Journal Homepage: -www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI:10.21474/IJAR01/20593
DOI URL: http://dx.doi.org/10.21474/IJAR01/20593

RESEARCH ARTICLE

HOSPITAL-BASED STUDY TO ASSESS THE SEVERITY OF ANEMIA AMONG PREGNANT WOMEN IN DUBAI, UNITED ARAB EMIRATES

Jinu Varghese[1,2] and Sajad Ahmad Bhat[3]

1. Department of Laboratory, Emirates Hospital, Dubai, UAE.
2. Department of Paramedical Technology, Nims College of Paramedical Technology, Nims University, Jaipur, Rajasthan, India.
3. Department of Medical Biochemistry, NIMS University, Jaipur, Rajasthan, India.

Manuscript Info

Manuscript History
Received: 14 January 2025
Final Accepted: 17 February 2025
Published: March 2025

Key words:-
Pregnancy-Related Anemia, Hemoglobin Concentration (g/L), Trimester, Severity of Anemia, Anemia Grading

Abstract

Background: Anemia is a prevalent nutrition-related concern impacting pregnant women globally. Anemia is a medical disorder that shows reduced hemoglobin levels, packed cell volume, or reduction in the total RBC count below normal levels., resulting in a reduced capacity to deliver oxygen and meet the body's physiological needs.

Aim: This study aims to assess the severity of anemia throughout various trimesters of pregnancy at Emirates Hospital in Dubai, UAE. The severity of anemia during pregnancy is minimally monitored across the country.

Methods: Ethical Committee approval was granted for this research in accordance with local and international guidelines for research ethics. The study employed time-bound prospective design, encompassing a total of 833 pregnant women.

Statistics: The statistical analysis for the data was compiled, organized into tables, and analyzed using Software SAS (Version 9.4), © 2024.

Results: Out of the 595 women examined, 71.43% had haemoglobin values of 110 g/L or above, indicating no anemia. A cohort of 134 women falls into the mild anemia category, with haemoglobin levels ranging from 100 g/L to 109 g/L. 103 pregnant women in the sample showed moderate anemia, with haemoglobin levels ranging from 70 g/L to 99 g/L. Only one woman (0.12%) in the sample has a haemoglobin level <70 g/L, indicating severe anemia.The mean hemoglobin level of the participants was 113.1 ± 10.76 g/L, with a median of 116 g/L

Conclusion: This study estimated the severity of anemia as follows: 16.09% of women demonstrated Mild anemia, Moderate anemia was detected in 12.36% of the subjects, and 0.12% experienced Severe anemia. This study included pregnant women from all ethnic groups, reflecting Dubai's multicultural and multiethnic community. However, women attending a hospital may not fully represent the general population, and a community-based study is therefore recommended for a more comprehensive understanding.

Corresponding Author:-Jinu Varghese
Address:-Department of Laboratory, Emirates Hospital, Dubai, UAE.

Introduction:-

Anemia is a prevalent nutrition-related concern impacting pregnant women globally[1]. Anemia is a medical disorder that shows reduced hemoglobin levels, packed cell volume, or reduction in the total red blood cell (RBC) count below normal levels., resulting in a reduced capacity to deliver oxygen and meet the body's physiological needs. Physiological needs differ based on factors such as age, gender, living altitude, smoking behaviour, and distinct stages of pregnancy[2]. According to World Health Organization (WHO), anemia during pregnancy is characterised by a haemoglobin level below 110 g/L or a haematocrit less than 33% in the first and third trimesters and a haemoglobin level under 105 g/L with a haematocrit below 32% in the second trimester[3]. The WHO classifies anemia into three severity levels: mild anemia, characterized by haemoglobin levels between 100 and 109 g/L; moderate anemia, ranging from 70 to 99 g/L; and severe anemia, defined by haemoglobin values below 70 g/L[4]. Anemia is the most noted haematological disorder during gestation andalso a significant global public health issue. Maternal anemia results in significant perinatal morbidity and mortality. As stated byWHO, Anemia affects around 40% of antenatal women worldwide. Iron deficiency is considered as the predominant etiology of nutritional anemia during pregnancy [4]. Anemia can result in symptoms including weakness, weariness, dizziness, and dyspnea. Possible causes include nutritional deficiencies, infections, chronic diseases, inflammation, hereditary abnormalities, and gynecological problems. The most prevalent nutritional cause is iron insufficiency, although deficits in folate, vitamins B12, and A are also significant[5]. A reduction in serum or plasma ferritin levels with normal hemoglobin may suggest iron deficiency or depleted iron stores. Conversely, reducedplasma or serum ferritin and lowered hemoglobin values could point out iron deficiency anemia[6].

