graph 3: Graph showing the Distribution According to Perinatal Record in the Study Groups

Specific Information with Respect to Past Obstetric History in the Study Group: Looking at the anemic pregnant women of below poverty line, it was found that a low percentage of 34.27% of women ended up either with abortion or miscarriage while 18.53% women either had IUD or still birth and 13.64% encountered neonatal death in their earlier pregnancies. Considering the non-anemic poor pregnant 5.66% of women underwent abortion or miscarriage. Considering the inter pregnancy interval (IPI) for the poor anemic women, it was noted that 34.62% of women had less than 1 year of IPI and 50.70% women who had 1-2 years of IPI. While, the poor non-anemic pregnant women there were 16.98% who had IPI of ≥ 3 years

Table 4: Specific Information with Respect to Past Obstetric History in the Study Group

Past Obstetric History	Poor (Total= 339)			
	Anemic (n =286)		Non-anemic (n =53)	
	Number	%	Number	%
Abortion/ Miscarriage	98	34.27	3	5.66
IUD/ Still Birth	53	18.53	0	0.00
Neonatal Death	39	13.64	3	5.66
Inter Pregnancy Interval (IPI)				
<1 year	99	34.62	5	9.43
1-2 years	145	50.70	28	52.83
≥ 3 years	11	3.85	9	16.98



Graph 4: Graph showing the Specific Information with Respect to Past Obstetric History in the Study Group

Socio-Economic and Demographic Factors and its Association with Anemia in the Study Groups: The next parameter being the educational status of the mother for pregnant women of below poverty line, it was observed that 36.01% women who were illiterate, 42.31% who merely scrapped through their primary education and only 19.93% who cleared their secondary and were found to be anemic. However, there were 94.94% non-anemic pregnant women were graduate.

Looking into the educational qualification of the fathers, nearly 22.73% men of the anemic women of below poverty line were illiterate and 44.06% men managed to finish their primary education. Focussing on the socio-economic and demographic factors were the occupation of the mother, there were 82.87% and 16.08% of the poor pregnant women who were housewife and working as daily labourers respectively and were anemic. Taking into account the occupation of the husband, it was observed that close to 69% poor men had anemic wives and who were daily wage workers.

Income of the mother, for the poor there 16.08% women earned ≤ 10000 per month and were anemic and nearly 68% men who grossed less than ≤ 10000 per month and had anemic wives.

Next criteria under consideration were the per capita expenditure on food, 100% pregnant women of below poverty line spent ≤ 1000 on food and were found to be anemic, however, considering the poor non-anemic 69.81% ≤ 1000 and 30.19% women spent1100-1500 on food per month.

Another point under consideration is the association of anemia was availability of lavatory, it was noted that in the anemic pregnant women of below poverty line, nearly 36% women had no availability of lavatory and while for the non-anemic there were 94.34% who had the availability of lavatories

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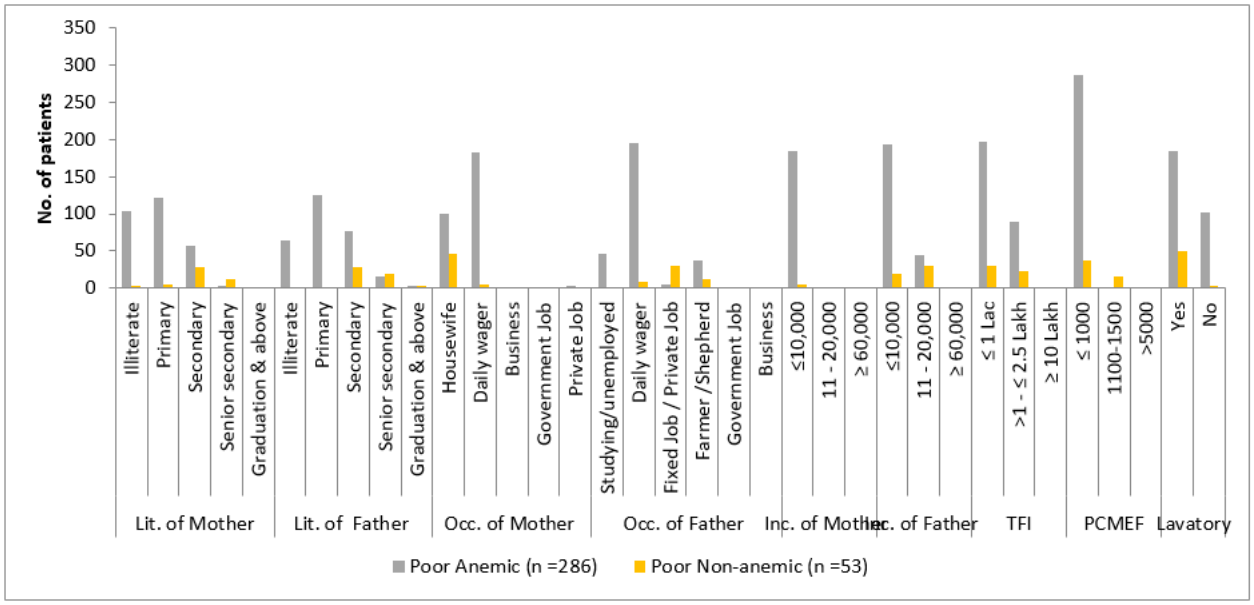
Table 5: Socio-Economic and Demographic Factors and its Association with Anemia in the Study Group

Educational Parameters	**Poor (Total= 339)**			
	Anemic (n =286)		**Non-anemic (n =53)**	
	Number	**%**	**Number**	**%**
Mother				
Illiterate	103	36.01	3	5.66
Primary	121	42.31	6	11.32
Secondary	57	19.93	29	54.72
Senior secondary	4	1.40	13	24.53
Graduation & above	1	0.35	2	3.77
Father				
Illiterate	65	22.73	1	1.89
Primary	126	44.06	2	3.77
Secondary	77	26.92	28	52.83
Senior secondary	15	5.24	19	35.85
Graduation & above	3	1.05	3	5.66
Occupation of Mother				
Housewife	237	82.87	47	88.68
Daily wager	46	16.08	6	11.32
Business	0	0.00	0	0.00
Government Job	0	0.00	0	0.00
Private Job	3	1.05	0	0.00
Occupation of Father				

