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THE DETERMINANTS OF MATERNAL ANAEMIA VERSUS BIRTH WEIGHT OF NEWBORN, A COMPARATIVE STUDY AMONG NON-ANAEMIC AND ANAEMIC PREGNANT WOMEN IN A SELECTED TERTIARY CARE HOSPITAL, CHENGALPATTU DISTRICT, TAMILNADU.

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ABSTRACT

Background: During pregnancy women with haemoglobin level less than 11 grams/decilitre in their red blood cells are said to have anaemia during pregnancy. Anaemia is one of the most common preventable medical condition that affect women during pregnancy. It is not only the greatest challenge but also an easily treatable problem faced by the developing countries, hence understanding the determinants of maternal anaemia is essential to boost the prophylactic and therapeutic management of anaemia during pregnancy.

Methodology: Quantitative exploratory research approach was selected to compare the determinants of maternal anaemia and the foetal wellbeing among non-anaemic and anaemic pregnant women. The analytical cross-sectional design was used to study eighty two pregnant women (41 non-anaemic women and 41 anaemic women) who visited the labour ward at Chrompet government hospital, Tamil Nadu, India. A structured interview schedule was used to collect the determinants of maternal anaemia. Comparison of the determinants of maternal anaemia that affect the birth weight of the newborn among non-anaemic and anaemic pregnant women was done.

Result: The comparison of the determinants in the study reveals that 43% of pregnant women at 21-25 years of age, pregnant women with obstetrical score at 44% of gravida 1 and gravida 2, 49% of para 2 and live birth 2 were anaemic. Majority of 81% of anaemic pregnant women belonged to nuclear family, 42% had a family income of 15,000 to 20,000 per month, 61% had SSLC level of education, 81% were unemployed, 91% were non-vegetarian, and 59% were at 39 weeks of gestation. Independent t-test of levels of haemoglobin among anaemic and non-anaemic pregnant women was 10.39±1.179 and 12.38±1.005 with statistical significant at $p<0.001$. There exist a statistically significant association amid the treatment given to the anaemic women and the birth weight at $p<0.001$.

Conclusion: The statistically significant level of haemoglobin reveals that a homogenous group of pregnant anaemic and non-anaemic women with determinants such as 21-25 years of age, obstetrical score of G1P2L2 and G2P2L2, 39 weeks of gestation, nuclear family, non-vegetarian, family income, education, and unemployment were predominantly anaemic during pregnancy. The treatment given during pregnancy was statistically significantly associated with the birth weight of the anaemic pregnant women which indicates that special attention given to the women during pregnancy wound be effective to minimize the impact of anaemia on newborn.

INTRODUCTION

Pregnant women with haemoglobin level less than 11 grams/decilitre in their red blood cells are said to have anaemia during pregnancy. Anaemia is one of the most common preventable medical condition that affect women during pregnancy in developing countries that are not only easily detectable but also easily treatable.

The risk of low birth weight baby, intrauterine growth retardation of fetus, high maternal and child mortality and premature delivery may arise in those antenatal women who are suffering from anemia during pregnancy.Understanding the determinants of maternal anaemia is essential to boost the prophylactic and therapeutic management of anaemia during pregnancy.

NEED FOR THE STUDY

Understanding the determinants of maternal anaemia is essential to boost the prophylactic and therapeutic management of anaemia during pregnancy. The international prevalence of anaemia during pregnancy is estimated to be around 38.2% or it affects 32 million pregnant women. Particularly, 45.7% of pregnant women in urban areas and 52.1% in rural areas in India

are affected with anaemia during pregnancy making this a significant public health problem.

In South Asia, anaemia during pregnancy is the underlying cause or contributing factor for 20-40% of maternal deaths in India, which account for 80% of the total maternal deaths in South Asia. As the severity of anaemia increases greater is the risk of low birth weight baby due to many factors associated with anemia.

There are only a fewer studies on determinants of anaemia that may be either due to its complex etiology or the lack of diagnostic facilities. Hence, all the strategies executed in order to prevent or treat anaemia should be tailored to local environmental set-ups, taking into account the specific etiology and prevalence of anaemia among pregnant women living in that particular population.

Placenta is not only the central supply of nutrients and oxygen to the foetusbut also an exit point to eliminate waste and also acts as a protective barrier. Anaemia during pregnancy affects placental function that in turn affects the fetal outcome dreadfully as placenta is the vital organ that binds them both. Therefore, the effective functioning of the placenta is necessary for good fetal outcome. **[Jyoti]** The healthy placenta and fetal outcome depends on maternal health during the antenatal period.

Therefore the comparison of the determinants of anemia during pregnancy and its impact on birth weight of the newborn, aids to formulate a realistic guideline for the management and prevention of anemia during pregnancy.

MATERIALS AND METHODS:

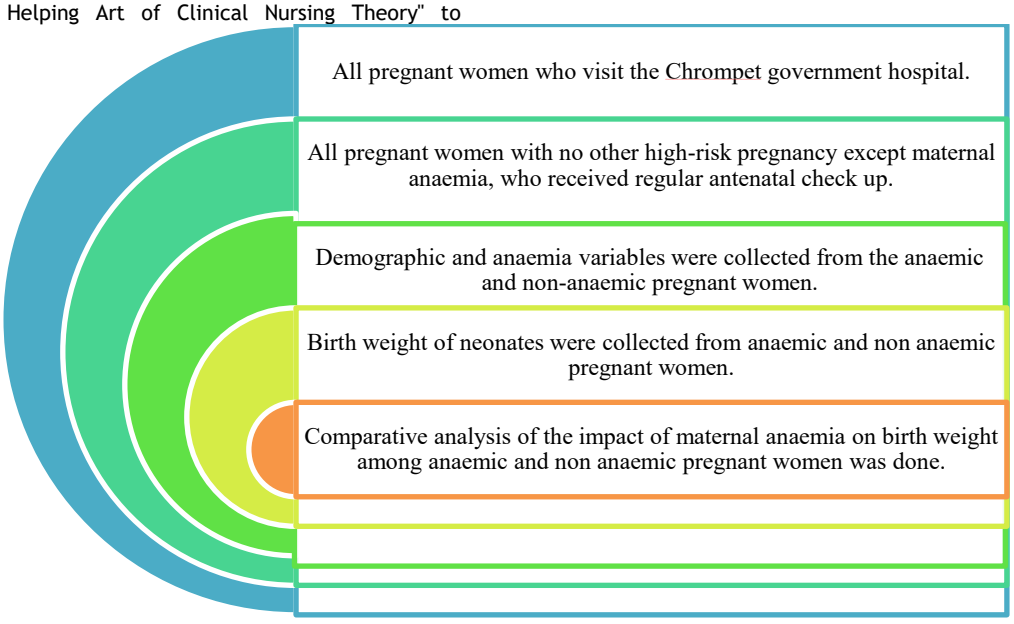
The extensive review of literature, the investigators professional experience and the expert guidance received from the field of gynaecological department has helped the researcher to design the methodology, select appropriate and reliable tools for the data collection.

