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# In district Swat Khyber Pakhtunkhwa Pakistan anemia (iron deficiency) in pregnant women of different ages as a public health problem becomes a reality

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**Abstract**
Iron deficiency, its variations and dietary effects was studied in pregnant woman of Swat District from January to September 2016. The study samples comprised of 250 pregnant women in different trimester. FBC was conducted through hem analyzer. Confirmed anemic cases were then examined for IDA with serum ferritin, serum iron, total iron binding capacity (TIBC) through Randox kit and serum transferrin saturation was estimated by formula (serum ferritin saturation =serum iron ×100/TIBC). In the first trimester 26 out of 50 women were suffering from IDA with 52% weightage of Prevalence rate (mean Hb concentration 9.602 ± 0.87 g/dl), The rates of IDA were 63.3%; (mean Hb concentration 8.48 ± 1.24 g/dl) and 54%; (mean Hb concentration 9.18 ± 1.28 g/dl), among 150 and 50 participants in the second and third trimester. Highest prevalence of anemia was found 78.2% in the age groups from 26-30 and 36-40 years in second trimester.

**Keywords:** Anemia, iron deficiency, pregnancy, serum ferritin, Northern Pakistan

## 1. Introduction
Iron is a vital constituent of hemoglobin that carries oxygen from the respiratory organ to the rest of the body through blood. Iron is essential for normal biological activities, including DNA synthesis, respiration, and cell division [1]. Hemoglobin below 11 g/dL during pregnancy is considered abnormal and anemia can be observed due to iron deficiency (ID) [2]. ID is the most globally nutritional problem and is considered at epidemic level in many developing countries [3]. About 50% of ID cases are reported due to the insufficient iron intake during pregnancy [4]. Due to fetal growth, need for iron supplementation rises in the second and third period. To meet this increased iron demand fascination in the gut is not adequate. Therefore, iron equilibrium depends on parental iron stocks throughout these stages [5]. The incidence of anemia in developed countries is 9% while in developing countries it has reached to 43% of population [6]. Anemia in early prenatal period has been related with adverse pregnancy outcomes [7]. Most common symptoms of iron deficiency anemia (IDA) are fatigue, fainting and difficulty in breathing [4]. Anemia is usually noticed in teenager mothers due to their unplanned pregnancies and the suboptimal nutrition status [8]. Infant and young children suffer from anemia are at high risk of developmental abnormalities like cognitive, social emotional and adoptive functions [9]. Prevalence of anemia is higher in those pregnant women who belong to low socioeconomic status in many parts of the world [10]. While the other group of women is teenager mothers who face high risk to their health and realize greater nutritional requirements [11]. The current study describes, that nutritional deficiencies at beginning and throughout the primary prenatal period may impact the result of the pregnancy. Moreover, pregnancy at teenage must need the required diet for mother health in addition to the nutritional desires during gestation. In addition, women belong to low income families are commonly at more risk due to insufficient intake of balanced food. The main cause of anemia is heavy bleeding during menstrual cycle and its effect is found in 9-14% women [12]. During pregnancy the increase in demand of iron occurs which leads to, increase in iron binding capacity and serum transferrin level rises [13]. The present study was conducted to find out the incidence of iron deficiency in pregnant women of Swat District; to analyze the iron variations and its dietary effects during January – September 2016.

## 2. Material and methods

### 2.1 Study area

The study was conducted in Swat District, Khyber Pakhtunkhwa (K P), Pakistan. Two maternity health clinics, Sabeel Surgical and Maternity Home (the study clinic), Shifa hospital (the control clinic) in the Saidu Sharif Swat were selected for data collection in this study. Data were collected during the period since Jan to Sep, 2016.

### 2.2 Study Population

The study contributors were mainly pregnant women. All women at pregnancy were registered for antenatal health care at the maternal health Centre within the study periods for better counseling served as the study population.

### 2.3 Data collection

Two hundred and fifty clinically positive pregnancy cases from age16 to 45 years nominated from the Swat District. Complete history collected from each patient were analyze in this study.

