

## Research Article

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# Hematological profile and risk factors associated with pregnant women anemia in District Lower Dir, Pakistan

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### Abstract

Anemia in pregnancy is a common clinical problem throughout the world contributing to increased morbidity and mortality in both mother and fetus. Lower Dir is a less developed area of Pakistan which need exploration of pregnant women anemia. The current study aimed to estimate the prevalence of iron deficiency anemia among pregnant women of district Dir Lower, Khyber Pakhtunkhwa Pakistan. A total of (454) samples containing (3cc) blood from each pregnant women of different ages were collected randomly and stored in EDTA tube, giving ID and socio-demographic factors recorded in designed questioner between October 2018 to April 2019. Collected samples were brought to Department of Pharmacy, University of Malakand for further laboratory test. Hematological test of each sample were performed by using automatic hematological analyzer machine and the results of collected data was analyzed by using MS-Excel 2016 and SPSS version 22 were used for statistical analysis. P value <0.05 were consider statistically significant. In the present study the overall prevalence of pregnant women anemia was found (45.37%) with high incidence in Timergara (52.83%) and Samar Bagh (51.85%). In socio-demographic factors, high prevalence rate in age of 20-35 were found (64.15%), in poor financial status (65.21%), labor occupation of husband (53.60%), 2<sup>nd</sup> trimesters (59.25%) and in educational level, illiterate pregnant women (74.48%) were occurred in pregnant women of study area. Risk factors like area, financial status, trimester and educational level were found statistically (<0.05) while age and husband occupation were found statistically (>0.05). M ± SD of all Hematological tests like Hb, HCT, MCH, MCHC, MCV, PLT and WBC were found less than ideal range. From this study, it was concluded that pregnant women of study area are highly affected by anemia which need improvement in socio-demographic factors, women education, balance diet with rich nutrients and awareness of women to elevate anemia during pregnancy.

**Keywords:** Anemia; Hematological profiles; Iron deficiency; Lower Dir; Pregnancy; Risk Factors

## Introduction

Globally anemia is the most common public health problem which affected 1.62 billion people with 24.8% pregnant women throughout the nations [1]. According to World Health Organization (WHO), level of Hemoglobin less than 11 g/dl, less than 10.5 g/dl by Quality Assurance in Primary Health Care Manual during pregnancy and less than 10 g/dl by the US Preventive Service Task Forces considered as anemia in pregnant women [2]. Anemia is a condition in which the number of red blood cells (RBCs) and thus hemoglobin (HGb) level decreases below the normal range resulting in inadequate capability of blood to transport oxygen in the body tissues [1]. In developing countries, severe morbidity and mortality cases found in pregnant women due to anemia which have no symptoms but in severe conditions, anemia is related with signs like weakness, fatigue, loss of normal color in the skin, lips, tongue and nails, dizziness and drowsiness. In Asian countries, about 12.8% deaths occur immediately after birth due to anemia [3]. Death due to anemia have three reasons like, extreme blood loss during or after birth, decreased resistance to infection and heart failure due to hemoglobin level of less than 4 g/dl particularly during delivery or soon after which lead death [4]. Deficiency of iron during pregnancy is responsible for about 95% anemia, which increasing the demand of iron. During the first half of pregnancy, iron requirement may not increase significantly and iron intake of 10–15 mg/day from food is sufficient to cover the basal loss of 1 mg/day. However, in the second half of pregnancy, iron requirements increase owing to an expansion of red blood cell mass and rapid growth of the fetus. Increased number of red blood cells and higher hemoglobin mass require about 500 mg irons. The iron requirement of the fetus on average is 300 mg. Thus, the total amount of iron necessary over the course of a

normal pregnancy is approximately 800 mg. This cannot be supplied in the diet, and iron supplementation is a must [1]. Sufficient uptakes of food and nutrition supplement are important to avoid anemia in pregnant women. Anemia due to decreased RBCs may be caused by malnutrition or lack of micronutrients that are essential for synthesis of RBCs. The malnutrition defined by World Food Program (WFP) as "a state in which due to multiple micronutrient deficiencies the normal body processes such as recovery and resistance to diseases, physical work, lactation, pregnancy and growth may not be sustained for a longer period of time." [3]. Anemia is a major global public health alarm. According to (WHO) the highest percentage of people affected are from Sub-Saharan Africa and Southeast Asia [5]. It affects all age and sex-groups with highest prevalence of 43% and 38% occurring among under age of 5 in children and pregnant women respectively [6]. This shows that although anemia attacks all global population. The children and pregnant women are the most susceptible groups that become easily affected. Anemia has a multi-factorial etiology among which iron deficiency is its most common cause [7]. Iron is an essential element for many biochemical processes such as electron transport chain reactions, gene regulation, oxygen transport and regulation of cell growth and differentiation. Oxygen is mainly bound to hemoglobin within the red blood cells or as catalyst of oxygen diffusion in tissue. Iron becomes deficient in the body when there is long term negative iron balance because of the insufficient dietary iron intake and absorption in the body, increased demand for iron during pregnancy and growth periods, increased iron loss during menstruation, chronic illnesses and infections [8]. Pregnancy is considered as the most important and exclusive periods of women's life cycle. Though it is quite a period of fulfillments and expectations, but it