Anemia is indeed a significant global scenario, and approximately 800 million children and women are impacted globally, in which anemia affects 38.2% of pregnant women, contributing significantly. Average hemoglobin levels and the prevalence of anemia exhibited considerable variation between regions and countries. The lowest mean blood haemoglobin levels and highest anemia rates were found in the WHO's African, Eastern Mediterranean, and Southeast Asian regions[7]. As per WHO data in 2019, the global prevalence of anemia among women of childbearingage was 29.9%, affecting more than 500 million women between the ages of 15 and 49. Among women who are not pregnant, within this age group, prevalence was 29.6%, while it was 36.5% for pregnant women. Since 2000, there has been a slight decrease in the prevalence of anemia in antenatal women globally[8].

Physiological anemia during pregnancy: normal pregnancy increases blood volume, leading to hemodilution and increased red blood cell mass. However, plasma volume decreases, causing relative anemia with lowered hemoglobin levels and hematocrit values. This discrepancy happens in the early third and late second trimesters. During pregnancy, the increase in maternal blood volume exceeds the rise in red blood cell mass, causing physiological anemia and hemodilution[9].

Causes of anemia during pregnancy can be attributed to various conditions. Possible causes include nutrient deficiencies, insufficient food, infections, inflammation, chronic diseases, gynecological and obstetric problems, and hereditary red blood cell disorders. Iron deficiency is the predominant nutritional deficiency, which is then followed by deficiencies in vitamins A, folate, vitamin B12, and riboflavin. Infections have the potential to hinder the process of absorbing and metabolizing nutrients, whereas persistent diseases can lead to inflammation. Anemia can be caused by heavy menstrual bleeding, postpartum hemorrhageand increased blood volume during pregnancy[10]. The causes of anemia during pregnancy can be classified into acquired or inherited causes. Iron deficiency anemia, anemia due to acute blood loss, anemia due to chronic disease, megaloblastic anemia, hemolytic anemia, and aplastic or hypoplastic anemias are examples of acquired causes. On the other hand, inherited causes are thalassemia's, sickle-cell hemoglobinopathies, other hemoglobinopathies, and hemolytic anemia[11].

Symptoms of anemia occur due tolowering the quantity of RBCs or hemoglobin in the bloodstream, resulting in a subsequent fall in the oxygen supply to the tissues. Anemia might appear in various forms, such as tiredness and lack of vitality, dizziness, headaches and discolored skin (pale or yellowish), rapid heart rate, irregular heart rhythms and chest discomfort, dyspnea, cold hands and feet, and claudication. The prevalence and extent of these signs and symptoms vary[12].

As per WHO global anemia estimates, the 2021 edition, during the gestation period, iron deficiency anemia can result in negative reproductive consequences such as premature birth, babies born with low birth weight, and reduced iron reserves for the baby, which may affect developmental progress. Anemia indicates inadequate nutrition and overall poor health[13]. Anemic pregnant women face increased risks of perinatal mortality and morbidity. Severe anemia is associated with higher maternal mortality, although this is based on retrospective data. Studies consistently report lower birth weights in anemic women, and substantial evidence linksIron deficiency anemia during early pregnancy to low birth weight and preterm delivery. Maternal anemia is also associated with lower infant Apgar scores, increased premature birth risks, and more perinatal complications, growth stunting, and low nutrient stores in infants[14]. Anemia can lead to cardiac and renal failure by causing hypoxia, peripheral vasodilatation, decreased blood pressure, stimulation of the sympathetic and renin-angiotensin-aldosterone system (RAAS), increased heart rate and the amount of blood pumped with each heartbeat, reduced blood flow to the kidneys, and elevated plasma volume. Prolonged anemia initiates the development of left ventricular hypertrophy (LVH), the death of myocardial cells, myocardial fibrosis, cardiomyopathy, and congestive heart failure (CHF)[15].

Anemia has minimal direct consequences for the fetus and mother. However, infants born to mothers with iron insufficiency may have reduced iron reserves as newborns. The maternal consequences of anemia are the same as those associated with any form of anemia in adults. When anemia is corrected, women with a sufficient amount of red blood cells are better prepared to handle sudden blood loss during labor and delivery[16]. According toWHO, anemia is a major public health concern when prevalence exceeds 5% [17] [18] [19].

Materials and Methods:-

Study Design:

The study design employed a time-bound prospective study that followed a non-probability convenience sampling technique, conducted at Emirates hospital, Dubai, UAE. Ethical approval for this research has been granted in accordance with local and international guidelines for research ethics.