Studying/ unemployed	47	16.43	2	3.77
Daily wager	196	68.53	8	15.09
Fixed Job / Private Job	6	2.10	31	58.49
Farmer /Shepherd	37	12.94	12	22.64
Government Job	0	0.00	0	0.00
Business	0	0.00	0	0.00
Income of Mother				
≤ 10,000	46	16.08	6	11.32
11 - 20,000	0	0.00	0	0.00
≥ 60,000	0	0.00	0	0.00
Income of Father				
≤ 10,000	194	67.83	20	37.74
11 - 20,000	45	15.73	31	58.49
≥ 60,000	0	0.00	0	0.00
Total Family Income (Annual)				
≤ 1 Lac	197	68.88	30	56.60
>1 - ≤ 2.5 Lakh	89	31.12	23	43.40
≥ 10 Lakh	0	0.00	0	0.00
Per Capita Monthly Expenditure on Food (Rs.)				
≤ 1000	286	100.00	37	69.81
1100-1500	0	0.00	16	30.19
>5000	0	0.00	0	0.00
Income Tax Slab				
No Tax (<2.5 lakh slab)	286	100.00	53	100.00
>10 lakh slab	0	0.00	0	0.00
BPL card				
Yes	286	100.00	53	100.00
No	0	0.00	0	0.00
Bhamasha Card				
Yes	277	96.85	41	77.36
No	9	3.15	12	22.64
Home type				
Self-Owned	181	63.29	47	88.68
Rented	105	36.71	6	11.32
Kaccha	97	33.92	37	69.81
Pakka	189	66.08	14	26.42
Vehicle				
No	189	66.08	3	5.66
Cycle	95	33.22	31	58.49
Two-wheeler	2	0.70	19	35.85
Four-wheeler	0	0.00	0	0.00
Multiple	0	0.00	0	0.00
Electricity				
Yes	237	82.87	48	90.57
No	49	17.13	5	9.43
Drinking water				
Purified	0	0.00	0	0.00

Tap water	186	65.03	36	67.92
Well / Hand pump	35	12.24	12	22.64
Buy water	65	22.73	5	9.43
Bathroom				
Yes	273	95.45	49	92.45
No	13	4.55	4	7.55
Lavatory				
Yes	184	64.34	50	94.34
No	102	35.66	3	5.66



Graph 5: Graph showing the Socio-Economic and Demographic Factors and its Association with Anemia in the Study Group

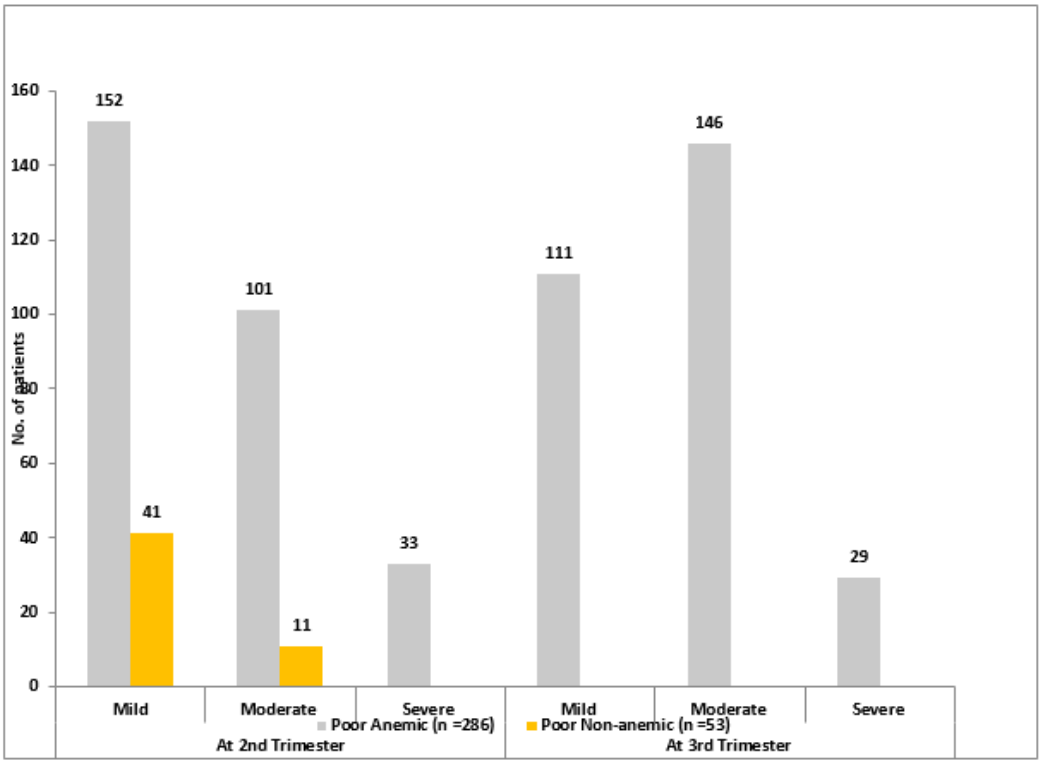
Comparison of the Various Grades of Anemia in the Study Group belonging to Second and Third Trimester: The table below depicts the various grades of anemia in the late trimesters. Taking into consideration the anemic pregnant women of below poverty line, that constituted to a total of 286 women, who had anemia either in their second or, and third trimester, it made a total of 84.36% of the total poor pregnant women. Furthermore, they were grouped as mildly anemic with 53.15%, a total of 35.31% of them suffered with moderate anemia and 11.54% of them witnessed severe anemia in their second trimester. While, talking about the third trimester there were 38.81% of women suffered from mild anemia, 51.05% of them witnessed moderate anemia and a 10.14% suffered from severe anemia. Visualising the various grades of anemia in the second and third trimesters in the non-anemic pregnant women of below poverty line, it was seen, 77.36% of women suffered from mild anemia, 20.75% of women had moderate anemia and none of them witnessed severe anemia in their second trimester.

For the anemic women of below poverty line, multiple factors were found to be associated with anemia. First being the age at marriage and anemia, it was found to be significant and had a mild

positive correlation with r=0.337. Secondly, age at first delivery and anemia was also found to be significant and had a mild correlation with r=0.382. Thirdly, number of gravida and anemia, it also exhibited a substantial mild correlation with r=0.180.

