Original Article

ASSESSMENT OF IRON DEFICIENCY ANEMIA IN PREGNANT WOMEN OF DISTRICT MARDAN BY DETERMINING SERUM FERRITIN

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ABSTRACT

Objective: *The study sought to determine the prevalence of iron deficiency anaemia in pregnant women and the levels of haemoglobin and serum ferritin.*

Materials & Methods: *Three hundred blood samples were drawn randomly from expectant mothers. There is a six-month study period. Patients seeking prenatal care in the Gynae obs OPD at the Mardan Medical College Teaching Hospital provided blood samples taken in EDTA tubes. Questionnaires were completed at the time of the blood collection. The Mindrey model BC 3000plus automated haematological analyzer was used to measure haemoglobin levels.To determine whether an iron deficit was the source of the anaemia, those with haemoglobin levels less than 11g/dl had their blood ferritin levels further evaluated. SPSS 20 was used to analyze the data after Microsoft Excel had tabulated it.*

Results: *According to the research, anaemia affected 76.6% of the expectant mothers. 42.6% of the frail subjects had very low serum ferritin levels. Serum ferritin, which measures iron reserves, was found in the 12–30 ng/ml range in another 43% of the population.*

Conclusions: *The recent research found that even with regular prescriptions for iron supplements, anaemia is common among District Mardan's pregnant women.*

Key Words: *Pregnancy, anaemia, prevalence, iron deficiency, haemoglobin, serum ferritin.*

INTRODUCTION

In terms of maternal and foetal morbidity and mortality during pregnancy, anaemia is a well-researched and well-known risk factor. [1, 2]. Anaemia is a serious medical condition that has to be completely resolved. Anaemia is a disease in which either the quantity of red blood cells is reduced, or their ability to transport oxygen is inadequate to satisfy the body's demands.

The term anaemia comes from the ancient Greek term "without blood." Factors such as age, sex, altitude, smoking, and pregnancy status may all affect this illness [3]. The WHO defines anaemia as having a haemoglobin level below 11 gm/d in pregnant women and severe anaemia as having a haemoglobin level below 7 gm/dl. Anaemia is defined as less than 11 gm/dl in the first and third trimesters and less than 10.5 gm/dl in the second trimester by the Centres for Disease Control and Prevention (1990) [4].

Inadequate iron intake is the most common kind of anaemia [5]. A condition known as iron deficiency is characterized by the absence of mobilizable iron reserves and a weakened iron supply to the tissues, especially the red blood cells [6]. The body goes through physiological changes during pregnancy, such as an increase in red cell mass, to counteract the greater loss of blood after delivery. However, frail women cannot fulfil these increasing needs since they do not have enough iron reserves. An iron deficient condition results from insufficient iron absorption and the body's use of all of its iron reserves. This condition is characterized by decreased haemoglobin synthesis

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and a subsequent level decline. Iron storage, or ferritin levels, also decreases even before a decline in haemoglobin levels. Because iron is a necessary component of cells, anaemia symptoms arise before a decrease in haemoglobin levels [8].

Iron deficiency anaemia is a complicated aetiology due to the involvement of several variables. In addition to other reasons, diet-related issues comprise most of the aetiology. Micronutrient deficiencies such as iron, folic acid, vitamin B12, and vitamin A are among the dietary causes of anaemia.

Iron is thought to be the most responsible factor 9 of all of these. The main causes of iron insufficiency are inadequate consumption of foods high in iron and low iron bioavailability relative to pregnancy requirements. Because the majority of the food eaten by our people consists of cereals, poor bioavailability has been identified as the primary cause of iron deficiency. In addition to the types of iron found in food—heme and non-heme—factors that either promote or hinder iron absorption—like phytate and calcium—or inhibit it—like ascorbic acid. Furthermore, an increased need for iron may also result from pathologic blood loss, such as hookworm infection [10].

Alternatively, physiological, such as increased demand during gestation and haemorrhage after parturition or menstruation cycles. Adult women who reproduce often may also be more susceptible to anaemia.

Though not very firmly shown, it has been thought that closely spaced pregnancies reduce nutritional reserves, notably iron. Low haemoglobin concentration will result if these reserves are not promptly and appropriately replenished [11]. It has been proposed that haemoglobin concentration in non-pregnant women is one of the indicators of anaemia during pregnancy [12].

Anaemia is often defined as the proportion of the population having iron deficiency anaemia, as determined by the haemoglobin concentration in the blood. This has likely been done since measuring haemoglobin in blood is very simple to undertake at the population level due to its low cost and simple methodology. If a population's iron deficiency prevalence has to be investigated, serum ferritin and haemoglobin levels should be the instruments of choice. Typically, enzyme-linked immunosorbent assays (ELISA) or enzyme immunoassays are used to measure ferritin in serum or plasma. For its assessment, dried serum spot samples are an additional option [13].