The study was conceptualized based on "The Ernestine Wiedenbach's - Helping Art of Clinical Nursing Theory" to compare the impact of maternal anemia on placenta weight and fetal wellbeing among anemic and non-anaemic pregnant women. Through this theory the nurse investigator has explained nursing as the practice of identifying the need of maintaining normal hemoglobin level during pregnancy through regular monitoring of hemoglobin level and the impact of maternal anemia on placental weight and fetal well-being among anemic and non-anemic pregnant women.

Quantitative exploratory research approach was selected to assess the determinants of maternal anemia that affect placental weight and fetal wellbeing among anemic and non-anaemic pregnant women. The analytical cross-sectional design was used to study eighty two pregnant women (41 non-anemic women and 41 anemic women)who visited the labor ward at Chrompet government hospital, Tamil Nadu, India. A structured interview schedule was used to collect the determinants of maternal anemia. A structural interview schedule was developed and used by the researcher, the sample details consisting of 14 items that assess the demographic data of anaemic and non-anaemic pregnant women, 5 items that assess the placental characteristic of non-anaemic and anaemic pregnant women and 4 items that assess the newborn characteristics among non-anaemic and anaemic pregnant women was acquired to compare the determinants of maternal anaemia that affect the placental weight and fetal wellbeing among non-anaemic and anaemic pregnant women was done.

Health education regarding prevention and corrective care of anaemia was given to both non-anaemic and anaemic pregnant women and pamphlet was provided to the pregnant women to promote health and prevent anaemia in future. The pamphlet contained information on the effects of anaemia during pregnancy, causes, signs and symptoms, and management of anaemia.

DATA COLLECTION PROCESS *(Fig 1)*



DATA ANALYSIS AND RESULTS

The figure 2, shows a comparative analysis of frequency distribution of the age among non-anaemic and anaemic pregnant women.

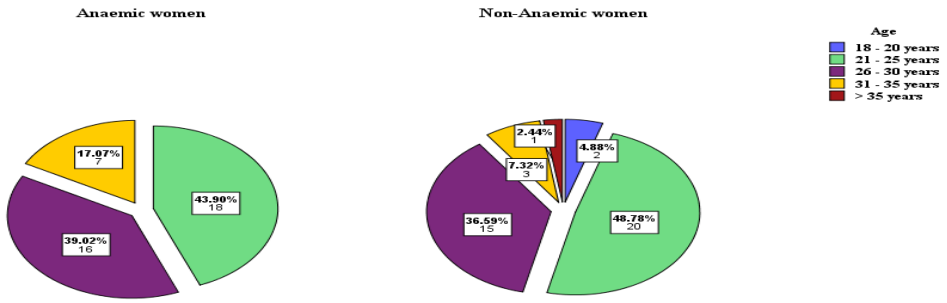


Fig (2)

The figure 3, shows a comparative analysis **of the frequency distribution of parity and number of live births among non-anaemic and anaemic pregnant women.**

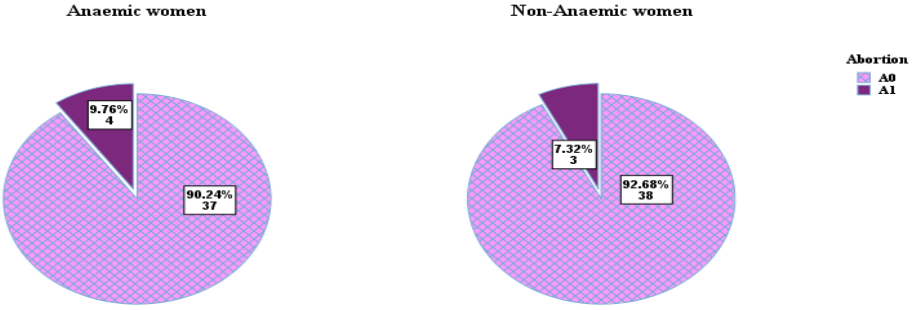


Fig (3)

The figure 4 shows a comparative analysis **of the frequency distribution of the number of abortions among non-anaemic and anaemic pregnant women.**

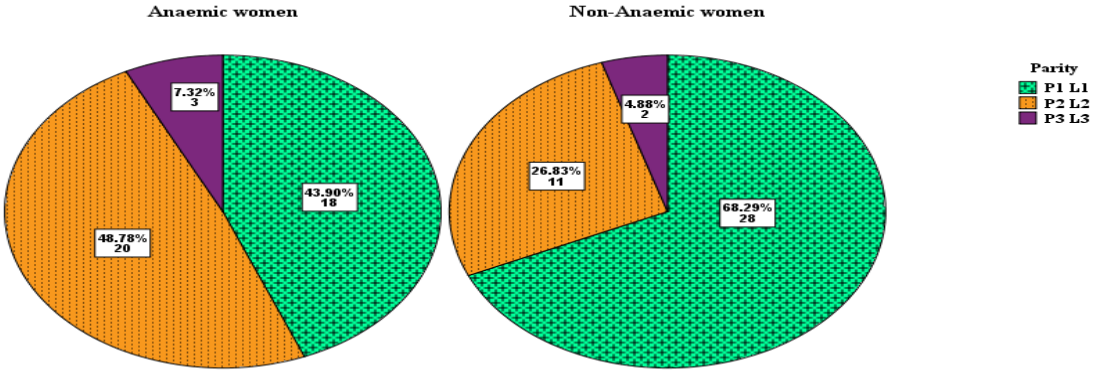


Fig (4)