Table 6: Comparison of the Various Grades of Anemia in the Study Group belonging to the Second and Third Trimester

Range Of Anemia (gm/dl)	Poor Anemic (Total=286)			
	Anemic (n =286)		Non-anemic (n =53)	
	Number	%	Number	%
At 2nd Trimester				
Mild (10-10.9)	152	53.15	41	77.36
Moderate (7-9.9)	101	35.31	11	20.75
Severe (<7)	33	11.54	0	0.00
At 3rd Trimester				
Mild (10-10.9)	111	38.81	0	0.00
Moderate (7-9.9)	146	51.05	0	0.00
Severe (<7)	29	10.14	0	0.00

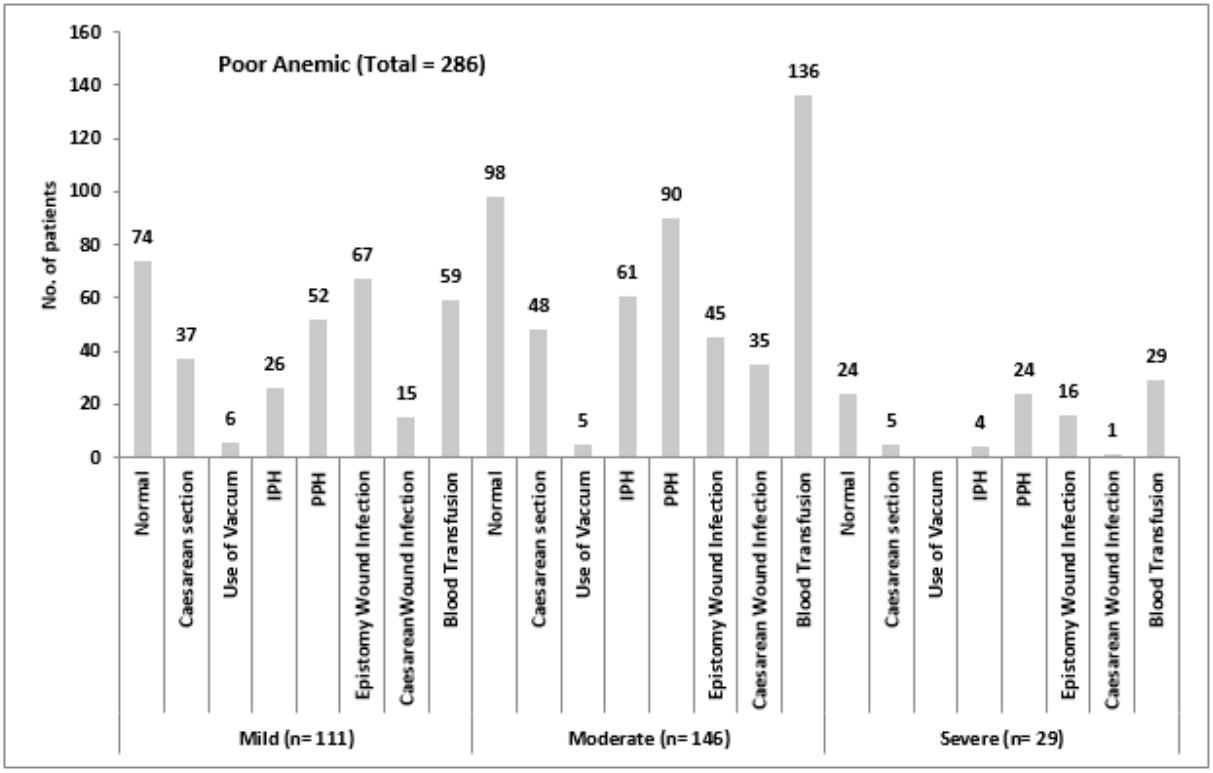


Graph 6: Graph showing the Comparison of the Various Grades of Anemia in the Study Group belonging to the Second and Third Trimester

Specific Information with Reference to Maternal Morbidity in the Study Group: Taking into account the maternal morbidity, it was noted that for the mildly anemic pregnant women of below poverty line 66.67%, 33.33%, 5.41%, 23.42%, 46.85%, 60.36%, 13.51%, 53.15%, while for moderately anemic women 67.12%, 32.88%, 3.42%, 41.78%, 61.64%, 30.82%, 23.97%, 93.15%, and for severely anemic poor pregnant women 82.75%, 17.24%, 0%, 13.79%, 82.76%, 55.17%, 3.45%, and 100% witnessed normal delivery, caesarean, use of vacuum, IPH, PPH, epistomoy wound infection, caesarean wound infection and blood transfusion respectively, which are classified as the maternal morbidities.

Table 7: Specific Information with Reference to Maternal Morbidity in the Study Group

Maternal Morbidity	**Number**	%	**Poor Anemic (Total = 286)**					
			Mild (n= 111)		**Moderate (n= 146)**		**Severe (n=29)**	
			Number	%	**Number**	%	**Number**	%
Mode of Delivery								
Normal	198	69.23	74	66.67	98	67.12	24	82.75
Caesarean section	88	30.77	37	33.33	48	32.88	5	17.24
Use of Vacuum	11	3.85	6	5.41	5	3.42	0	0
IPH	91	31.82	26	23.42	61	41.78	4	13.79
PPH	166	58.04	52	46.85	90	61.64	24	82.76
Epistomy Wound Infection	128	44.76	67	60.36	45	30.82	16	55.17
Caesarean Section Wound Infection	51	17.83	15	13.51	35	23.97	1	3.45
Blood Transfusion	224	78.32	59	53.15	136	93.15	29	100