The first comprehensive study on the prevalence of anaemia worldwide was released by DeMaeyer and Adiels-Tegman [14]. After that, the data was modified to reflect the population growth rate. This modification corresponds to the global anaemia rate of [15]. Additionally, it has been acknowledged without evidence that there would be at least 2.5 instances of iron deficiency for every episode of anaemia. Approximately 1.62 billion individuals are anaemic worldwide. This represents 25% of the world's population, and of them, 42% of pregnant women are anaemic globally, while 51% of pregnant women in Pakistan are estimated to be anemic [16].

The incidence of iron deficiency needs to be better understood even though it is recognized as a significant cause of anaemia. According to several research studies, the prevalence of iron deficiency anaemia varies among pregnant women in Multan (76%), Lahore (73%), and Karachi (64%). However, there is a lack of information on the biochemical shortage of micronutrients such as iron in pregnant women in our KPK area. This is due to the expensive and specialized nature of the biochemical test for stored iron or serum ferritin. Therefore, only a few researchers have attempted to study at the population level.

The purpose of the present study was to evaluate the prevalence of anaemia and real iron deficiency in pregnant women in District Mardan with earlier research. The study aims to determine the prevalence of iron deficiency anaemia in pregnant women and the levels of haemoglobin and serum ferritin.

MATERIALS AND METHODS

Three hundred pregnant women between the ages of 18 and 40 who came from various socioeconomic backgrounds to the Mardan Medical Complex's Gynaecology and Obstetric Unit as outpatients made up the research group. The inclusion criteria were healthy expectant mothers from District Mardan who were between 18 and 40 at various stages of pregnancy and had haemoglobin levels less than 11g/dl. Pregnant women with any acute illnesses, obesity, hypertension, gestational diabetes mellitus, and other chronic conditions were excluded from consideration. Women over 40, since it is thought that pregnancy at this age carries a considerable risk. Women who

have had blood transfusions or blood loss in the past are now pregnant. The chief of the Gynae Obstetric Unit at MMC Teaching Hospital, Mardan, granted the required authority to conduct the investigation. Every participant signed a permission form to guarantee that their participation was voluntary.

Every participant was interviewed using a questionnaire. Three hundred pregnant women at different stages of pregnancy had blood samples taken. EDTA tubes were used to collect the blood samples. A haematology analyzer was used to quantify haemoglobin. The pathology and haematology laboratory of Bacha Khan Medical College Mardan uses the BC 3000 Plus Auto Haematology Analyzer (MINDRAY: Bio-medical Electronics business Ltd Shenzhen China). This device measures haemoglobin within a range of 1 to 25 gh/dl. In the lab, blood samples were labelled and processed. After that, the samples were put into the analyzer. Then, the automated measurement started.

Serum ferritin was estimated to determine the blood iron reserves in those anaemic females (Hb < 11gm/dl). Blood samples were taken and kept between 2 and 8 C for three to five days in tubes containing EDTA. The serum ferritin level was further estimated after ten to fifteen samples were taken. Serum ferritin was measured using an Elecsys and COBAS e (Trademark of Rosche) immunoassay analyzer. This kit's serum ferritin ranges from 0.5 to 2000 ng/ml.

RESULTS

Three hundred pregnant patients visiting the prenatal OPD from various District Mardan locations were chosen for this research. A thorough medical and pregnancy history was recorded. Three hundred women's haemoglobin levels were estimated. Two hundred

Table 1: Prevalence of anemia in the study population

Total patients	Hb level	No. of patients	Percentage
300	< 11gm/dl	230	76.6%
	>11gm/dl	70	23.3%

Table 1: Prevalence of anemia based on its severity

Group	Severity of Anemia	Haemoglobin Levels	No. of patients	Percentage
1	Mild	10.9 – 10	157	68.5%
2	Moderate	10 – 7	67	29%
3	Severe	Less than 7	6	2.5%

Grading based on WHO classification of Anemia.

Table 3: Prevalence of Iron deficiency in the study population

Category 1	S. ferritin <12ng/ml	98 women	42.6%
Category 2	S. ferritin 12-30ng/ml	100 women	43%
Category 3	S.ferritin 31-300ng/ml	27 women	12%
Category 4	S.ferrtin>300 ng/ml	5 women	2.2%

Table 4: Comparison of anemia with S.ferritin in the study population

Total Anemic Pts	230	S.ferritin<12ng/ml	S.ferritin 12-30ng/ml	S.ferritin
Mild Anemia	157	43.3% (N= 68)	19% (N= 30)	37% (N=59)
Moderate anemia	67	32.8% (N= 22)	38.8% (N= 26)	28% (N=19)

thirty of them had haemoglobin levels below 11 g/dl. According to the World Health Organisation, anaemia is defined as haemoglobin levels below 11.0 g/dL; the present research found that 76.6% of the individuals had this condition.