Study population:

The study included all pregnant women enrolled by obstetricians or gynecologists at Emirates Hospital in Dubai, UAE, encompassing a total of 833 participants with a time-bound prospective approach during the initial six months, from September 2022 to February 2023, across different trimesters. This study excluded the pregnant women with chronic health issues such as chronic kidney disease, autoimmune disorders, and any other complications related to an unusual pregnancy. Additionally, we excluded those under the age of 18, as well as cases of aborted pregnancy. Pregnant women without a history of thalassemia or genetic disorders were included.

Data Collection:

Study population data was collected from the obstetrics, gynecology departments, medical record department, and hospital information system (HIS).

Sampling:

Samples were analyzed within the hospital's Department of Laboratory, which is an ISO 15189-accredited laboratory. and reports were generated as per standard operating procedures and policies by using hematology analyzer (XN 550). Internal and external quality controls were performed for the accuracy and reliability of the test results. QC was run daily using three different levels to ensure the quality of sample results. Anemia in pregnancy is identified by measuring hemoglobin levelsof<110 g/L or a hematocrit of <33% in the first and third trimesters and a hemoglobin level of <105 g/L with a hematocrit of <32% in the second trimester. Classification of severity of anemia is categorized as mild anemia (Hemoglobin: 100–109 g/L), moderate anemia (Hemoglobin: 70–99 g/L), and severe anemia (Hemoglobin:<70 g/L).

Data analysis:

The statistical analysis for the data was compiled, organized into tables, and analyzed using Software SAS (Version 9.4), © 2024. Appropriate tools for primary and secondary data collection may be selected from observation techniques, questionnaires, interviews, and checklists. Statistical analysis was performed using t-tests for mean comparisons and chi-square tests for categorical associations, with significance set at p value <0.05.

Results:-

Table 1:- Severity of anemia during pregnancy based on hemoglobin concentrations.

Hemoglobin (g/L)	Number of women	Percentage (%)	Severity
110 or Higher (No Anemia)	595	71.43%	Normal
100 - 109 (Mild Anemia)	134	16.09%	Mild
70 - 99 (Moderate Anemia)	103	12.36%	Moderate
<70 (Severe Anemia)	1	0.12%	Severe

Table:1 shows the classification of anemia severity in pregnancy based on hemoglobin levels. The participant's mean hemoglobin was 113.1 g/L (SD: 10.76), with a median of 116 g/L. The majority of 595 women, representing 71.43% of the study population, have a hemoglobin concentration of 110 g/L or above, indicating no anemia. A cohort of 134 women, representing 16.09% of the sample, fall into the mild anemia category with Hemoglobin levels of 100-109 g/L. 12.36% of the women in the sample exhibit moderate anemia, with hemoglobin levels between 70 and 99 g/L. Only one woman (0.12%) in the sample has a hemoglobin level <70 g/L, indicating severe anemia.

Figure 1:

Figure 1:- Pie chart illustrating the severity of anemia during pregnancy, categorized based on hemoglobin concentrations.