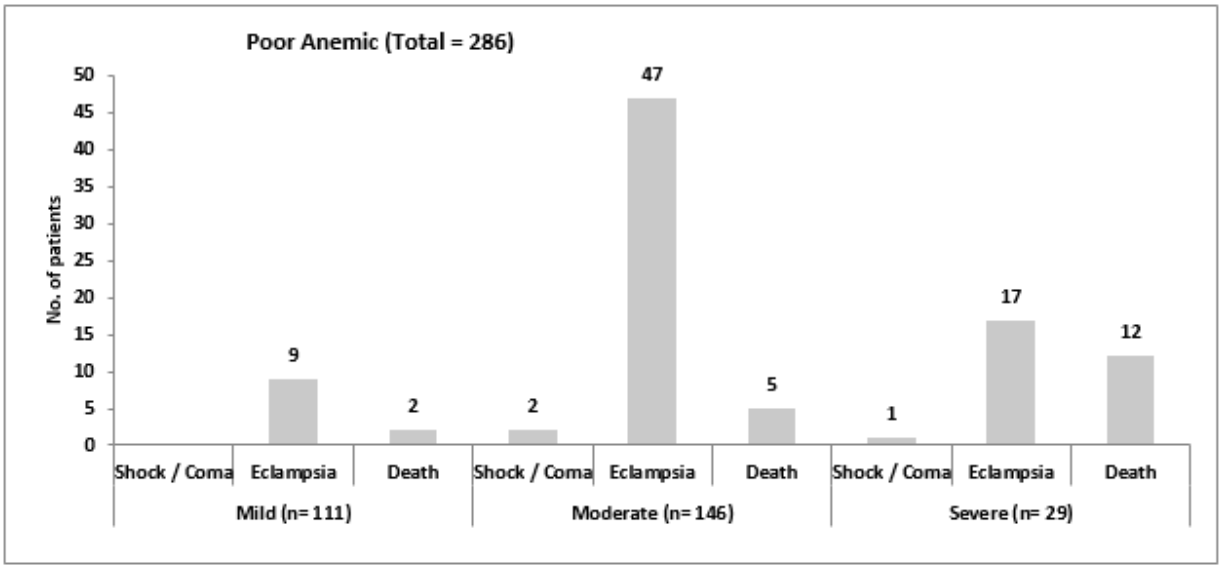


Graph 7: Graph showing the Specific Information with Reference to Maternal Morbidity in the Study Group

Specific Information with Reference to Maternal Mortality in the Study Group: The table depicts the maternal mortality in the anemic women of below poverty line. It was found that, in the mildly anemic women of below poverty line there were 8.11% and 1.80% women who experienced eclampsia and death respectively, while there were no incidence of shock or coma. Looking into the moderately poor anemic women there were 1.37%, 32.19% and 3.42% women who encountered shock/coma, eclampsia and death respectively. Nonetheless, taking into consideration the severely anemic pregnant women there were 3.45% women who witnessed shock/coma and 58.62% women who had eclampsia and 41.38% women died during delivery.

Table 8: Specific Information with Reference to Maternal Mortality in the Study Group

Maternal Mortality	Total Number	%	Poor Anemic (Total = 286)					
			Mild (n= 111)		Moderate (n= 146)		Severe (n=29)	
			Number	%	Number	%	Number	%
Shock / Coma	3	1.05	0	0	2	1.37	1	3.45
Eclampsia	73	25.52	9	8.11	47	32.19	17	58.62
Death	19	6.64	2	1.8	5	3.42	12	41.38



Graph 8: Graph showing the Specific Information with Reference to Maternal Mortality in the Study Group

Specific Information with Reference to Fetal Outcome in the Anemic Pregnant Women of below Poverty Line: The table below portrays, the specific information of the fetal outcomes in the anemic pregnant women of below poverty line. It was seen that among the mildly anemic, moderately anemic and severely anemic poor pregnant women there were 95.50%, 93.84% and 41.38% who had live births respectively with a total of 89.16% live births

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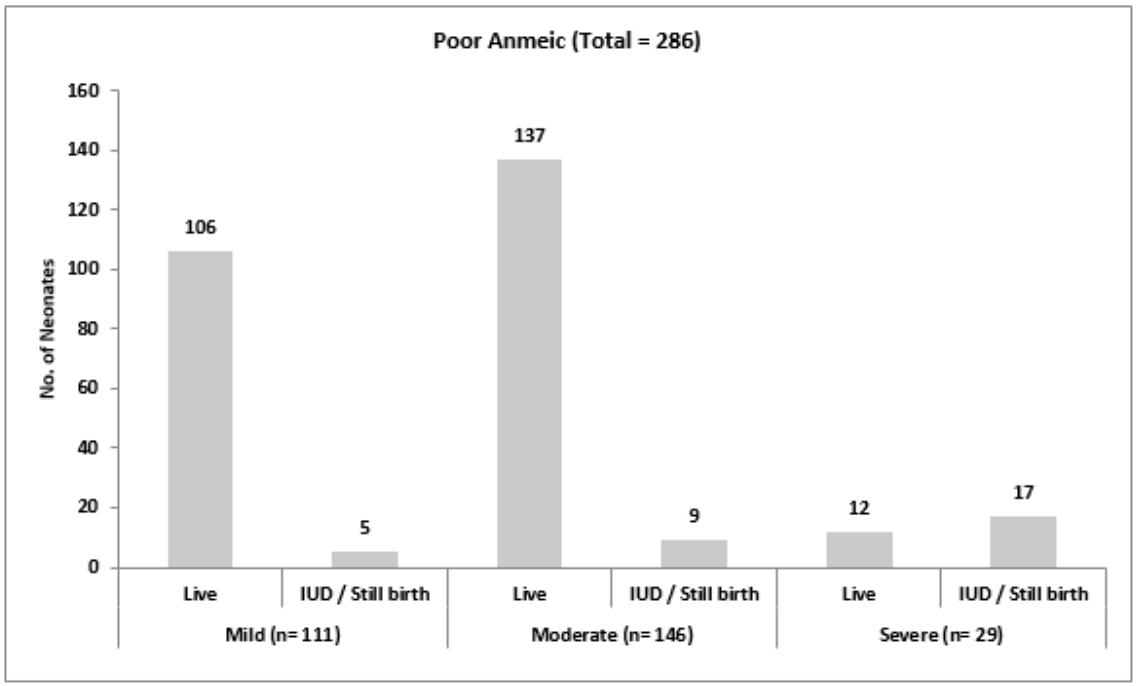
Table 9: Specific Information with Reference to Fetal Outcome in the Anemic Pregnant Women of Below Poverty Line

Fetal outcome	Poor Anemic (Total = 286)							
	Number	%	Mild (n= 111)		Moderate (n= 146)		Severe (n=29)	
			Number	%	Number	%	Number	%
Live	255	89.16	106	95.50	137	93.84	12	41.38
IUD / Still birth	31	10.84	5	4.5	9	6.16	17	58.62



Graph 9: Specific Information with Reference to Fetal Outcome in the Anemic Pregnant Women of Below Poverty Line