The figure 5 shows a comparative analysis **of the frequency distribution of the educational status of the non-anaemic and anaemic pregnant women.**

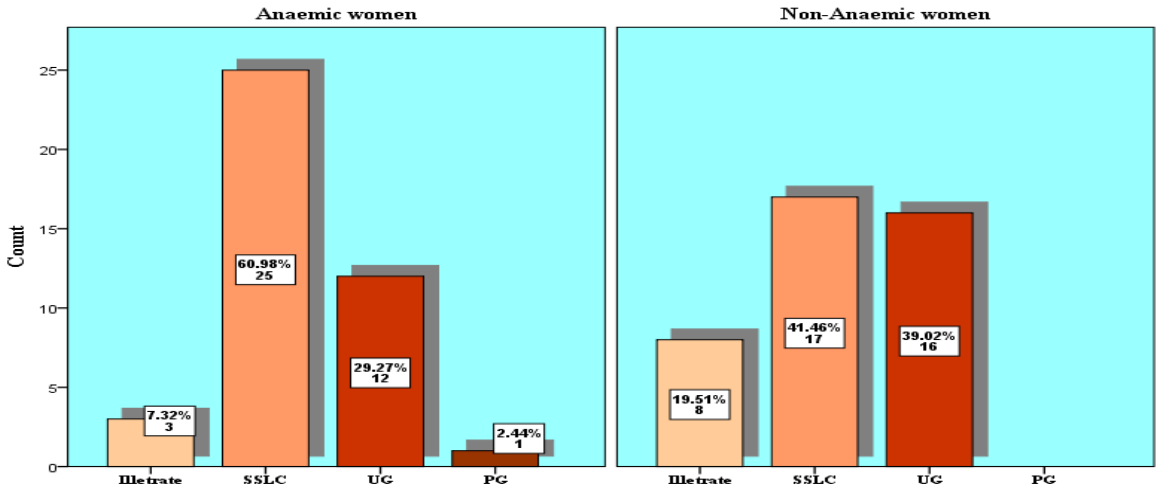


Fig (5)

The figure 6 shows a comparative analysis **of the frequency distribution of the Gravida of the non-anaemic and anaemic pregnant women**

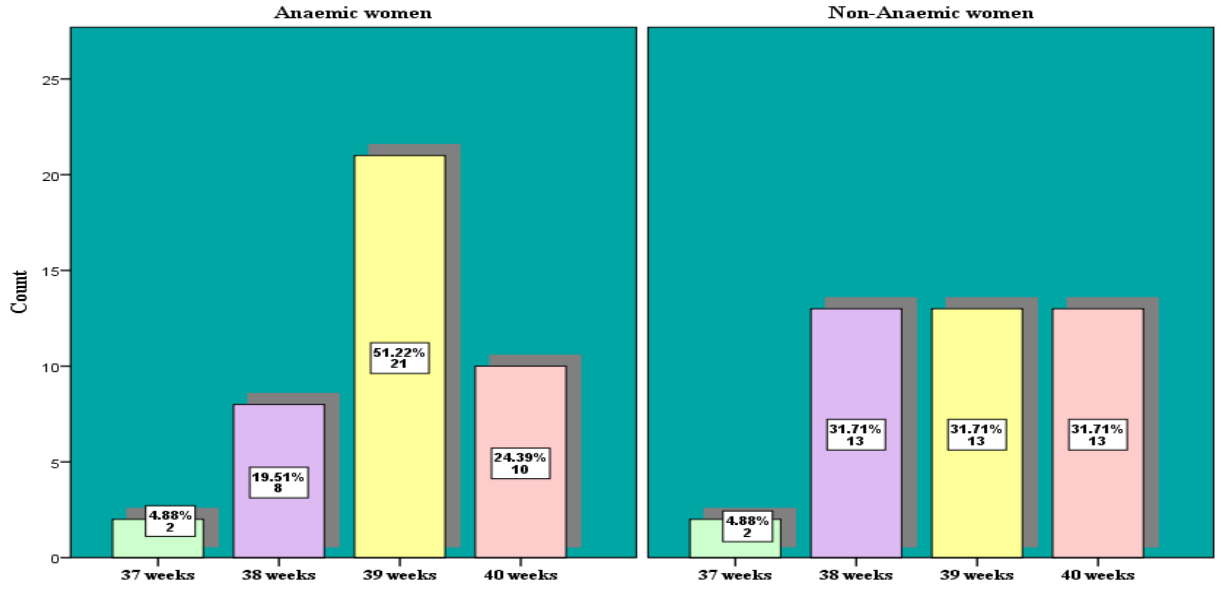


Fig (6)

The figure 7 shows a comparative analysis **of the frequency distribution of the income of the non-anaemic and anaemic pregnant women**

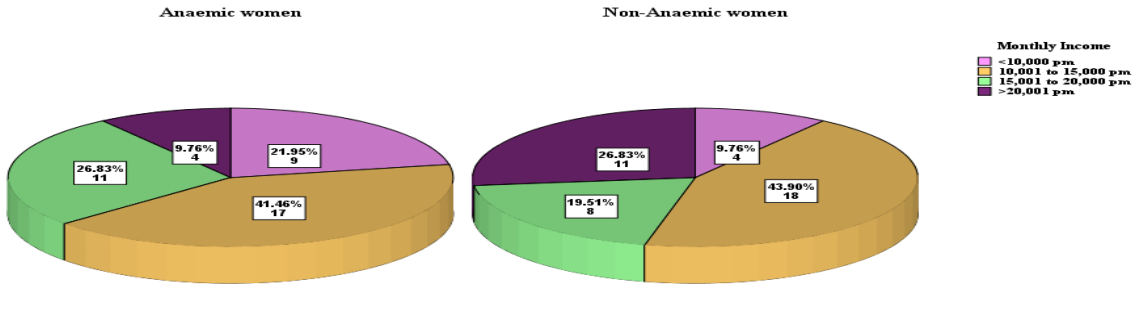


Fig (7)