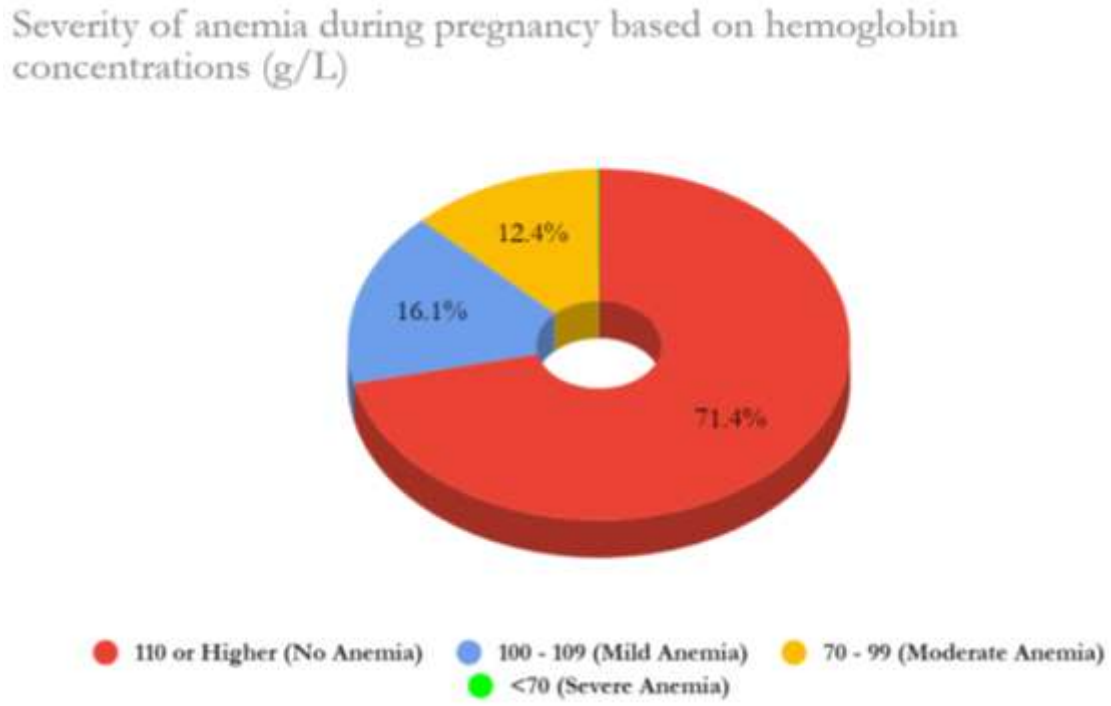


Table 2:- Distribution of Hb level in pregnant women with antenatal period (Trimester).

Hemoglobin (g/L)	≥110	%	100 to 109	%	70 to 99	%	<70	%	Total	%
1 st Trimester	216	25.93	22	2.64	17	2.04	0	0.00	255	30.61
2nd Trimester	209	25.09	62	7.44	42	5.04	1	0.12	314	37.70
3rd Trimester	170	20.41	50	6.00	44	5.28	0	0.00	264	31.69
Total	595	71.43	134	16.09	103	12.36	1	0.12	833	100.00

Table: 2 illustrates the distribution of Hemoglobin Levels in Pregnant Women Across Antenatal Periods (Trimesters). In the case of the 'No anemia' population 25.93% of women in the first trimester have no anemia (n=216), with the hemoglobin levels of 110 g/L or higher. This represents the largest percentage of non-anemic women among this trimester. In the 2nd trimester the percentage of non- anemic women slightly decreases to 25.09% (n=209), indicating a minor drop in hemoglobin levels as pregnancy progresses. By the third trimester, only 20.41% (n=170) of women maintain hemoglobin levels of 110 g/L or higher.

In case of mild anemia population (hemoglobin 100 - 109 g/L), first trimester shows only 22 women (2.64%) experiencing mild anemia but in the second trimester this percentage rises to 7.44% and in the third trimester, the percentage of mild anemia cases remains elevated at 6.0%.

In the case of moderate anemia population (Hemoglobin: 70-99 g/L),17 women (2.04%) in the first trimester shows moderate anemia but in the second trimester, the number of women with moderate anemia increases to 42 (5.04%) and in 3rd trimester the number of women with moderate anemia slightly rises to 44 (5.28)

In the case of severe anemia (Hemoglobin:<70 g/L), only one case (0.12%) was affected by hemoglobin levels <70 g/L and no cases were reported in the first and third trimesters.

Figure 2:-

Figure 2:- Bar chart depicting the distribution of Hb level in pregnant women with antenatal period (Trimester).