is a stressful period because many anabolic activities take place and fetal development is almost completed resulting in widespread changes in maternal body composition and metabolism [9]. Due to insufficient availability of proper diet like iron etc., anemia is the most common disease in pregnant women of Pakistan. During this phase many physiological changes occur in the body, such as decrease in blood hemoglobin (HGb) level and hormonal changes, even in normal pregnant women with increase in circulating blood's volume, the level of hemoglobin decreases which results in dilution [10]. There are many symptoms that illustrate the link among preterm delivery, maternal iron deficiency anemia and low birth weights, which may be due to increased peripartum blood loss and placental abruption. The deficiency of many micronutrients like iron can affect cognition between placenta and fetus, reproductive performance and growth of baby. During pregnancy about 50% of Iron deficiency cases are reported due to the insufficient iron intake [11]. In Pakistan, Anemia prevalence in married but non pregnant women (15-44-year-old) in rural and urban areas was 47% and 26% respectively. In pregnant women,

the percentage is same (29-50%) in urban area. Socio-Demographic factors are strongly associated with cause of anemia in pregnancy. No literature is available on pregnant women anemia at Dir Lower. So, the present study was carried out to evaluate the socio-demographic factors associated with anemia in pregnancy.

## Materials and Methods

### Study Area

District Lower Dir is located between 34°-37' to 35°-07' North latitude with 71°-31' to 72°-14' East longitude which spread on a range of 1583 squares kilometer, divided into seven Tehsils (Fig. 1). The boundaries of District Lower Dir are attached with District swat on it East, Afghanistan is on it West, Chitral and Upper Dir is on it North and north-west correspondingly and Bajaur Agency and Malakand is on it South. Moderate and warm season in District Lower Dir is summer season and the hottest months are June and July. In January mean maximum and minimum temperature recorded as 11.22°C and -2.39°C respectively while in the month of June, the record of maximum and minimum temperature are 32.52°C and 15.67°C respectively and in march maximum rainfall 242.22 mm has been recorded [12].



Figure 1. Map of study area (Lower Dir) in red circle (Source google).  
Sample collection

Randomly 454 blood samples were collected from pregnant women of Lower Dir between October 2018 to April 2019, were engaged for the analysis with informed permission, for each pregnant woman, husband and their home elder in case of inconsequential included in the study. The 3ml blood samples were collected from the antecubital vein of the pregnant women by using of simple sterilized 5cc syringes 3cc blood sample was taken by puncturing the vein and keep in EDTA to prevent from clotting. The blood samples were labeled with questioner ID corresponding and put the socio-demographic record in designed questioner containing area, age, financial status, husband occupation, trimesters, educational background. All collected data were kept secret and samples were transported to Hematology Lab, Department of Pharmacy, University of Malakand, Pakistan for test within 24 hours.

#### **Laboratory tests**

Complete blood count (CBC) test congaing count of Hemoglobin (Hb), Hematocrit (Hct), MCHC (Mean Corpuscular Hemoglobin Concentration), Red Blood Cells (RBCs), White Blood Cells (WBCs) and count of Platelet were done by using automatic hematological analyzer machine (BC 3000 Plus Auto hematology analyzer, MINDRAY: Bio-medical Electronics company Ltd., Shenzhen China) and recorded in each questioner.

#### **Statistical analysis**

Prevalence were calculated by dividing positive sample on total and multiplying by hundred. Data were further organized and  $M \pm SD$  calculated by MS-Excel 2016. SPSS software was used for comparison.