The figure 8 shows the comparative analysis **of the frequency distribution of occupation among non-anaemic and anaemic pregnant women**

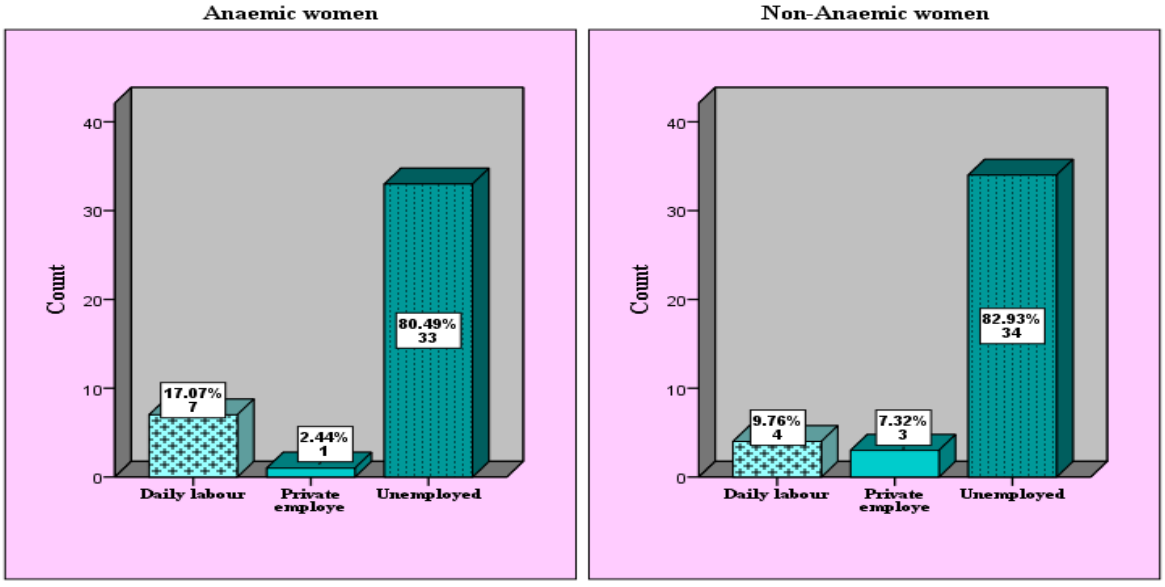


Fig (8)

The figure 9 shows the comparative analysis **of the frequency distribution of the dietary pattern among non-anaemic and anaemic pregnant women.**

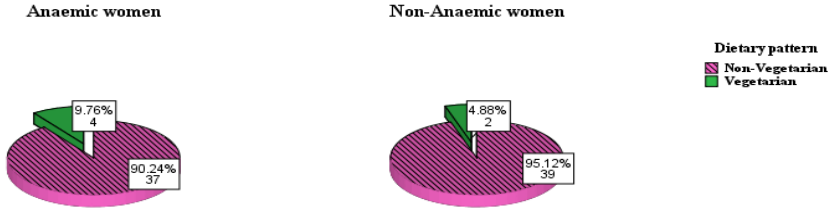


Fig (9)

ANAEMIA CHARACTERISTICS

The figure 10 reveals the comparative analysis **of the frequency distribution of the past history of anaemia among non-anaemic and anaemic pregnant women.**

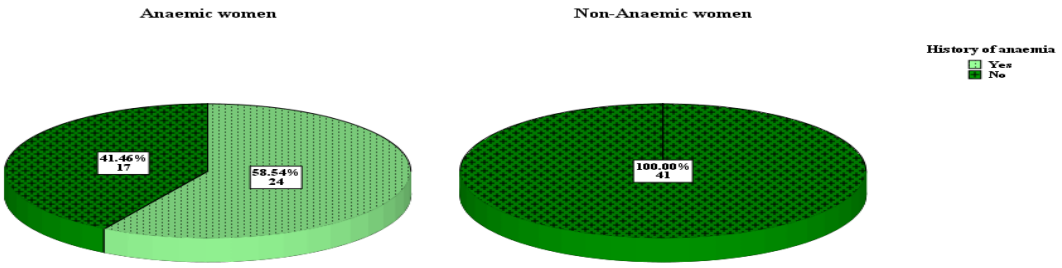


Fig (10)

The figure 11 reveals the comparative analysis **of the frequency distribution of the treatment of anaemia among non-anaemic and anaemic pregnant women.**

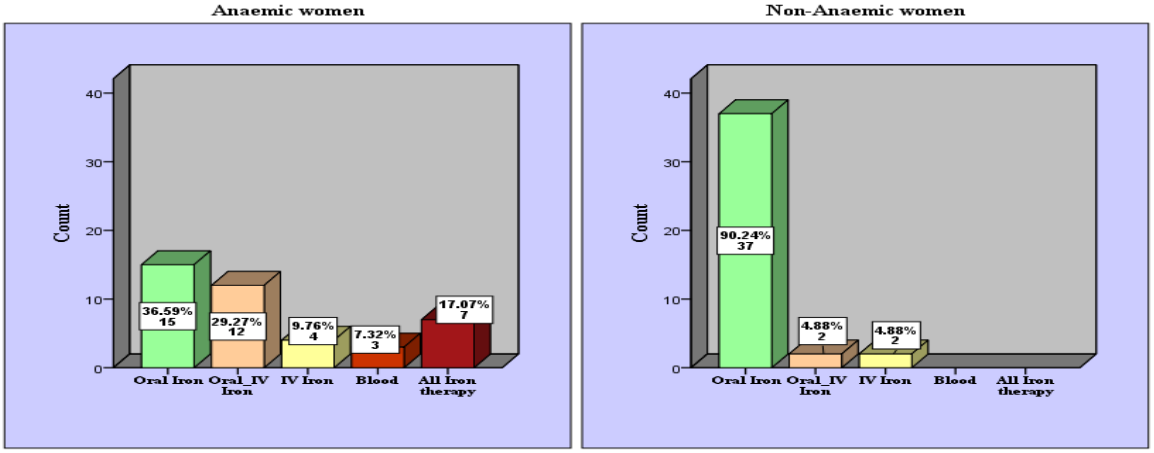


Fig (11)