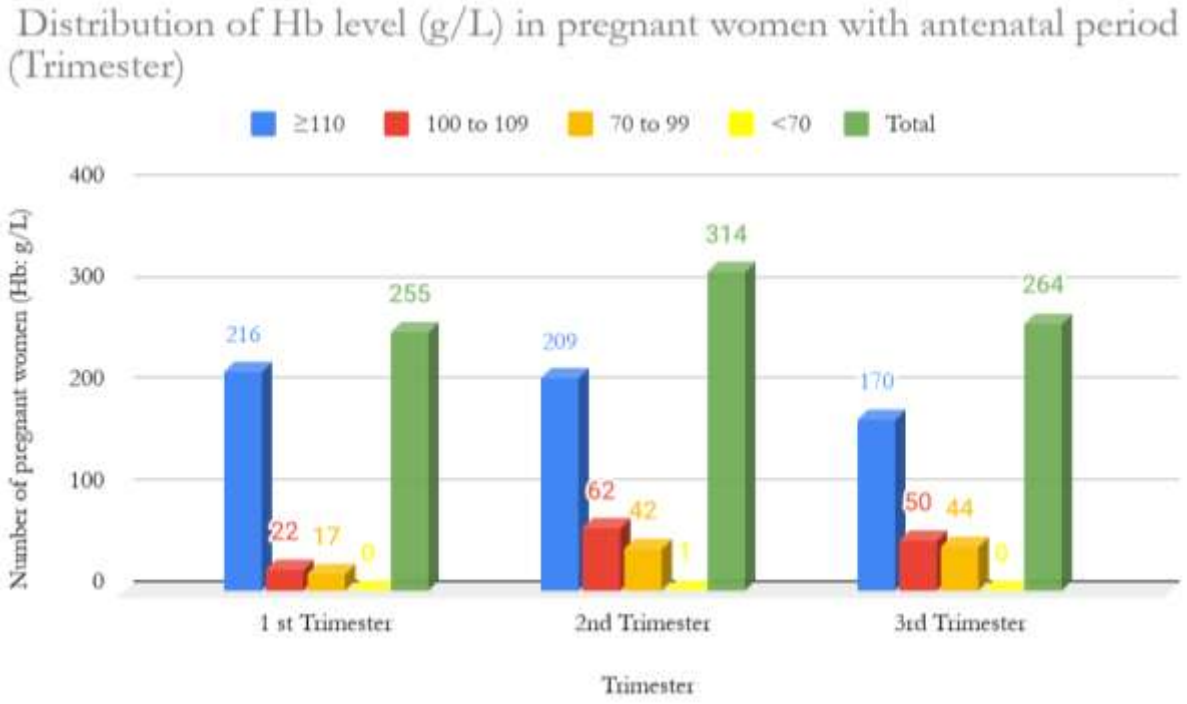


Table 3:- Distribution of Hb level in pregnant women with age group during pregnancy.

Hemoglobin (g/L)	≥110	%	100 to 109	%	70 to 99	%	<70	%	Total	%
Age: 18-24	25.00	3.00	3.00	0.36	5.00	0.60	1.00	0.12	34.00	4.08
Age: 25-35	407.00	48.86	100.00	12.00	65.00	7.80	0.00	0.00	572.00	68.67
Age: >35	163.00	19.57	31.00	3.72	33.00	3.96	0.00	0.00	227.00	27.25
Total	595.00	71.43	134.00	16.0	103.00	12.36	1.00	0.12	833.00	100.0

				9						0

Table 3 indicates the distribution of hemoglobin levels among pregnant women across the different age groups. The participants' mean age was 31.92 years, ± 4.52 SD.Altogether 34 antenatal women aged 18–24 years, constituting 4.08% of the study population, were analyzed. Within the 25–35-year age demographic, the predominant number of participants, 572 women, constituted 68.67% of the overall study population. Meanwhile, women aged >35 years constituted 227 participants, representing 27.25% of the total.

Figure 3:-

Figure 3:- Bar chart showing the distribution of Hb level in pregnant women with age group during pregnancy.