### 2.4 Sampling method

The study of samples comprised of 250 pregnant women in the all trimester (Total 250 cases; out of which 50 are in the 1st trimester, 150 in 2nd trimester and 50 cases are in the 3rd trimesters) classified in to different age groups.

### 2.5 Blood test

Blood sample from each woman was collected and full blood count (FBC) was conducted through Mindray BC-3000 plus hem analyzer for all pregnant individuals. Microcytic and macrocytic anemia is determined by (Diamond Diagnostics, Holliston, MA 01746, USA).Confirmed anemic individual were then examined for IDA with serum ferritin, serum iron, total iron binding capacity (TIBC) through Randox kit and serum transferrin saturation was estimated by formula (serum ferritin saturation =serum iron ×100/TIBC).

### 2.6 Statistical analysis

All experimental results were examined by statistical package for social sciences (SPSS) software database. Observations were considered statistically significant at ($p$<0.05).

## 3. Result

### 3.1 IDA during first trimester in studied population

The occurrence of IDA during first trimester in different age groups of 50 patients 26 were found anemic which constitutes 52% of the sample size. The proportion of anemic patients were found; 75, 55.5, 30, 63.6, 50 and 33.3% in age groups 16-20, 21-25, 26-30, 31-35, 36-40 and 41-45 respectively. The highest number of anemic patients was found in age group 16-20, while the lowest number was found in 21-25 group of population as shown in the (Table 1). Differences in the incidence value amongst different age groups in the first trimester were not statistically significant ($P$ = 0.32)

**Table 1:** Shows percent anemic contributions in1st trimester in population.

| Age group (years) | No. of cases (n) | Anemic (n) | Anemic in age groups (%) |
|---|---|---|---|
| 16-20 | 8 | 6 | 75% |
| 21-25 | 9 | 5 | 55.5% |
| 26-30 | 10 | 3 | 30% |
| 31-35 | 11 | 7 | 63.6% |
| 36-40 | 6 | 3 | 50% |
| 41-45 | 6 | 2 | 33.3% |
| Total | 50 | 26 | 52% |

### 3.2 IDA during second trimester in studied population

In the second trimester among 150 participants 95 were found anemic which constitutes 63.3% of the sample size shown in Table 2. The percentage of anemic patients were; 72, 39.2, 78.2, 62.5, 78.2 and 20% in age groups, 16-20, 21-25, 26-30, 31-35, 36-40 and 41-45, respectively, in population. The maximum number of patients was observed in age group 26-30, while the least number of anemic patients were in age group 41-45. Differences in the incidence value amongst the different age groups in the second trimester were statistically significant ($P$ = 0.00).

**Table 2:** Shows percent anemic contributions in 2nd trimester in population.

| Age group (Year) | No. of cases (n) | Anemic (n) | Anemic in age groups (%) |
|---|---|---|---|
| 16-20 | 11 | 8 | 72% |
| 21-25 | 28 | 11 | 39.2% |
| 26-30 | 46 | 36 | 78.2% |
| 31-35 | 32 | 20 | 62.5% |
| 36-40 | 23 | 18 | 78.2% |
| 41-45 | 10 | 2 | 20% |
| Total | 150 | 95 | 63.3% |

### 3.3 IDA during third trimester in studied population

Data shown in Table 3 represent the occurrence of IDA during third trimester. Out of 50 participants 27 were found anemic which constitutes 54% of the sample size for the third trimester. The percent number of anemic patients in third trimester were, 71.4, 63.6, 36.3, 57, 66.6 and 37.5% in age groups, 16-20, 21-25, 26-30, 31-35, 36-40 and 41-45, respectively, in population. Differences in the incidence value amongst the different age groups in the third trimester were not statistically significant ($P$ = 0.082).