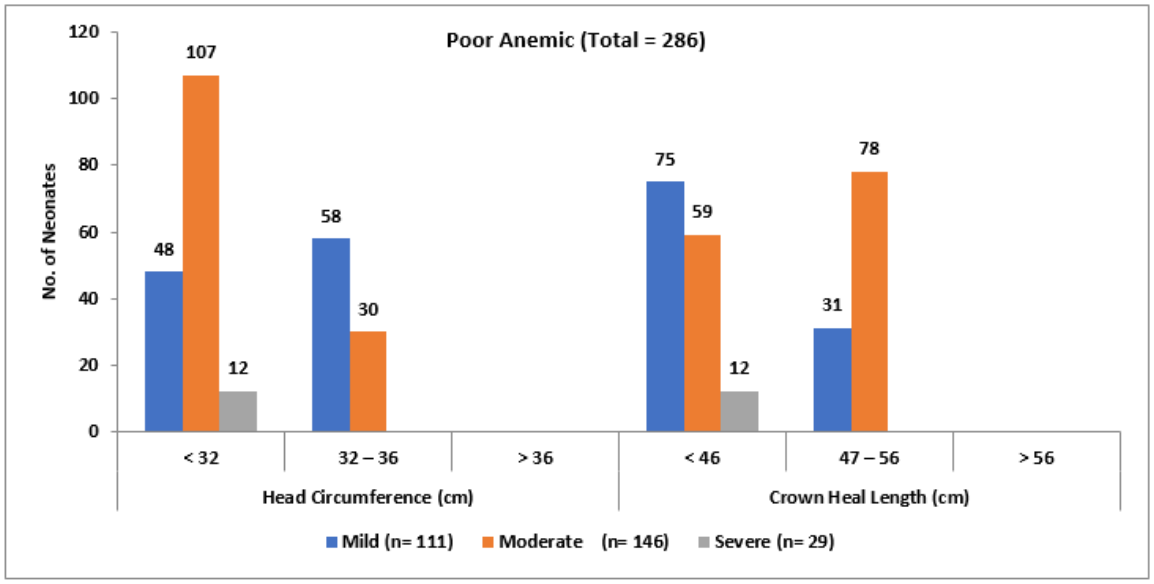
Particular Information with Reference to Neonatal Morbidity of the Anemic Pregnant Women of Below Poverty Line:

- Anthropometric Measurements: The table given below demonstrates the particular data with reference to neonatal morbidity outcome in the study group. Looking at the mildly anemic women, the results were as follows 43.24% and 52.25% neonates with HC < 32 cm and 32-36 cm respectively. Viewing the same for the moderately anemic pregnant women, 73.29% neonates had HC >32 cm while 20.55% neonates had HC between 32-36 cm. Moving on to the severely anemic pregnant women it was observed that 41.38% neonates had HC below 32 cm. Calculating the mean HC of the neonate for the poor pregnant women, it was observed as 29.09+2.94 cm, with a 't' value -15.71 and p value 0.00. Hence, null hypothesis is rejected for the poor anemic pregnant women as the mean value was found to be less than the test value.

The crown-heel length is the next benchmark under anthropometric measurements. For the mildly anemic women of the study group, it was seen that 67.57% and 27.93% neonates had their crown-heel length >46 cm and 47-56 cm respectively, while for the moderately anemic poor pregnant women it was seen that 40.41% and 53.42% neonates had crown-heel length > 46 cm and 47-56 cm respectively. However, looking at the severely anemic poor pregnant women it was observed that 41.38% of neonates had their crown-heel length < 46 cm. The mean crown-heal length of the neonate of the study group that is pregnant women below poverty line, was seen as 43.35+4.20 cm, 't' value being -7.95 and p value 0.00. Hence, null hypothesis is rejected for the study group that is expecting women of below poverty line as the result showed that the mean value was lesser than test value.

Table 10: Particular Information with Reference to Neonatal Morbidity of the Anemic Pregnant Women of Below Poverty Line - Anthropometric Measurements

Neonatal Morbidity	Number	%	Poor Anemic (Total = 286)					
			Mild (n= 111)		Moderate (n= 146)		Severe (n=29)	
			Number	%	Number	%	Number	%
Head Circumference (cm)								
< 32	167	58.39	48	43.24	107	73.29	12	41.38
32 – 36	88	30.77	58	52.25	30	20.55	0	0
> 36	0	0	0	0	0	0	0	0
Crown Heel Length (cm)								
< 46	146	51.05	75	67.57	59	40.41	12	41.38
47 – 56	109	38.11	31	27.93	78	53.42	0	0
> 56	0	0	0	0	0	0	0	0

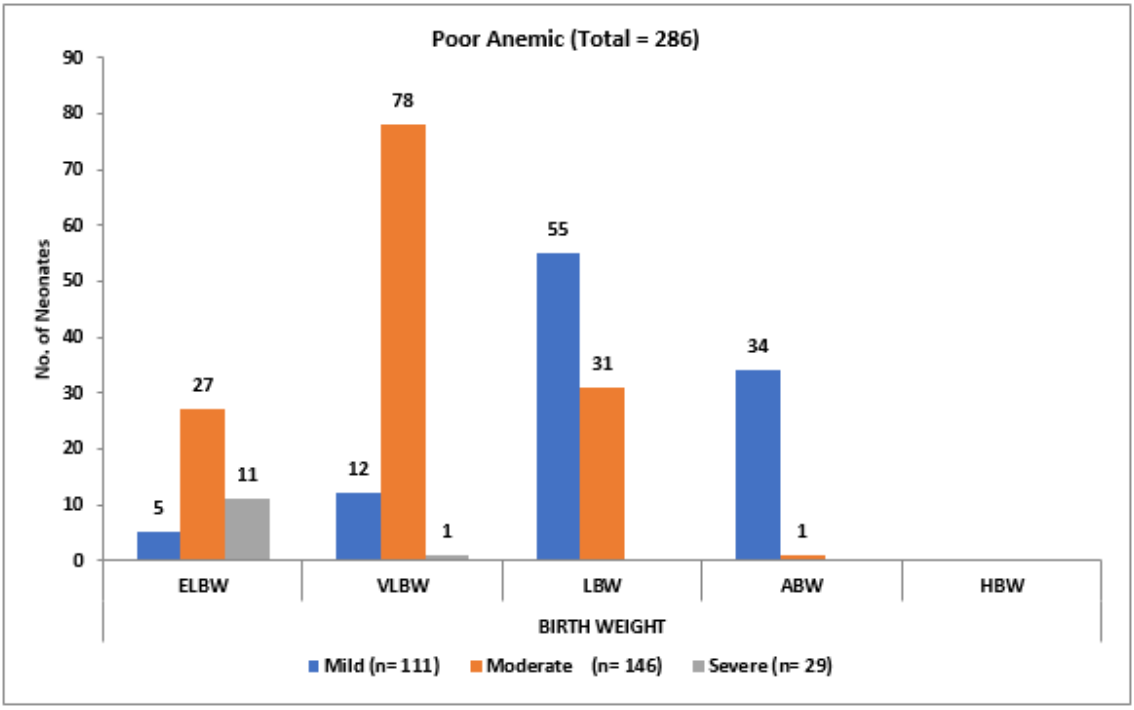


Graph 10: Particular Information with Reference to Neonatal Morbidity of the Anemic Pregnant Women of Below Poverty Line - Anthropometric Measurements