#### **Results**

In this study randomly 454 pregnant women were included for evaluation of different socio-demographic factors related with pregnant women anemia in which 206 cases were found anemic. Pregnant women anemia in Lower Dir were found (45.37%). In tehsils, the prevalence of anemia was recorded Adenzai (38.88%), Timergara (52.83%), Balambat (34.37%), Munda (47.72%), Samar Bagh (51.85%), Lal Qila (37.5%) and Khal (44.82%). In different socio-demographic factors, like age below 20, the prevalence rate of anemia was found (37.83%), between age of 20-35 (64.15%) and age >35 (25%) anemic cases were recorded. In financial status, high prevalence rate was occurred in poor people with (65.21%), good (24.67%) and middle (41.37%) (Table 1). In regard of husband occupation, incidence of anemia in government employ (37.09%), business man (41.17%) and in labor occupation (53.60%) were occurred. In different phases of pregnancy, the prevalence rate of anemia was 1<sup>st</sup> trimesters (47.76%), 2<sup>nd</sup> trimesters (59.25%) and 3<sup>rd</sup> trimesters (13.46%) anemia was recorded. In educational level, illiterate (74.48%), intermediate (25.58%) and Bachelor-Master (18.6%) anemic cases were observed in pregnant women (Table 2). In hematological test, the overall mean of Hb,g/dl concentration in the study population was  $8.23 \pm 2.15$ , while mean HCT level was  $34.76 \pm 7.92\%$ , mean WBC count was  $5.85 \pm 4.73 \times 10^9$ , mean PLT count was  $356.82 \pm 137.92 \times 10^9$ , MCV was  $69.37 \pm 10.87$  FL, MCH was  $25.11 \pm 3.61$ pg, and MCHC was  $29.83 \pm 10.47$  g/dL (Table 3).

**Table 1. Risk Factor like Area, Age and Financial status wise prevalence of anemia in pregnant women in Lower Dir, KP, Pakistan**

Risk Factor	Examined Samples	Anemic Cases	Prevalence	P-Value
Area	(n=454)	(n=206)	(%)	
Tehsil Adenzai	36	14	38.88	0.0003*
Tehsil Timergara	106	56	52.83	
Tehsil Balambat	64	22	34.37	
Tehsil Munda	88	42	47.72	
Tehsil Samar Bagh	54	28	51.85	
Tehsil Lal Qila	48	18	37.5	
Tehsil Khal	58	26	44.82	
<b>Age</b>				
<20	74	28	37.83	0.0314ns
20-35	212	136	64.15	
>35	168	42	25	
<b>Financial status</b>				
Good	154	38	24.67	0.0000*
Middle	116	48	41.37	
Poor	184	120	65.21	

\*mean p-value is significant; ns mean p-value is not significant

**Table 2. Risk Factor like Husband Occupation, Trimesters and Educational Level wise prevalence of anemia in pregnant women in Lower Dir, KP, Pakistan**

Socio-Demographic Factors	Examined Samples	Anemic Cases	Prevalence (%)	P-Value
Husband Occupation	(n=454)	(n=206)		
Government Employ	124	46	37.09	0.1482ns
Business Man	136	56	41.17	
Labor	194	104	53.60	
<b>Trimesters</b>				
1 <sup>st</sup> Trimesters	134	64	47.76	0.0001*
2 <sup>nd</sup> Trimesters	216	128	59.25	
3 <sup>rd</sup> Trimesters	104	14	13.46	
<b>Educational Level</b>				
Illiterate	196	146	74.48	0.0000*
Intermediate	172	44	25.58	
Bachelor-Master	86	16	18.6	

\*mean p-value is significant; ns mean p-value is not significant

**Table 3. Hematological profile showing anemia during pregnancy in women of Lower Dir, KP, Pakistan**

S. No.	Test Names	Overall M ± SD
1	Hb,g/dl	8.23 ± 2.15
2	HCT, %	34.76 ± 7.92
3	WBC count, ×10 <sup>9</sup>	5.85 ± 4.73
4	PLT count, ×10 <sup>9</sup>	356.82 ± 137.92
5	MCV, FL	69.37 ± 10.87
6	MCH, pg	25.11 ± 3.61
7	MCHC, g/dL	29.83 ± 10.47

**Abbreviations:** Hb, hemoglobin; HCT, hematocrit; MCH, mean corpuscular hemoglobin; MCHC, mean corpuscular hemoglobin concentration; MCV, mean cell volume; PLT, platelet; WBC, white blood cell.

## Discussion

Pregnant women anemia cases mostly occurring in Obstetrics and Gynecological unit which is directly associated with socio-demographic factors. So, current study was conducted to evaluate the pregnant women anemia in District Lower Dir. In present study the prevalence rate of pregnant women anemia was recorded (45.37%). Similarly, the reported results from other district of Pakistan like in Karak (67.6%) prevalence rate of anemia in Kohat (66.6%) and Peshawar showed the prevalence rate (53.0%) [13]. The reported percentage of anemia inconsistency may be due to differences in life style while lower rate of pregnant women anemia in District Lower Dir may be due to availability of balance diet and the use of milk and dairy product because most of the people of Lower Dir keep cattle in their homes for food requirement which are highly rich all aspects of nutrients.