**Table 3:** shows percent anemic contributions in 3rd trimester in population.

| Age group (Year) | No. of cases (n) | Anemic (n) | Anemic in age groups (%) |
|---|---|---|---|
| 16-20 | 7 | 5 | 71.4% |
| 21-25 | 11 | 7 | 63.6% |
| 26-30 | 11 | 4 | 36.3% |
| 31-35 | 7 | 4 | 57% |
| 36-40 | 6 | 4 | 66.6% |
| 41-45 | 8 | 3 | 37.5% |
| Total | 50 | 27 | 54% |

### 3.4 Microcytic, macrocytic and normocytic anemia in our studied population

After finding the percent ratio of anemic patients in different trimesters next, we found out the ratio of different types of anemia in affected population. The data shown in Table 4 represented the occurrence of microcytic anemia (80.2%), macrocytic anemia (14.9%) and normocytic anemia (4.9%) in 148 anemic pregnant women of different age group belongs to different region of Swat District. In first trimester the number of patients; 73.0, 7.5, and 19.5% were found micro-, macro- and normocytic, respectively. In the second trimester it was 85.5, 3.5 and 11.5%; micro-, macro- and normocytic, respectively. In 3rd trimester number of patients was similar to the first group except only 2.8% increase in normocytic anemia.

**Table 4:** Microcytic, macrocytic and normocytic anemia in different trimester

| Trimester | No of cases | Anemic | Microcytic anemia | Macrocytic anemia | Normocytic anemia |
|---|---|---|---|---|---|
| 1st Trimester | 50 | 26 | 19 (73%) | 2 (7.5%) | 5 (19.5%) |
| 2nd Trimester | 150 | 95 | 81 (85%) | 3 (3.5%) | 11 (11.5%) |
| 3rd Trimester | 50 | 27 | 19 (70.3%) | 2 (7.4%) | 6 (22.3%) |
| Total | 250 | 148 | 119 (80.2%) | 7 (4.9%) | 22 22 (14.9%) |

### 3.5 Classification of IDA severity in studied population

Severity of IDA was classified into severe and moderate groups on the basis of serum ferritin level. The patients suffered from moderate IDA were 61.5, while 38.5% were found with severe level data showed in (Table 5).

**Table 5:** Distribution of anemia on the bases of severity of ID.

| Severity | No of anemic patient (n) | Percentage (%) |
|---|---|---|
| Moderate serum ferritin 8-12 µg/L | 91 | 61.5% |
| Severe serum ferritin < 8µg/L | 57 | 38.5% |

### 3.6 Mean and standard deviation of blood variable during pregnancy

The lowest occurrence was observed in the first trimester (52%; mean Hb concentration 9.602 ± 0.87 g/dl), the high incidence were found in the second trimester (63%; mean Hb concentration 8.48 ±1.24 g/dl), while in the third trimester (54%; mean Hb concentration 9.18± 1.28 g/dl). The mean, SD of all Hb, serum ferritin, serum iron, TIBC, transferrin saturation, MCV and MCH were calculated (Table 6).

**Table 6:** Evaluation of pregnant women categorized by trimester of pregnancy with deference to Hb, serum ferritin, serum iron, TIBC, transferrin saturation, MCV and MCH in anemic and non-anemic pregnant women.

| | First trimester | | | | Second trimester | | | | Third trimester | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Anemic | | Non Anemic | | Anemic | | Non Anemic | | Anemic | | Non Anemic | |
| Variable | Mean | SD | Mean | SD | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| Hbgm/dl | 7.8 | 1.1 | 11.1 | 0.7 | 7.3 | 0.9 | 11.9 | 1.0 | 7.2 | 1.1 | 11.4 | 0.5 |
| serum ferritin | 10.4 | 10.5 | 68.8 | 18.5 | 8.4 | 7.0 | 63.2 | 16.4 | 17.3 | 25.4 | 71.4 | 21.6 |
| Serum iron | 39.4 | 10.5 | 98.8 | 18.5 | 38.4 | 7.0 | 93.2 | 16.4 | 47.3 | 25.4 | 101.4 | 21.6 |
| TIBC | 232.2 | 10.5 | 290.5 | 18.5 | 230.1 | 7.0 | 284.9 | 16.4 | 239 | 25.4 | 293.1 | 21.6 |
| Transferin saturation | 17.2 | 3.2 | 33.7 | 4.6 | 16.6 | 2.0 | 32.4 | 3.5 | 19 | 7.3 | 34.1 | 5.9 |
| MCV | 59.3 | 10.9 | 82.6 | 13.0 | 59.5 | 11.7 | 79.4 | 6.6 | 64.9 | 11.6 | 79.7 | 6.0 |
| MCH | 16·3 | 1.9 | 17.1 | 3.0 | 17.9 | 2.8 | 26.2 | 2.8 | 16.4 | 1.4 | 17.8 | 1.7 |

