

Comparative Analysis of Anaemia & Hematological Biomarkers among Pregnant and Non-Pregnant Women in Karachi

Analysis of Anaemia & Hematological Biomarkers Among Pregnant and Non-Pregnant

Zubaida Masood¹, Fauzia Ali², Saiqa Rashid², Jarry Masood³, Mataa-e-Masood⁴ and Shagufta Perveen⁵

ABSTRACT

Objective: To compare iron deficiency and various haematological parameters in pregnant and Non-pregnant women.

Study Design: A quasi experimental study

Place and Duration of Study: This study was conducted at the Al-Tibri Medical College and Hospital and Karachi Medical and Dental College, between the duration of October 2020 to November 2021.

Materials and Methods: A total of 450 participants were screened for the study which comprises of One hundred and twenty-five pregnant women and one hundred and twenty-five Non-Pregnant women.

Pregnant women were enrolled who were reported the outpatient department OPD for their maternal care at ATMCH&H. Non-Pregnant Women were recruited from healthy population of ATMCH&H.

Results: Among 450 participants, it has been observed that 46% pregnant women were suffering from moderate anaemia following 41% severe anaemia and only 12% mild anaemia. In contrast, the percentage of moderate to severe anaemic condition were found to be quite low (i.e. 1-8%) in non-pregnant women. Mild anaemic condition was observed in 25% of non-pregnant participants and 64% were found to be non-anaemic. The difference between these two groups were found to be statistically significant with P-value less than 0.05 ($p < 0.05$).

Conclusion: Iron is influencing the medical condition of the pregnant and non-pregnant women therefore it should be supplemented in their daily diet to prevent the unwanted damages to the conceiving mother and its fetus.

Key Words: Anaemia, Pregnant women, Iron Deficiency, Iron supplements, Hematological parameters.

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INTRODUCTION

Anaemia is a globally effected the population in developed and underdeveloped countries.

1. Department of Gynae/Obs, Sobhraj Hospital, Karachi Medical and Dental College, Karachi.

2. Department of Gynae/Obs, Karachi Medical and Dental College, Karachi.

3. Department of Gynae/Obs, Dow International Medical College, Karachi.

4. Department of Gynae/Obs, Memon Medical Hospital, Karachi.

5. Department of Gynae/Obs, Al-Tibri Medical College & Hospital, Karachi.

Correspondence: Prof Zubaida Masood, HOD Gynae/Obs Sobhraj Hospital, Karachi Medical and Dental College, Karachi.

Contact No: 0308-2153400

Email: zubaidamasood@hotmail.com

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It effects the adults, infants, old age and most importantly pregnant women and children of age less than 5 years old, hence leading cause of morbidity and mortality worldwide^[1].

There are several types of anaemia out of which Iron Deficiency Anaemia (IDA) is most prevalent cause of anaemia. Research evidence that IDA is associated with high maternal morbidity and mortality among pregnant women with increased risk of adverse reaction to offspring. IDA is diagnosed by serum iron and serum ferritin concentration. WHO defines IDA as the Presence of ferritin $< 30 \mu\text{g/L}$ in serum. Hepcidin, a new marker which is also use for the diagnosis of anaemia during pregnancy^[2,3]. The World Health Organization WHO describes mild, moderate and severe anaemia based on haemoglobin concentration which is $< 11.0 \text{ g/dL}$, $< 9.9 \text{ g/dL}$, and $< 7.0 \text{ g/dL}$ respectively. Moreover, Hemoglobin (Hb) value $< 11.0 \text{ g/dL}$ or Hct $< 33\%$, in pregnant women and Hb $< 12.0 \text{ g/dL}$ or Hct $< 36.0\%$ in non-pregnant women are referred as anaemic^[4].

Anaemia is diagnosed by the low number of Red Blood Cells (RBCs) and low concentration of haemoglobin or hematocrit (HCT) which consequently leads to the

impairing of oxygen transport capacity of RBCs. Thus adverse effect the peoples of all age group.

The factors associated with anaemia in women includes deficiencies of micronutrients especially iron, unhealthy diet, vitamin B12, folic acid and due to some chronic disease like HIV, Malaria, and parasitic infection of hookworm. Additional elements include differences in way of life, socio-demographic factors, sanitation conditions, and genetic susceptibility^[5].

The complications of anaemia based upon the type and severity of anaemia which can cause multi adverse effects among pregnant and non-pregnant women. In pregnancy severe anaemia may cause shortness of breath due to low level of oxygen supply to RBCs, which can lead to impaired oxygen delivery to fetus, thereby resulting in premature and low birthweight of neonate and sometime cause abortion and intra uterine fetal death. According to a research, in low income countries anaemia attributes about 44%, 25% and 21% of premature birth, low birth weight and perinatal mortality respectively^[6]. According to World Health Organization (WHO), Hemoglobin (Hb) value <11.0 g/dL or Hct <33%, in pregnant women and Hb <12.0g/dL or Hct <36.0% in non-pregnant women are referred as anaemic ^[6].