The figure 12 reveals the comparative analysis **of the frequency distribution of the trimester from when the iron supplementation was began among non-anaemic and anaemic pregnant women**

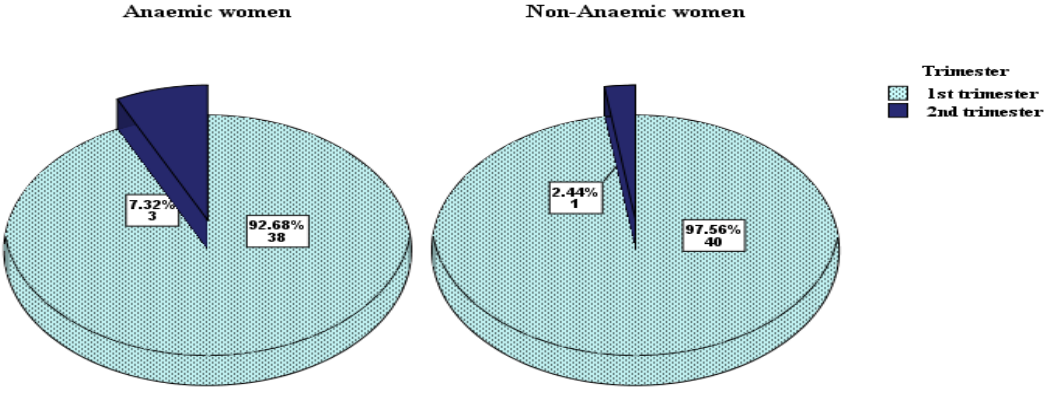


Fig (12)

The figure 13 reveals the comparative analysis **of the frequency distribution of the level of haemoglobin among anaemic and non-anaemic pregnant women**

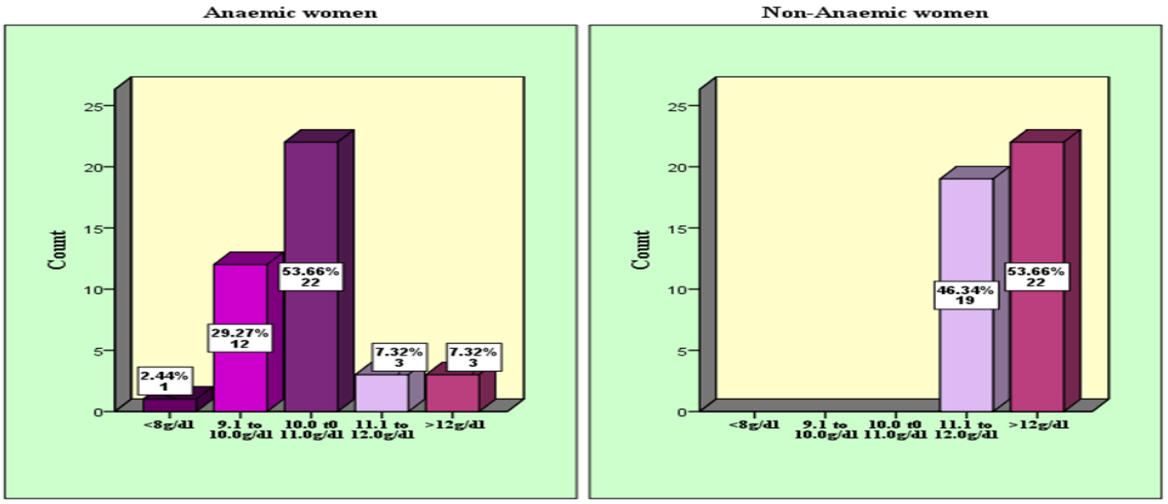


Fig (13)

The figure 14 reveals the comparative analysis **of the mean haemoglobin level among non-anaemic and anaemic pregnant women.**

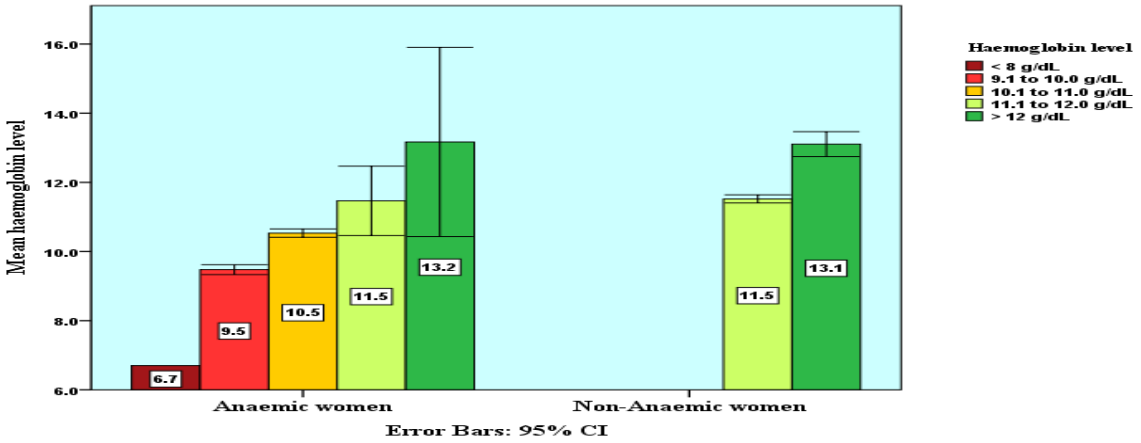


Fig (14)

The bar chart presents the mean haemoglobin levels among non-anaemic and anaemic pregnant women, categorized by different haemoglobin ranges. The chart represent the 95% Confidence Interval (CI), indicating the range within which the true mean haemoglobin level is expected to fall. Routine anaemic management appears to be effective, as anaemic women show improvement in haemoglobin levels. Non-anaemic women maintain stable haemoglobin levels, reinforcing the importance of maternal nutrition and iron supplementation. Anaemic women still show variability in haemoglobin levels, suggesting that further intervention may be needed for severely anaemic cases.