Particular Information with Reference to Neonatal Morbidity of the Anemic Pregnant Women of Below Poverty Line – Birth Weight: Among the mildly anemic poor pregnant, the next criteria was the birth weight of the neonates, 4.50%, 10.81% and 49.55% neonates were observed in the category of ELBW, VLBW and LBW respectively while only 30.63% had ABW, considering the poor moderately anemic it was noticed that 18.49%, 53.42% and 21.23% neonates were ELBW, VLBW and LBW respectively and only 0.68% had ABW, the conditioned deteriorated for the poor severely anemic expecting ladies who had 37.93% and 3.45% with ELBW and VLBW neonates and no neonates had ABW in the live births. . The mean birth weight for the poor anemic was 1652.9+600.96 gm, and 't' value -22.33, p value 0.00. Hence, the null hypothesis was rejected for the poor anemic pregnant women of the study group as the mean value is less than the test value.

Table 11: Particular Information with Reference to Neonatal Morbidity of the Anemic Pregnant Women of Below Poverty Line – Birth Weight

Neonatal Morbidity	Number	%	Poor Anemic (Total = 286)					
			Mild (n= 111)		Moderate (n= 146)		Severe (n=29)	
			Number	%	Number	%	Number	%
Birth Weight								
ELBW	43	15.03	5	4.5	27	18.49	11	37.93
VLBW	91	31.82	12	10.81	78	53.42	1	3.45
LBW	86	30.07	55	49.55	31	21.23	0	0
ABW	35	12.24	34	30.63	1	0.68	0	0
HBW	0	0	0	0	0	0	0	0



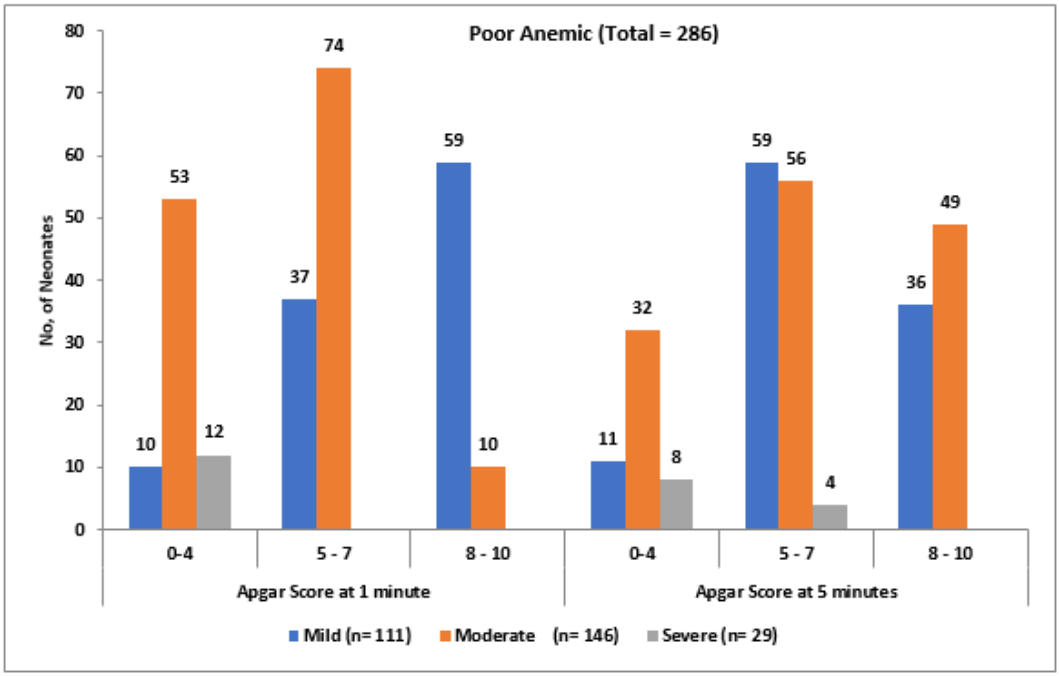
Graph 11: Graph showing the Particular Information with Reference to Neonatal Morbidity of the Anemic Pregnant Women of Below Poverty Line– Birth Weight

Particular Information with Reference to Neonatal Morbidity of the Anemic Pregnant Women of below Poverty Line - Apgar score at 1 Minute and 5 Minutes: The health of the neonate can be ascertained by the Apgar score at 1 minute and 5 minutes. Considering the Apgar score at 1 minute for the anemic women of the study group was 9.01%, 33.33% and 53.15% at 0 - 4, 5 - 7 and 8 - 10 at 1 minute respectively while, Apgar Score at 5 minutes in the stretch of 0 - 4, 5 - 7 and 8 - 10 minutes were 9.91%, 53.15% and 32.43% respectively. The condition deteriorated for the moderately anemic poor pregnant women in the study group, with 36.3%, 50.68% and 6.85% neonates having their Apgar score in the value between 0 - 4, 5 - 7 and 8 - 10 at 1 minute

respectively while 21.92%, 38.36% and 33.56% had their Apgar score between 0 - 4, 5 - 7 and 8 - 10 at 5 minutes. The condition even worsens for severely anemic women of the study group who had an Apgar score at 1 minute of 41.38 for 0 to 4 range, while the Apgar score at 5 minutes for the range of 0 - 4 and 5 - 7 was 27.59% and 13.79% respectively. There were none reported in the range of 8 - 10 at 1 minute or at 5 minutes. The mean Apgar value at 1 minute for the poor anemic women of the study group was 5.48+2.24, 't' value being -10.92 and p value 0.002. Whereas, 6.63+1.93 was the mean Apgar value at 5 minutes, and 't' value being -3.07 and p value 0.02. Hence, the null hypothesis is rejected for the anemic women of the study group.