The aim of our study was to focus on the anaemic pregnant and non-pregnant women in the premises of Al-Tibri Medical College & Hospital (ATMC&H) and to determine the severity of the anaemic condition.

MATERIALS AND METHODS

Ethical Approval: The cross sectional study was conducted after ethical approval from concerned authority of Al-Tibri Medical College and Hospital, Isra University Karachi.

Study Design: This cross-sectional study was carried out over a period of 12 months from October 2020 to November 2021. This study was conducted at Al-Tibri Medical College and Hospital (ATMCH&H) & Karachi Medical and Dental College, Karachi. Pregnant women (less than 13 weeks of gestation) were recruited who were reported the outpatient department OPD for their maternal care at ATMCH&H. Non-Pregnant Women were recruited from healthy population of ATMCH&H. A total of 450 participants were screened for the study which comprises of One hundred and twenty-five pregnant women and one hundred and twenty-five Non-Pregnant women (Control). The sample size was calculated by using the formula with the margin error (E) of 5% and confidence level of 95%. The mean age of the participants was 25.18 ± 4 years.

Exclusion criteria: This include women who were not anaemic, taking any type of oral contraception medicine and breast-feeding mothers.

Collection of Sample: Blood samples from all participants were collected in EDTA tube. Approximately 2-3 mL of blood was drawn from both

pregnant and non- pregnant women and were analysed for haematological parameters on fully automated blood cell counter SYSMEX XE-200 & SYSMEX XE-100.

Data Analysis: All data were analysed by using statistical software SPSS version 20.00. Mean, standard deviation and significant differences between the groups were determined by paired t-test and one-way ANOVA. The $p \leq 0.05$ was considered as statistically significant.

RESULTS

In our study, 44% participants belong to age group of 25 to 29 years, 34% belong to age group 19 to 24 years and only 20% belong to 30 to 34 years of age group as showed in Table 1.

Following WHO guideline, we categorized the anaemic women into three groups (Mild, Moderate, and severe) according to severity of anaemia. The classification was made in order to find out the severity of anaemic condition in our population. We analysed that 46% pregnant women were suffering from moderate anaemia following 41% severe anamia and only 12 % mild anaemia as showed in Table 2.

In contrast, the percentage of moderate to severe anaemic condition were found to be very low (i.e. 1-8%) in non-pregnant women. Mild anaemic condition was observed in 25% of non-pregnant participants and 64% were found to be non-anaemic in our study as showed in Table 3.

The mean hemoglobin concentration of pregnant participants were found to be low (9.12 ± 0.23 g/dL) in comparison to non-pregnant women (13.22 ± 0.24 g/dL) with low hematocrit concentration $31.33 \pm 0.23\%$ and $37.23 \pm 0.21\%$ in pregnant and non-pregnant women. Moreover, decreased RBCs $3.01 \pm 0.11 \times 10^{12}/L$ and increased Total white blood cells (TWBC) $11.5 \pm 0.35 \times 10^9/L$ were also observed in pregnant women. The difference between these two groups were found to be statistically significant with p-value less than 0.05 ($p < 0.05$).

Table No.1: Distributions of participants on the basis of age

Age Group	Number of Subjects	age (%)
19-24	155	34.44%
25-29	201	44.66%
30-34	94	20.8%
Total	450	

Table No.2: Status of Anaemia among pregnant women

Anaemic Condition	Number of subjects	Percentage (%)
Mild	28	12.44%
Moderate	104	46.22%
Severe	93	41.33%
Total	225	

Table No.3: Status of Anaemia among Non-pregnant women

Anaemic Condition	Number of Subjects	Percentage (%)
Non-Anaemic	145	64.44%
Mild	57	25.33%
Moderate	19	8.44%
Severe	4	1.77%
Total	225	

Table No.4: Hematological parameters of pregnant and Non-pregnant participants

Parameters	Unit	Pregnant Women Mean \pm SD	Non-Pregnant Women Mean \pm SD	p-value
Hb	g/dL	9.12 \pm 0.23	13.22 \pm 0.24	<0.045
RBC	X10 ¹² /L	3.01 \pm 0.11	4.11 \pm 0.05	<0.05
HCT	%	31.33 \pm 0.23	37.23 \pm 0.21	<0.045
MCV	fL	75.23 \pm 0.45	82.20 \pm 0.03	<0.05
MCHC	g/L	22.10 \pm 0.16	30.12 \pm 0.11	<0.04
WBC	X10 ⁹ /L	11.5 \pm 0.35	10.31 \pm 0.17	<0.05
Platelet Count	X10 ⁹ /L	175.25 \pm 0.12	325.21 \pm 0.019	<0.05
Neutrophil	%	51.45 \pm 0.21	61.12 \pm 4.08	<0.05
Lymphocyte	%	25.12 \pm 0.32	29.091.03	0.056
Eosinophil	%	04.12 \pm 0.02	05.34 \pm 0.09	0.062
Monocyte	%	03.04 \pm 0.001	01.01 \pm 0.001	0.067
Basophil	%	00	01	0.092