## 4. Discussion

The present study described that imbalance diet and lack of iron supplementation in pregnancy or in daily routine life develops the risk of IDA. The total amount of iron required during pregnancy in a women of 55-kg is nearly about 1040 mg [14].High incidence rates of IDA with 75, 72, and 71% in different trimesters (1st, 2nd and 3rd); in 16-20 age group indicated the poor diet quality of pregnant women living in Swat District. Anemia is the second prominent cause of parental death in Asia, about 12.8% of death is caused by postpartum hemorrhage [15]. Previously, enough information is not available on IDA during pregnancy in Swat District, to use as reference. The total cases of anemic patient is highest in low/ mid income countries (LMIC) of the world it is also continues to be a huge problem of high income countries [16].However, the majority of people in district Swat use vegetables as a major diet, and most of them have poor economic status who cannot afford balanced healthy meal. During pregnancy, anemia is linked to poor outcomes including preterm delivery, infants with poor iron storage and infant with low birth weight [17].Another contributing factor showed responsible for IDA is no iron supplements intake in about half of the studied population. Typical deficiency of iron throughout pregnancy has harmful effects on perinatal and as well as on maternal health [18]. The higher rank of anemia is found in developing world where its factors are numerous [19]. Pregnant women using Iron supplementations seem to be more protective from severe IDA. It has been estimated that nearly all the pregnant, lactating women, half of the young age women or bearing child age and about 30% mature men in Pakistan suffer from anemia [20].

In our study the highest prevalence of the anemia was found, 75% in age group of 16-20 years in the first trimester reflected the lack of regular medical checkup for young married women. Maximum iron transmit to the fetus after fourth month of pregnancy which show high prevalence of parental iron absorption [21].Iron loss in fertile women is due to menstruation, breast feeding and pregnancy [22]. Most of patients 16-20 year old who visited clinics after feeling sever fatigue and body pain was found pregnant. The risk of mortality rate is increased due to severe anemia at the time of delivery and as well as at perinatal period [23]. Similarly, the highest occurrences of anemia were found 78.2% in the age from 26-30 years followed by 78.2% in the age group 36-40 years compared to the other age groups in the second trimester. In pregnancy iron requirements are increased, especially in the 3rd trimester, during pregnancy the net iron requirements are 840 mg approximately [24].The occurrences of microcytic, macrocytic and normocytic anemia are 80.2%, 14.9% and 4.9% in population of 250 pregnant women of different age group belong to different region of Swat District. Awareness about the relationship between unbalanced diet and health issue are strongly suggested in studied areas.

## 5. Conclusion

The present study shed light on IDA status among women who attended health care center, and were identified pregnant, in Swat District. High incidence of anemia in our study population remains a warrant for a deep study to determine further risk factors. This study also provides a base for the nutritional interference act programs focused in the direction of expectant women to combat IDA. In the current study the prevalence of IDA in third trimester is lower as compared to the first and second trimester. The reason for decline of IDA is possibly frequent clinic consultations. In addition, taking iron and other supplements during last stages of gestation and better care possibly reduced the chances of IDA.

## 6. Recommendation

Health care centers in Swat District need to focus on the importance of iron supplementation and balance diets for pregnant and lactating mothers. In our study, high incidence of anemia in population gives directions for further investigations to determine the risk factors. Although the adopted policy regarding primary health care looks to be well scheduled and built on international approvals.

## 7. Acknowledgment

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## 8. Conflict of interest

All authors are agreed upon all the section of this research article and there is no conflict of interest.

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