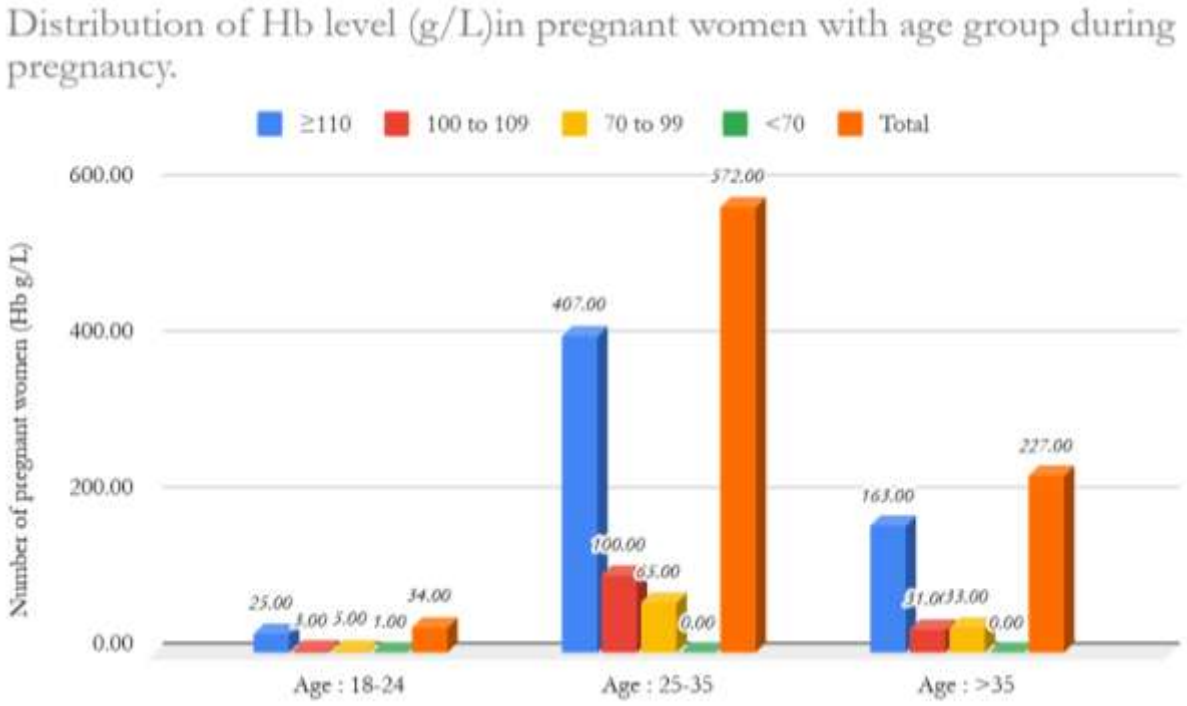


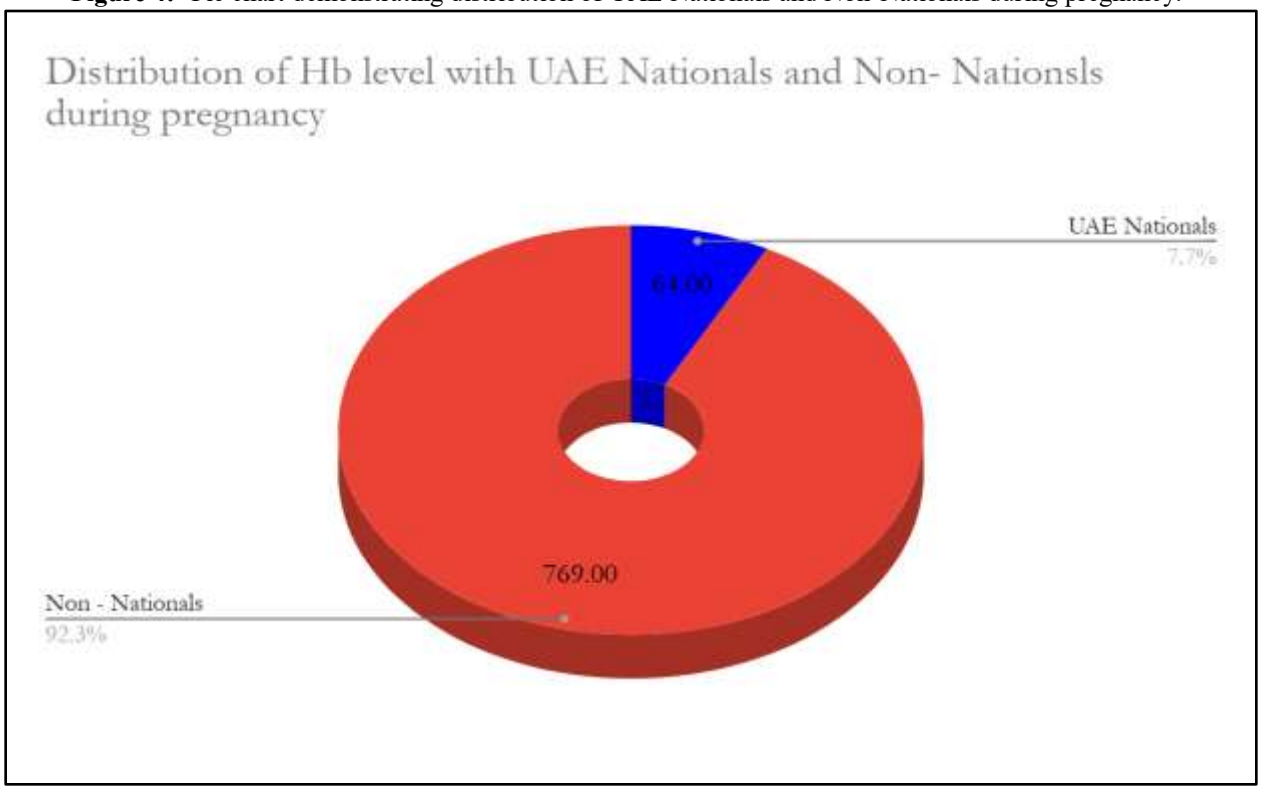
Table 4:- Distribution of Hb level with UAE Nationals and Non- Nationals during pregnancy.

Hemoglobin (g/L)	≥110	100 to 109	70 to 99	<70	Total	%
UAE Nationals	45	10	9	0.00	64.00	7.68
Non - Nationals	550	124	94	1.00	769.00	92.32
Total	595	134	103	1.00	833.00	100.00

Table:4 highlights the Distribution of hemoglobin (Hb) levels among UAE nationals and non-nationals during pregnancy highlights notable differences in both total numbers and percentages. Among the study population of 833 pregnant women, UAE nationals constituted a smaller group of 64 women (7.68%), while the majority, non-nationals, accounted for 769 women (92.32%)

Figure 4:

Figure 4:- Pie chart demonstrating distribution of UAE Nationals and Non-Nationals during pregnancy.