The figure 15 reveals the comparative analysis **of the frequency distribution of the level of haemoglobin among non-anaemic and anaemic pregnant women in first and third trimester.**

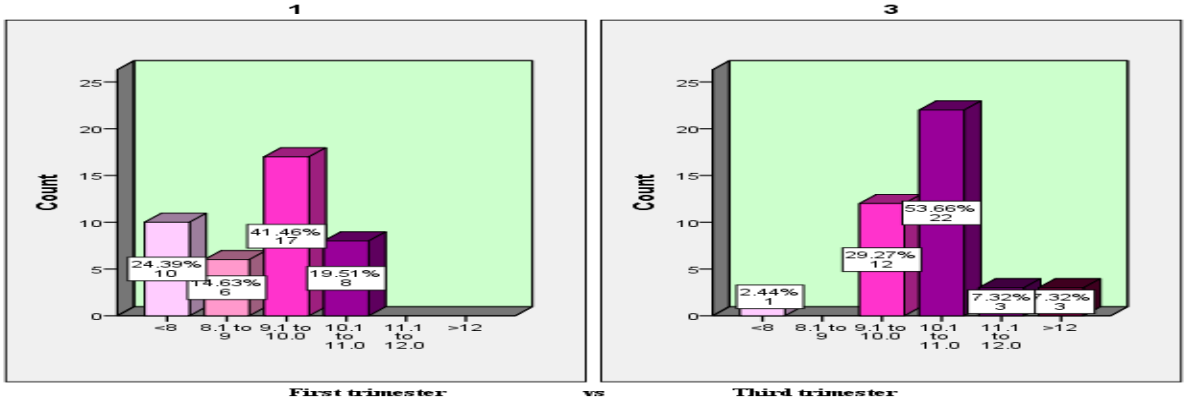


Fig (15)

The diagram represents majority of the women fall within the **9.1 to 10** range, but a significant portion shows lower values (<8), suggesting that some women may have a deficiency (e.g., anemia) early in pregnancy. There's a significant improvement in values by the third trimester, with fewer women in the lower ranges (<8 and 8.1 to 9). The diagram demonstrates a significant improvement in the measured parameter (possibly hemoglobin levels) from the **first trimester** to the **third trimester** of pregnancy.

The figure 16 reveals the comparative analysis **of the mean haemoglobin level among pregnant women with anaemia in first and third trimester**

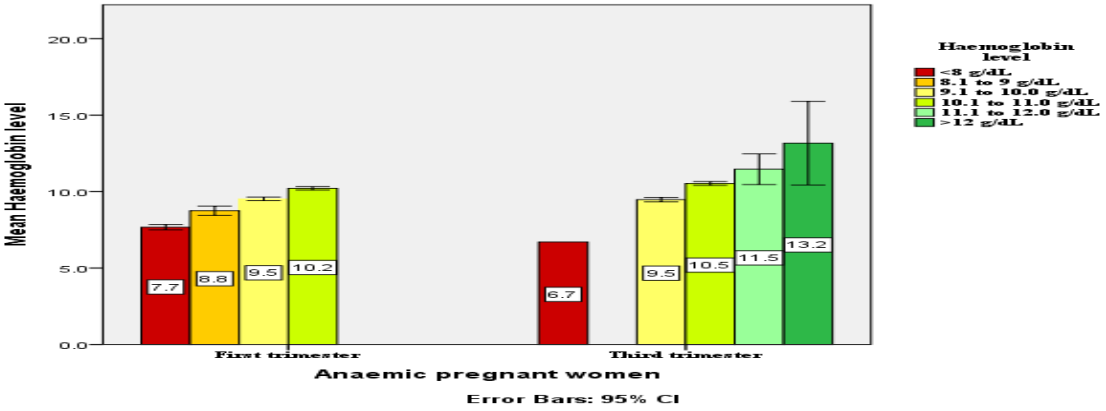


Fig (16)

The bar chart represents a comparison of mean haemoglobin levels among anaemic pregnant women in the first and third trimesters, categorized by different haemoglobin ranges. The bars represent the 95% confidence interval (CI), showing the variability within each haemoglobin group. The mean haemoglobin levels have increased significantly from the first to the third trimester. The proportion of women with haemoglobin levels <8 g/dL decreased, while more women moved into the >11 g/dL category. The difference in the third trimester is significant, indicating greater variability in haemoglobin improvement among different individuals.

Table : 1 Independent t-test of maternal anaemia in the study reveal a statistically significant effect of the routine treatment given for anaemia during pregnancy

Comparison Of Characteristics	Anaemic Women		Non-Anaemic Women		Independent T-test	
	Mean +SD	SE	Mean +SD	SE	T value	P value
Haemoglobin level	**10.39 ± 1.179**	0.184	**12.38 ± 1.005**	0.157	**-8.206**	**0.000 *****

***** Significant at P < 0.001**

The table represents an Independent t-test analysis comparing haemoglobin levels between non-anaemic and anaemic pregnant women to evaluate the effectiveness of routine anaemia treatment during pregnancy. The negative t-value indicates that the mean haemoglobin level in anaemic women is significantly lower than that in non-anaemic women. The p-value less than 0.001 confirm that this difference is statistically significant. This suggests that routine treatment for anaemia during pregnancy effectively increases haemoglobin levels, distinguishing anaemic from non-anaemic pregnant women. The analysis demonstrates a significant effect of routine anaemia treatment during pregnancy, as evidenced by the substantial difference in haemoglobin levels between non-anaemic and anaemic women.