Table 12: Particular Information with Reference to Neonatal Morbidity of the Anemic Pregnant Women in the Study Group - Apgar Score at 1 Minute and 5 Minutes

Neonatal Morbidity	Number	%	Poor Anemic (Total = 286)					
			Mild (n= 111)		Moderate (n= 146)		Severe (n=29)	
			Number	%	Number	%	Number	%
Apgar Score at 1 Minute								
0-4	75	26.22	10	9.01	53	36.3	12	41.38
5 - 7	111	38.81	37	33.33	74	50.68	0	0
8 - 10	69	24.13	59	53.15	10	6.85	0	0
Apgar Score at 5 minutes								
0-4	51	17.83	11	9.91	32	21.92	8	27.59
5 - 7	119	41.61	59	53.15	56	38.36	4	13.79
8 - 10	85	29.72	36	32.43	49	33.56	0	0

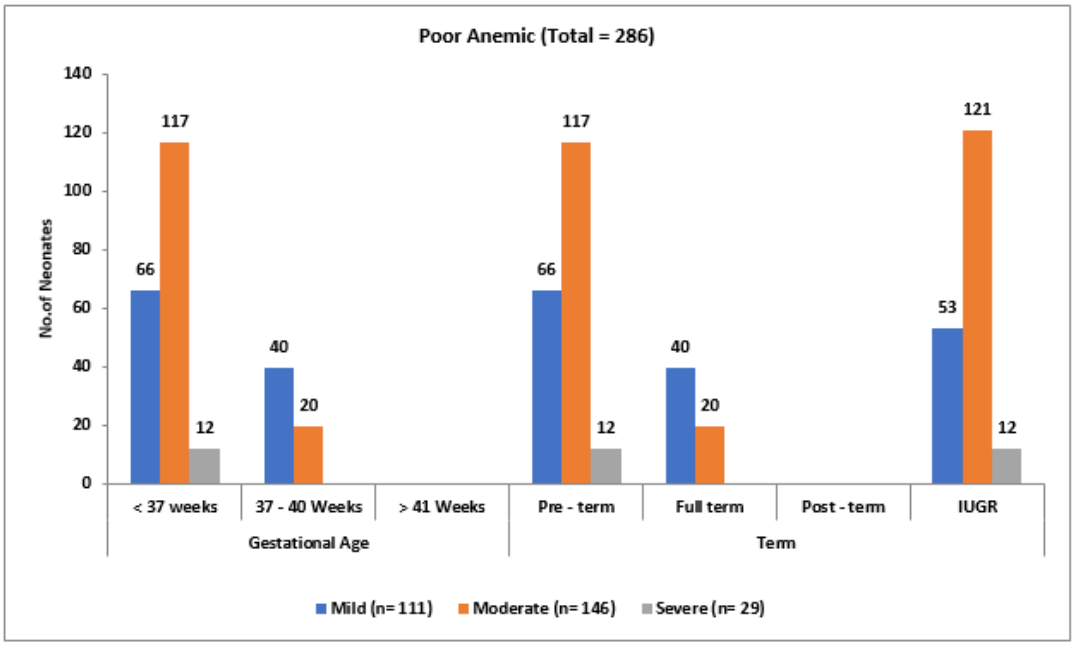


Graph 12: Particular Facts with Reference to Neonatal Morbidity of the Anemic Pregnant Women in the Study Group - Apgar score at 1 Minute and 5 Minutes

Particular Facts with Reference to Neonatal Morbidity in the Anemic Pregnant Women of the Study Group- Gestational Age and Term: Among the anemic mothers in the study group, gestational age is the next condition of assessment. It was seen that among the anemic mothers of the study group 59.46% were born pre-term and were premature. Of which 47.75% were classified as IUGR. Considering the moderately anemic pregnant women, a higher percentage of 80.14% women had preterm and premature babies, nearly 82.88% babies had IUGR. Looking at the last section of severely anemic women of the study group, it was seen that 41.38% women underwent pre-term labour and 100% were both premature and with IUGR.

Table 13: Particular Facts with Reference to Neonatal Morbidity in the Anemic Pregnant Women of the Study Group- Gestational Age and Term

Neonatal Morbidity	Number	%	Poor Anemic (Total = 286)					
			Mild (n= 111)		Moderate (n= 146)		Severe (n=29)	
			Number	%	Number	%	Number	%
Gestational Age								
< 37 weeks	195	68.18	66	59.46	117	80.14	12	41.38
37 - 40 Weeks	60	20.98	40	36.04	20	13.7	0	0
> 41 Weeks	0	0	0	0	0	0	0	0
Term								
Pre-term	195	68.18	66	59.46	117	80.14	12	41.38
Full term	60	20.98	40	36.94	20	13.7	0	0
Post-term	0	0	0	0	0	0	0	0
IUGR	186	65.03	53	47.75	121	82.88	12	41.38



Graph 13: Particular Facts with Reference to Neonatal Morbidity in the Anemic Pregnant Women of the Study Group- Gestational Age and Term

DISCUSSION

It was observed that among the pregnant women of the study group there were 286 (84.36%) who were anemic in the second trimester. The mean+SD being 8.48 ±0.94 and at third trimester mean+SD being 9.0±0.02, however, merely 53 (15.63%) women were found to be non-anemic. The mean+SD in second trimester being 10.89±0.34 while at third trimester the mean+SD being 11.14±0.13. Hence, it can be stated that for the expecting women of below poverty line it was statistically significant to be anemic with p value < 0.05.

Grossly two-third of the population is affected with anemia (Ali, S. A. *et al.,* 2020). Anemia tends to accelerate as the stages of pregnancy progresses, (Sheikholeslam, R. *et al*., 2001); (De Benoist, B. *et al*., 2008); (Gonzales, G. F., Tapia, V., & Fort, A. L., 2012); (Stevens, G. A. *et al*., 2012); (Sadeghian, M. *et al*., 2013); (Suryanarayana, R. *et al*., 2016) and (Seema, B. N. 2017) Untreated anemia during pregnancy among the expected mothers, adversely compromise not only the health of the nation, but also affects the social, and economic growth of their nation (Fiedler, J. L., & D'Agostino, A., 2015).