Discussion:-

Anemia during pregnancy is a major public concern globally. This study contributes valuable insights into theanemia severityamong pregnant women and hemoglobin distribution among other factors influencing its severity. As evidenced by the literature review, the severity of anemia during pregnancy is minimally monitored across the country. In our study, the meanhemoglobin was 113.1 g/L, with a standard deviation of ±10.76 and a median of 116 g/L. A large portion of pregnant women (71.43%) had hemoglobin levels of ≥110 g/L, which indicates no anemia. Mild anemia was observed in 16.09% of women, while 12.36% had moderate anemia, and only one woman (0.12%) showed severe anemia. Our findings closely align with the results from the antenatal center in Sharjah, a nearby emirate, which reported 16% mild anemia, 12% moderate anemia, and 0% severe anemia among pregnant women. Anam Ahmed et al. (2015) from GMC Hospital, Ajman, UAE, reported 45% of cases of mild anemia and 50% of normal cases. This may be due to the study's selection criteria: Normal (Hb > 110 g/L), Mild (Hb: 80-110 g/L), and Moderate-Severe (Hb < 80 g/L). 20 Seshadri & Arjun (2021) noted that mild anemia (Hb: 100-109 g/L) is the most prevalent form in pregnancy, especially in developing countries[5]. An observational study conducted in rural India reported that 41.76% of participants had mild anemia, 37.05% had moderate anemia, 15.88% had severe anemia, and 3.29% had very severe anemia[21].

Another study conducted in Saudi Arabia by Ali Alghamdi (2016) indicated a reduced severity of anemia relative to our findings, with 12.6% of individuals classified as mildly anemic, 7.5% as moderately anemic, and merely 0.3% as severely anemic[22].

In the present study, in the first trimester, the majority of women (25.93%) have hemoglobin levels ≥110 g/L, indicating a healthy range. The study noticed that there is a decline in the normal hemoglobin levels as pregnancy progresses. Pregnant women with Hb ≥110 g/L, in the first trimester (25.93%), followed by 25.09% in the second trimester and 20.41% in the third trimester. This progressive decline may be due to the physiological changes during pregnancy, suggestive of 'physiological anemia' and increased iron requirements[9].

This study indicates that women aged 25 - 35 years were the predominant group (68.67%) and exhibited the highest proportion of normal hemoglobin levels (48.86%). Moyad J. Shahwan et al. (2019) found that women aged 25–35 were the majority (79%) and indicated the highest proportion of normal hemoglobin levels (55%). The mean ± SD age of the participants was 31.92 ± 4.52 years. The research revealed that 92.32% of participants were non-citizens, and the hemoglobin distribution among UAE nationals and non-nationals was notably comparable. However, non-nationals had a somewhat elevated incidence of severe anemia (0.13%), possibly indicative of disparities in socioeconomic conditions, healthcare accessibility, and nutritional practices.

Conclusion:-

This study estimated the severity of anemia as follows: 16.09% of women demonstrated Mild anemia, Moderate anemia was detected in 12.36% of the subjects., and 0.12% experienced Severe anemia. This study included pregnant women from all ethnic groups, reflecting Dubai's multicultural and multiethnic community. However, women attending a hospital may not fully represent the general population, and a community-based study is therefore recommended for a more comprehensive understanding.

Acknowledgement:-

The authors would like to acknowledge Dr. Kunjamma Roy (MBBS, DGO, MD) for reviewing the clinical significance of the article and Dr. Alice (Biostatistics) for providing support with statistical analysis. The study was conducted to fulfill the requirements for the PhD degree at NIMS University, 2021, Jaipur, India.

Statement of Ethics:
This research involved human participants, and all procedures were followed in accordance with the ethical standards of the responsible committee at Dubai and with the Helsinki Declaration ethical guidelines.

Ethical Approval:
Ethical approval for this research has been granted by the Dubai Scientific Research Ethics

Committee (DSREC), Dubai Health Authority, with Approval number: DSREC-SR-09/2022_03, Dated 21 September 2022.

Informed Consent Statement:
Written informed consent and Information sheet was obtained from the participants included in the study.

Conflict of Interest Statement:
Authors declare no Conflicts of Interest to disclose.