Table: 2 Paired t-test reveals a statistically significant improvement in the levels of haemoglobin among non-anaemic and anaemic pregnant women with routine anaemia management

Compared first and third trimester Haemoglobin levels	First Trimester		Third Trimester		Paired T test	
	Mean ± SD	SE	Mean ± SD	SE	T value	P value
Anaemic pregnant women	**9.09 ± 0.949**	**0.148**	**10.39 ± 1.179**	**0.184**	**7.500**	**0.000 *****
Non-Anaemic pregnant women	**11.80 ± 0.547**	**0.853**	**12.38 ± 1.005**	**0.157**	**5.799**	**0.000 *****

***** Significant at P < 0.001**

The table represents the results of a **Paired t-test** comparing **haemoglobin levels in the first and third trimesters** among anaemic and non-anaemic pregnant women. This test evaluates whether routine anaemia management leads to a significant improvement in haemoglobin levels during pregnancy. **Both anaemic and non-anaemic pregnant women show a significant increase in haemoglobin levels from the first to the third trimester.** The **highly significant p-values (p < 0.001)** confirm that the observed improvement is **not due to chance** but rather due to routine anaemia management.

- The **Paired t-test confirms a statistically significant improvement in haemoglobin levels** among both non-anaemic and anaemic pregnant women with routine anaemia management. This highlights the importance of continuous monitoring and treatment for anaemia during pregnancy to ensure better maternal and fetal health outcomes.

NEWBORN CHARACTERISTICS

The figure 17 reveals the comparative analysis of the frequency distribution of the birth weight of the baby among non-anaemic and anaemic pregnant women.

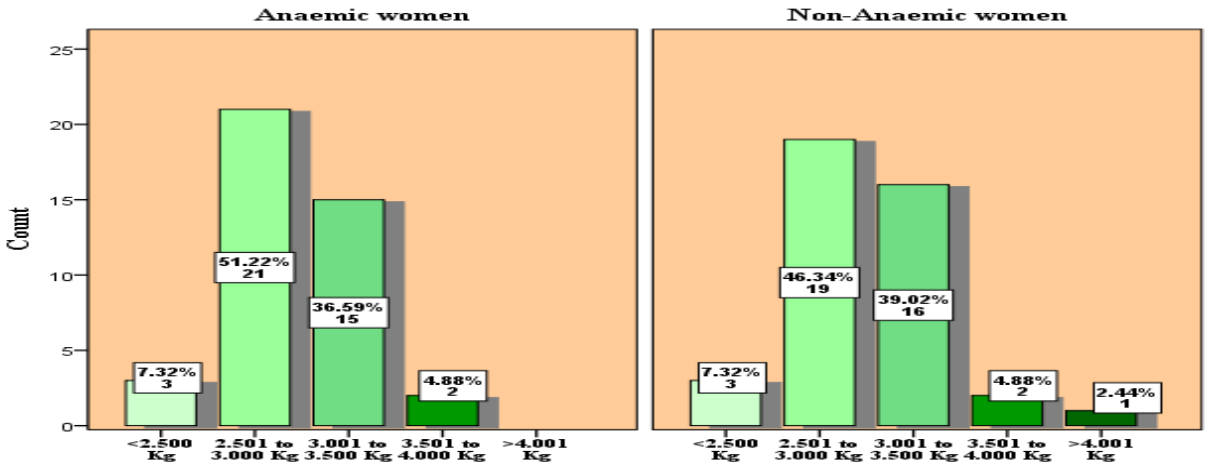


Fig (17)

The figure 18 reveals the comparative analysis of the mean birth weight of neonates among non-anaemic and anaemic pregnant women.

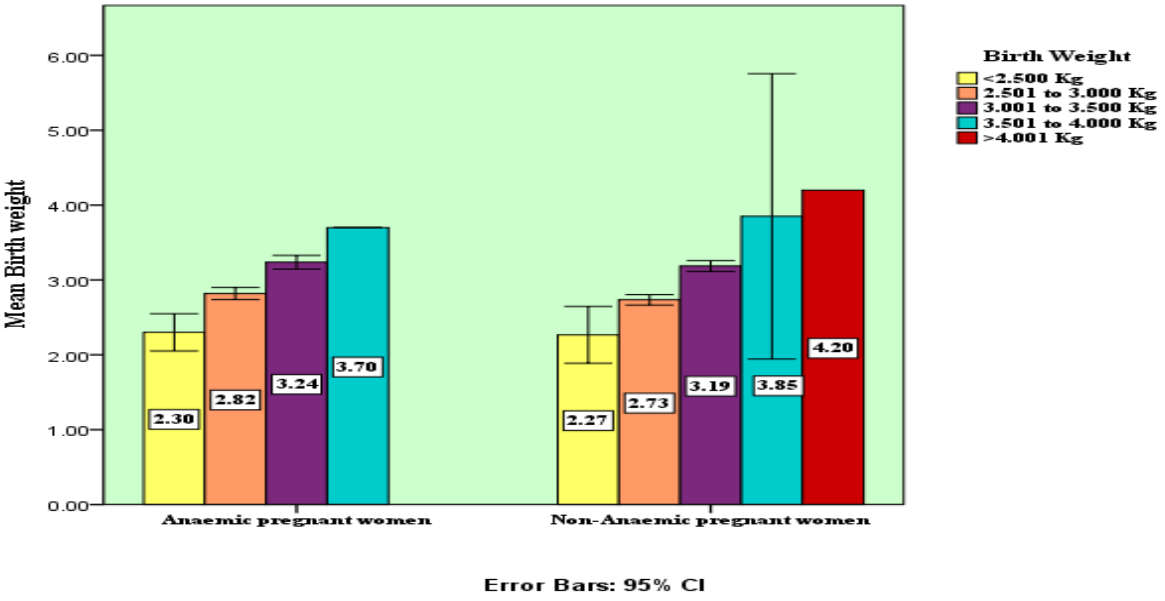


Fig (18)

The bar chart depicts **Higher mean birth weights** in the upper ranges (**3.501 to 4.000 Kg** and **>4.001 Kg**) in non-anemic women compared to anaemic women. Low birth weights (< 3.5Kg) in the anaemic group suggests that anemia might limit higher birth weights. **Anemia in pregnancy** appears to be associated with **lower birth weights**, suggesting that managing anemia might help improve neonatal birth outcomes.