The present research was in consonance with other such studies which affirmed that during the adolescent growing period, one has an increased need of energy than that of an adult. Therefore, anemia is more likely to occur when their iron and other micronutrient requirements increase (Sudhagandhi, B. *et al*., 2011); (Shaban, L. *et al*., 2020) this situation is seen more common among the women (Chalise, B. *et al*., 2018).

The early child marriage and childbearing contribute to social and physical problems as per the research by Kennedy, E., Gray, N., Azzopardi, P., & Creati, M. (2011); Hamed, A., & Yousef, F. (2017) and Berliana, S. M. *et al*., (2021).

Research also indicates that teenage pregnancies from low socioeconomic background led to anemia among the pregnant women. Parallel results were also observed by Cunnington, A. J. (2001); Kapur, D. *et al*., (2002); Wang, R. H., Wang, H. H., & Hsu, M. T. (2003); Sagili, H. *et al.,* (2012); Wong, S. P. *et al*., (2020) and Tiruneh, F. N. *et al*., (2021).

There was a statistically significant association between the parity of children and the occurence of anemia in the present study with <0.05. The percentage of anemic pregnant women with 3 or higher number of children was statistically associated with 88.46%. Related studies observed in an international study by Sadeghian, M., Fatourechi, A., Lesanpezeshki, M., & Ahmadnezhad, E. (2013); Abriha, A., Yesuf, M. E., & Wassie, M. M. (2014); Argaw, B. et *al*., (2015); Di Renzo, G. C. *et al.,* (2015) and *Shah*, T., Warsi, J., & Laghari, Z. (2020) have stated that multiparous pregnant ladies are more susceptible to develop anemia.

A statistically significant relationship of p value > 0.05 could not be established between the poor pregnant women of below poverty line and abortion or miscarriage, as only 34.27% of poor anemic women witnessed miscarriage or abortion. The present research work was in constant with other such studies from Paul, M. *et al*., (2009); Gedefaw, L., Ayele, A., Asres, Y., & Mossie, A. (2015); Zekarias, B. *et al*., (2017); Tadesse, S. E. *et al*., (2017) and Getaneh, D. *et al*., (2018). Excessive loss of blood prior to pregnancy and abortion could be the associated reason assigned, which in turn results in reducing the iron stores thus resulting in developing anemia. (Wagner, K. S. *et al*., 2012); (Melese, T. *et al*., 2017); (Owolabi, O. O. *et al*., 2017).

However, our findings stated that among the severely anemic pregnant women of below poverty line a higher witnessed percentage of women witnessed eclampsia, shock and even death. Specific National studies by Rukuni, R. *et al*., (2016) presumes no relation between maternal anemia and maternal mortality. However, some international studies by Murphy, J. F. (1986); Hare, G. M. *et al*., (2013); Nair, M., Kurinczuk, J. J., & Knight, M. (2014) and Hanprasertpong, T., & Hanprasertpong, J. (2015).

There was no significant correlation between maternal anemia and fetal outcome among the poor pregnant women with 89.16% (p>0.05). However, association was also established in the severely anemic poor pregnant women and still births / IUD with 58.62%. In other words, we observed that severely anemic women had a

greater magnitude and chances of fetal death than the expectant ladies with normal blood level. This indicates that anemia is an important factor in the fetal death rate in pregnant women. International studies by Webster, W. S., & Abela, D. (2007) stated when the mother is anemic, and the uterus and fetus receive less oxygen, resulting in severe fetal outcomes. World Health Organization (2014) also has associated severe fetal outcomes with anemia in their research. A cohort study done internationally on the association between still birth and anemic mothers by Nair, M. *et al*., (2018) in England on two hospitals also stated that the two factors had a linear relationship. A study by Young which was systematic and meta-analysis, M. F. *et al* (2019) also substantiates our findings on the two.

Looking at the neonates of the expectant women belonging to below poverty line, it was learnt to be a significant ($p<0.05$) association between anemia and HC with 51.05% having HC <32 and t value being -15.71 cm and 46.85% having crow-heel length <46 cm and t value as -7.95. Afifi, R. A. R. A., Ali, D. K., & Talkhan, H. M. (2013); Shah, T., Warsi, J., & Laghari, Z. (2020) have stated that there is a strong association with less value of Hb and anthropometric measurements such as weight and head circumference of the neonates.

According to the grade of anemia, newborns were categorised according to their birth and weight. And again, as with ELBW, VLBW, AND LBW results, anemia strongly correlated with neonatal weight. The mean birth weight for babies born to poor pregnant women was below average in 76.92% of cases. The t value being -22.33 for the poor pregnant women respectively. Undoubtedly, here too the neonates born to the moderate and severely anemic mothers were the worst hit. An international study done by Petrou, S. (2003) and Bird, A.L. *et al* ·· (2017) established that there was a greater risk of morbidity and mortality among the infants who had birth weight lesser than 2500 grams.

CONCLUSION

Two hundred and twenty-eight expecting women of below poverty line in their third trimester were anemic. This represented an extremely alarming percentage of 84.36% of women. Among this 38.81%women were suffering with mild anemia, 51.05% women had moderate anemia and 10.14% women faced severe anemia. Consequently, it could be finally stated that the expectant women that too of poor sections of the society are most influenced by anemia hazard with more severity given the higher percentage of women suffering from moderate to severe anemia. The rich and the poor pregnant women had a mean+SD of Hb at third trimester of 10.4+1.02 and 9.0+0.02 respectively.

With 10.84% of IUD/still births and 3.15% neonates experiencing neonatal death among the poor pregnant women, the neonatal outcome among the expectant women belonging to below poverty line had a greater causality as compared to 89.1% live births. Poor pregnant women with maternal anemia are at a higher risk for premature and babies with low birth weight, apgar score at 1 and 5 minutes with a low score, less head circumference and crown heel length, IUGR, and preterm babies.

The nation's ability to provide its people with nourishment, particularly to those who are most vulnerable, can be measured by its anemia rate. In countries like India, especially those with low – and middle incomes, pregnancy is often affected b anemia. Thus, comprehending the fundamental importance of knowing the influence of different levels of anemia on expextant women and their babies in particular for those from low economic background should be considered with supreme magnitude.

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