Among all tehsils, high prevalence rate of pregnant women anemia was recorded in Timergara (52.83%) and Samar Bagh (51.85%) as compared to Balambat (34.37%), Lal Qila (37.5%), Adenzai (38.88%), Khal (44.82%) and Munda (47.72%). High prevalence rate in Timergara and Samar Bagh may be due to migration of people from less develop hilly areas to cities and may be due to marriages in young stage of life which may lead anemia in pregnant women while other tehsils like Balambat, Lal Qila, Adenzai, Khal and Munda show lower rate of anemia during pregnancy. Low anemic occurrence may be due to the availability of pure food and balance diet in these areas. Most of the people of these tehsils eat simple food as compared to cities people which may commonly feed fast food. In age wise prevalence, pregnant women anemia was recorded higher in age of 20-35 which was (64.15%) as compared to age

below 20 years and >35 years. Our finding is strongly in line with the results of [14] who reported (60%) prevalence rate in District Mardan. High prevalence rate of anemia in pregnancy between age of 20-35 may be due less care and attention during young stage and the lack of regular medical checkup for young married women.

The most important socio-demographic factor related with pregnant women anemia was financial status which illustrate high prevalence rate in poor people with (65.21%) as well as good (24.67%) and middle (41.37%). This is similar to the study done in District Karak where (68%) of anemic pregnant females belonged to poor financial status [14]. Most of the people of study area belong to poor families and may lead anemia during pregnancy. The reason for this high prevalence might be due to our greater sample size from the poor families who approached ANC while most of the poor families remain deprived of such health facilities.

In regard of husband occupation, high incidences of anemia in labor occupation (53.60%) were occurred as compared to government employ (37.09%) and business man (41.17%). Which show that labor occupation families more affect then government employ and business man. Labors people mostly work out of his cities and due to less care in such family's cause anemia in pregnant women. Beside this, government employ and business man have social awareness and give full attention to their family health issues.

The prevalence rate of anemia in 2<sup>nd</sup> trimesters (59.25%) were found high as compared to 1<sup>st</sup> trimesters (47.76%) and 3<sup>rd</sup> trimesters (13.46%) anemia was recorded. Our result is in line with the reported result of [10] and presented (61.3%) prevalence rate while less prevalence rate was reported by [4]

who illustrated high prevalence rate of anemia in 2<sup>nd</sup> trimesters (45.7%). The fact that every 2<sup>nd</sup> pregnant woman is anemic requires some serious measures to be taken towards improvement. This study also reflected that most of the women were multi gravida, while some having their first pregnancy. High prevalence rate of anemia may be due to less attention and lack of knowledge about healthy diet during pregnancy. Difference in the prevalence rate may be due to difference in sample size and methodology which can lead variability in results. But our finding in contrast from the reported result of [8] who represent the prevalence of anemia among pregnant women in third Trimester (46.0%), in second (41.8%) and in first Trimester (26.5%). These differences may be due to age, health status and differences in healthy diet and rich nutrient supplement.

In educational level wise prevalence, the percentage of anemia in pregnant women were found in illiterate (74.48%) then intermediate (25.58%) and Bachelor-Master (18.6%) anemic cases were observed in pregnant women. High prevalence rate of anemia during pregnancy were also reported by [9] in Aurangabad City, India which was higher in illiterate women (96.4%), intermediate (94.8%) and Bachelor-Master (91.5%) women respectively while the anemia percentage among illiterate women (53.7%) was most common as compared to literate women (37.1%) in Jima town Southwestern Ethiopia [7]. These differences in results may be due lack of education in some areas and countries but it may be due some other socio-demographic factors like age, financial status of family and awareness etc.

The blood profile of pregnant women illustrates that most of the women have anemia and mean Hb, g/dl  $10.23 \pm 2.15$  which is not sufficient for the transportation of oxygen during pregnancy and may can cause

serious health issue because (12.0 to 15.5 gram per deciliter) hemoglobin level are required for healthy life. while mean HCT level was ( $34.76 \pm 7.92\%$ ) in our study represent low range of HCT level while normal level of HCT for women is (37%-48%).

### Conclusion

From the current study it can be concluded that the pregnant women of District Lower Dir is highly prevalent (45.37%). As compare to other tehsil, Timergara (52.83%) and Samar Bagh (51.85%) were found highly effected. Socio-demographic factors like age, financial status, husband occupation, trimestral and education level are strongly associated with pregnant women anemia. The Government needs to take solid steps to improve the quality of education and socioeconomic status of females, increase the number of health care providers and intensify public education. Health behavior's need to be changed and adherence to the prescribed programs by the government is needed. Providing long term iron supplementation and dietary modification starting from adolescence may improve the hemoglobin levels and later on prevent anemia in pregnancy.

### Authors' contributions

Conceived and designed the experiments: A Irshad, A Shad, MF Khan, S Noreen & M Shah, Performed the experiments: A Irshad Analyzed the data: A Irshad & N Aksar, Contributed materials/ analysis/ tools: S Tabassum, W Khan & M Irshad, Wrote the paper: A Irshad, U Sajid & S Yasmin.

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