Table: 3 Association of birth weight with routine anaemia management among non-anaemic and anaemic pregnant women

Methods adopted to treat anaemia		Chi square	
		x2	P value
Anaemic women	Oral iron supplements	43.432	0.000 ***
	Inj. Iron sucrose		
	Blood transfusion		
	Oral and IV iron supplements		

	Oral iron supplements, Iron sucrose therapy and blood transfusion		
Non-Anaemic women	Oral iron supplements	0.798	0.999 NS
	Inj. Iron sucrose		
	Blood transfusion		
	Oral and IV Iron supplements		
	Oral iron supplements, Iron sucrose therapy and blood transfusion		

**Significant at P<0.05
NS: Not Significant.

This table represents the association between various anaemia management methods during pregnancy and birth weight outcomes among anaemic and non-anaemic pregnant women, analyzed using the Chi-square (x^2) test. It reveals a significant association between of birth weight with routine anaemia management among anaemic women as they were statistically significant at $p < 0.05$, which indicates anaemic women management with routine anaemia treatment had a significant association and non-anaemic pregnant women shows no significant effect in management.

Table: 4 Association of birth weight with other determinants among non-anaemic and anaemic pregnant women. (n=82)

Association of determinants with birth weight		Chi Square	
		x2	p value
Age	**Anaemic women**	7.901	0.245 NS
	Non-Anaemic women	38.814	**0.001 *** **
Gravida	**Anaemic women**	18.244	**0.032 ** **
	Non-Anaemic women	15.375	**0.052 ** **
Para	**Anaemic women**	14.919	**0.021 ** **
	Non-Anaemic women	7.233	0.512 NS
Live	**Anaemic women**	14.919	**0.021 ** **
	Non-Anaemic women	7.223	0.512 NS

*** Significant at P < 0.001
** Significant at p<0.05
NS: Not Significant.

This table examines the association between birth weight and various maternal factors—gravida (number of pregnancies), and parity with live births—among non-anaemic and anaemic pregnant women, using the Chi-square (x^2) test to determine statistical significancant. Chi-square test reveals significant association of birth weight of the new born with other determinants among non-anaemic and anaemic pregnant women as they were statistically significant at p<0001 and p<0.05 level. Gravida and parity are significant factors affecting birth weight in anaemic women, while their impact in non-anaemic women is less pronounced.

MAJOR FINDINGS

- It reveals a significant association between of birth weight with routine anaemia management among anaemic women as they were statistically significant. **In Anaemic mother** x^2 value of 43.432 with a p-value of 0.000 indicates a highly significant association between the use of oral iron supplements and birth weight among anaemic women.
- This suggests that administering oral iron supplements to anaemic pregnant women is significantly associated with improved birth weight outcomes. additional treatments such as injectable iron sucrose, blood transfusion, combined oral and intravenous (IV) iron supplements, and a combination of oral iron supplements, iron sucrose therapy, and blood transfusion. In non anaemic mother x^2 value of 0.798 with a p-value of 0.999 indicates no significant association between the use of oral iron supplements and birth weight among non-anaemic women.
- **Chi-square test** reveals a statistically significant association between the **treatment methods** adopted by the anaemic pregnant women such as the oral iron supplementation A x^2 value of 43.432 with a p-value of 0.000 indicates a highly significant, intravenous iron sucrose injections, and blood transfusion with birth weight as they were statistically significant at **$p \leq 0.001$**, which indicates that the treatment take by the anaemic women had a **significant association with the birth weight** among the non-anaemic and anaemic pregnant women.

DISCUSSION

- The descriptive study conducted on anaemia in pregnancy shows that 388 females with diagnosis of anaemia during first trimester and mean haemoglobin

concentration was 10.4 gm/dl. 264(68%). Out of these 8 had severe anaemia, 65 (24.6%) had moderate anaemia and 191 (72.3%) had mild anaemia**. Susmita Sharma et.al, (2022)**

- In Devbhumi Dwarka, Gujarat a study was conducted regarding maternal anaemia and utilization of antenatal and postnatal care services, the results reveal that the prevalence of anaemia among pregnant women was 72.92% (Hb:<11g/dl) mild, 33.91% moderate and 0.83% severe anaemia. **Saha S., Raval D. et.al, (2018)**
- In Mkuranga district, Tanzania a study was conducted on the burden of anaemia during pregnancy among women attending the antenatal clinics, the result showed that anaemia was prevalent among 83.5% of pregnant women. Categorically, the normal haemoglobin of 16.3%, 51.9% had moderate anaemia and 24.4% had mild anaemia and 7.2% had severe anaemia (p=0.016). **Evelyine B, (Dec 2021)**
- The statistical analysis of the descriptive study regarding the knowledge on fetal well-being among antenatal mothers reveals that 37.7% of the antenatal mothers had inadequate knowledge, 46.6% of antenatal mothers had moderate knowledge, and 15.5% of antenatal mothers had adequate knowledge regarding fetal well-being with a statistical significant association of the knowledge with demographic variables. **Joanie Priya et.al, (2020)**

CONCLUSION

The **Paired t-test confirms a statistically significant improvement in haemoglobin levels** among both non-anaemic and anaemic pregnant women with routine anaemia management. This study also depicts the effectiveness of routine anaemia treatment during pregnancy in improving haemoglobin level. This highlights the importance of continuous monitoring and treatment for anaemia during pregnancy to ensure better maternal and fetal health outcomes.

- Early detection and effective management of the risk factors can reduce preventable complications such as small for gestation babies, low birth weight babies, and possible maternal and fetal mortality and morbidity. Long term positive approach towards anaemia is the need of the hour. **The management of anaemia must begin before conception to have the maximum benefit of the treatment modalities.** Appropriate assessment and holistic care (pre-conception and perinatal care) are the key components for prevention of perinatal anaemia.

DECLARATION
Conflict of interest: Nil
Funding: Self

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