Table No.5: Haematological parameters of pregnant women according to their 1st, 2nd and 3rd trimester

Parameters	Unit	1 st trimester Mean \pm SD	2 nd trimester Mean \pm SD	3 rd trimester Mean \pm SD
Hb	g/dL	8.22 \pm 0.16	9.22 \pm 0.26	10.06 \pm 0.22
RBC	X10 ¹² /L	4.51 \pm 0.11	4.11 \pm 0.07	5.01 \pm 0.02
HCT	%	27.21 \pm 0.23	28.02 \pm 0.11	29.45 \pm 0.23
MCV	fL	65.10 \pm 0.15	66.20 \pm 0.21	69.57 \pm 0.24
MCHC	g/dL	27.34 \pm 0.16	27.95 \pm 0.01	28.37 \pm 0.18
WBC	X10 ⁹ /L	10.5 \pm 0.35	11.3 \pm 0.11	12.5 \pm 0.35
Platelet Count	X10 ⁹ /L	215.66 \pm 1.38	185.11 \pm 1.23	223.26 \pm 1.33
Neutrophil	%	51.11 \pm 0.27	59.66 \pm 4.08	62.54 \pm 0.21
Lymphocyte	%	21.23 \pm 0.32	29.25 \pm 1.03	30.26 \pm 1.07
Eosinophil	%	03.20 \pm 0.02	04.19 \pm 0.05	04.56 \pm 0.04
Monocyte	%	03.10 \pm 0.001	02.01 \pm 0.001	02.02 \pm 0.002
Basophil	%	01.01 \pm 0.001	01.02 \pm 0.001	01.00 \pm 0.001

DISCUSSION

In our study we have used multiple hematological markers to compare the anemia between pregnant and non-pregnant participants. Our results shows slight recovery of iron deficiency anemia among pregnant women after taking constantly prescribed supplements and healthy diet. It was also observed in our participants that majority of them belong to low income family.

The non-pregnant women were found to be healthier with normal hemoglobin concentration in our study and

sever anaemic condition were observed only in 1% whereas majority of participants were non-anaemic.

Daily supplement of iron in pregnancy is highly recommended to compensate the insufficient intake of iron from regular diet. For this purpose, iron rich food is the first choice then iron supplements such as iron-sulfate, gluconate and fumarate is given orally^[7]. As this supplements are administrated at high doses, triggers some undesirable effects mainly associated with gastrointestinal distress (abdominal pain, vomiting, nausea, diarrhea, constipation, loss of appetite) which ultimately promote oxidative stress and undesirable changes in gut microbiome profile^[8]. It may also increase the risk of severe systematic measures like low birth weight neonates, premature delivery and cognitive defects in newborns^[9].

According to a study carried out in Abbottabad, the iron deficiency anemia affects about 68% people out of which female is more common^[10].

A report is published by World Bank on anemia in which they stated that "Anemia prevalence decreases in women with the income in every region or country". They also explained the prevalence of anemia, which is twice high in poorest as compared to richest^[11]. Iron supplements are necessary for all pregnant women and it should be prescribed according to need. Access to good health care facilities in developing countries helps out in early diagnosis of anemia and its prophylaxis. Moreover, it is also necessary to check hemoglobin concentration 2-4 weeks after initial dose of iron supplements and should keep continued for at least 6 months after recovery of iron concentration to normal^[12].

According to Pakistan National Nutrition Survey (NNS 2018), the prevalence of anaemia has been continuously increasing since 2001 to 2011 and then declined in 2018 with the rose of 50.9% to 61.9% and 53.7% respectively. According to this survey anaemia was also common in productive age of non-pregnant women^[13]. Globally anaemia affects about two-third pregnant women in developed countries. Moreover, in South East Asia about 41.9% of reproductive age women suffer from anaemia, followed by Eastern Mediterranean and African regions^[14]. More than half of Pakistani population of women (i.e.51%) were found to be anaemic. The ratio of anaemia were found to be low in non-pregnant women of reproductive age^[15, 16].

CONCLUSION

Anaemia is one of the most important public health concern among pregnant women. There are multiple factors such as low socioeconomic status, and diet that influence the iron deficiency in women of reproductive age group. For this purpose early diagnosis and iron supplements play an important role to prevent deleterious effect of anaemia.

Author's Contribution:

Concept & Design of Study: Zubaida Masood
 Drafting: Fauzia Ali, Saiqa Rashid
 Data Analysis: Jarry Masood, Mataa-e-Masood, Shagufta Perveen
 Revisiting Critically: Zubaida Masood, Fauzia Ali
 Final Approval of version: Zubaida Masood

Conflict of Interest: The study has no conflict of interest to declare by any author.

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