29% and 68.5% of the total anaemic patients had moderate anaemia. 2.5 per cent had severe anaemia. The WHO classification of anaemia is used to grade anaemia. (Table 1).

Grading based on WHO classification of Anemia.

Further tests were conducted on those individuals with haemoglobin concentrations less than 11g/dl to determine iron reserves in blood to determine the true prevalence of iron deficiency anaemia in the study population. According to the study's findings, 42.6% of participants had S. ferritin levels that were less than 12 ng/ml. Serum ferritin levels in 43% of the population were between 12 and 30 ng/ml, which indicates poor iron storage in almost half of the population. Twelve per cent had S. ferritin levels between 31 and 300 ng/ml and did not need any intervention. 2.2% had S. ferritin levels that were high—that is, >300ng/ml. (List 2)

This research established iron deficiency as the primary cause of anaemia by finding that low blood iron reserves (S.ferritn<12ng/ml) were present in 76.1% of frail women. 25% had S. ferritin levels between 12 and 30 ng/ml.83.3% of those with severe anaemia had low S. ferritin. (Table of Contents)

DISCUSSION

The single most prevalent micronutrient deficiency, i.e. iron deficiency coupled with anaemia in a pregnant woman, has serious health threats. The prevalence of IDA in developing countries, including Pakistan, remains high. According to a report from a national health survey of Pakistan, 50-60% of expectant mothers are affected by IDA.

In our area of Khyber Pakhtunkhwa, there was no indication of any research or data gathering about this serious health issue. To tackle this insignificant issue, our first goal was to determine the overall incidence of anaemia among pregnant women in District Mardan. Haemoglobin less than 11.0 g/dL was the World Health Organization's definition of anaemia. According to this research, anaemia was relatively common in these participants (76.6%); 28.5% had moderate anaemia, and 68.5% had mild anaemia. 2.5 per cent had severe anaemia. Second, the findings contrasted with those of previous research projects in Pakistan, particularly in Khyber Pakhtunkhwa.

It was shown that the frequency of anaemia was 66.6% in a research conducted in Kohat and 67.6% in a study conducted in the Karak area among pregnant women [19, 20]. Research conducted in Peshawar, Rawalpindi, Lahore, and Karachi revealed that the corresponding prevalence rates were 53%, 50%, 60%, and 54.3% [21]. However, research conducted in Hyderabad, Pakistan, revealed a relatively high frequency of 90.5% in the pregnant population, with 0.7% of pregnant women severely anaemic, 14.8% moderately anaemic, and 75% mildly anaemic [22]. In Aurangabad City, India, anaemia was present in 87.2% of pregnant women [23].

Since there isn't much information on the issue, the present research also sought to determine the common iron deficit among these anaemic individuals to examine the potential relationship between anaemia and iron deficiency. Therefore, serum ferritin levels in these anaemic participants' blood samples were evaluated. Four groups were created by categorizing the serum ferritin levels in the instances. Proactive action is needed if the level is less than 12ng/ml. Category 2 (12–30 ng/ml) still has poor iron reserves. Category 3 indicates a normal level, ranging from 31 to 100 ng/ml. Since serum ferritin is also an acute phase reactant, infections cause an increase in its level. Levels >300ng/ml were shown in Category [4].

This research demonstrated that iron deficiency is the primary cause of anaemia in pregnant women, with S. ferritin levels below 12 ng/ml in almost half of the population (42.6%). Studies conducted in the past have also shown that 50–60% of pregnant women suffer from iron deficiency anaemia [24]. In the current study, 43% had serum Ferritin in the range of 12-30ng/ml, which is a range that still signifies low iron stores. Only 12% had a normal value of S.ferritin, i.e. 31-300ng/ml.

CONCLUSION

This research concludes that iron deficiency anaemia is common in District Mardan. The present study's findings were consistent with the research conducted by other scientists in our nation. It has been noted that the causes of iron insufficiency have not changed throughout the years. The high incidence of IDA was caused by parity, short birth spacing, low socioeconomic position, and low levels of education.

In addition, it was noted that most pregnant women visited the A/N clinic in the second trimester. Thus, during conception, they were not consuming enough iron. A further significant contributing factor was found to be noncompliance with iron supplementation. Given that anaemia affects every second pregnant woman, significant improvement efforts must be implemented. Although there are national-level anaemia control efforts in almost every South Asian country, including Pakistan, the issue still exists. This research will provide the foundation for developing methods to prevent the elimination of IDA. To effectively address this issue, more than just iron and folic acid supplements are needed; a multifaceted strategy is needed. A strategy for eradicating anaemia should include dietary education and counselling, and routine assessment of haematological parameters throughout pregnancy. The focus of research should be on food fortification strategies and preventative supplements.

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