Artificial Intelligence (AI) Disclosure Statement:
AI-Unassisted Work

Funding / Support Sources:
No funding received

References:-

1. Shi H, Chen L, Wang Y, Zhang J, Liu M, Li X, et al. Severity of anemia during pregnancy and adverse maternal and fetal outcomes. JAMA Network Open. 2022 Feb 1;5(2)doi: 10.1001/jamanetworkopen.2021.47046. PMID: 35113162; PMCID: PMC8814908.
2. World Health Organization. Hemoglobin concentrations for the diagnosis of anemia and assessment of severity. Geneva: WHO; 2011. Report No.: WHO/NMH/NHD/MNM/11.1. Available from:
3. Global strategy for the prevention and control of noncommunicable diseases 2008-2013. Geneva: World Health Organization; 2011. Available from: https://iris.who.int/bitstream/handle/10665/85839/WHO_NMH_NHD_MNM_11.1_eng.pdf
4. World Health Organization. Iron deficiency anemia: assessment, prevention, and control. A guide for program managers. 2001. p. 47-62.
5. Seshadri, L., & Arjun, G. (2021). Essentials of Obstetrics (2nd ed.). Wolters Kluwer Health

6. World Health Organization (WHO), Anemia, Available from: https://www.who.int/health-topics/anemia#tab=tab_1
7. Hwalla N, Al Dhaheri AS, Radwan H, et al. The prevalence of micronutrient deficiencies and inadequacies in the Middle East and approaches to interventions. Nutrients. 2017 Mar 3;9(3):229. doi: 10.3390/nu9030229. PMID: 28273802; PMCID: PMC5372892.
8. World Health Organization (WHO). The global prevalence of anemia in 2011. Geneva Switzerland: WHO 2015: 1-6
9. World Health Organization (WHO) anemia in women and children. the global health observatory: explore a world of health data. [cited 2024 july 27]. available from: https://www.who.int/data/gho/data/themes/topics/anemia_in_women_and_children.
10. Costantine MM. Physiologic and pharmacokinetic changes in pregnancy. Frontiers in Pharmacology 2014;5. https://doi.org/10.3389/fphar.2014.00065.
11. World Health Organization. Anemia. Fact sheet. Available from: https://www.who.int/news-room/fact-sheets/detail/anemia. Accessed June 28, 2024
12. Cunningham FG, Leveno KJ, Dashe JS, Hoffman BL, Spong CY, Casey BM. Williams obstetrics. 26th international ed. New York: McGraw-Hill Education; 2022.
13. Freeman AM, Rai M, Morando DW. Anemia Screening. 2023 July 25. In: StatPearls. Treasure Island (FL): StatPearls Publishing; 2024 Jan–. PMID: 29763080.
14. World Health Organization. WHO Global Anemia estimates, 2021 Edition: Global anemia estimates in women of reproductive age, by pregnancy status, and in children aged 6-59 months. Geneva: World Health Organization; (cited 2024 July 26). Available from: https://www.who.int/data/gho/data/themes/topics/anemia_in_women_and_children.
15. Allen LH. Anemia and iron deficiency: effects on pregnancy outcome. the American Journal of Clinical Nutrition 2000; 71:1280S-1284S. https://doi.org/10.1093/ajcn/71.5.1280s.
16. Silverberg DS, Iaina A, Wexler D, Blum M. The pathological consequences of anemia. Clinical and Laboratory Hematology2001; 23:1–6. https://doi.org/10.1046/j.1365-2257.2001.00352.x.
17. Beckmann CRB, Ling FW, et al. Obstetrics and Gynecology. 7th ed. Washington, DC: American College of Obstetricians and Gynecologists; 2014.
18. De Benoist, B., et al., Worldwide prevalence of anemia 1993–2005; WHO Global Database of anemia. 2008.
19. World Health Organization. Hemoglobin concentrations for the diagnosis of anemia and assessment of severity. Geneva: WHO; 2011. Report No.: WHO/NMH/NHD/MNM/11.1. Availablefrom:https://iris.who.int/bitstream/handle/10665/85839/WHO_NMH_NHD_MNM_11.1_eng.pdf.
20. Ahmed A, Nasir H, Shafiq Q, Naeem B, Ghelani Y, Shaikh RB. The effect of anemia on pregnancy and fetal outcome: GMC Hospital, Ajman, UAE. 2015. Available from: https://applications.emro.who.int/imemrf/Gulf_Med_Univ_Proc/Gulf_Med_Univ_Proc_2015_4_5_Oral_75_81.pdf
21. Mangla M, Singla D. Prevalence of anemia among pregnant women in rural India: a longitudinal observational study. Int J Reprod Contracept Obstet Gynecol. 2016;5(10).
22. Alghamdi A. Prevalence of anemia among pregnant women in Riyadh, Saudi Arabia. Int J Health Sci Res. 2016; 6(9):54-60.