Prevalence of Anemia in The Antenatal Population of Dera Ismail Khan, Pakistan

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Abstract

Regardless of age or gender, anaemia is one of the most common health issues worldwide and has detrimental effects on human health. Women and children are more likely to acquire anaemia, and women who are of reproductive age are often more at risk. The majority of pregnant women suffer from anaemia. Anemia-related maternal death rates are estimated to be between 34/100,000 in Nigeria and 194/100,000 in Pakistan. At DHQ Zanana Hospital in D.I. Khan, a cross-sectional study was carried out. All pregnant patients receiving prenatal care at DHQ Zanana Hospital were included in the study population. Pregnant women's blood samples were collected to measure the haemoglobin levels and determine the prevalence of anaemia. This study included 551 pregnant women who were receiving prenatal treatment. According to the findings, 99% of the 551 pregnant women who went in for a prenatal screening had anaemia. During the study period, the majority of pregnant women had mild anaemia (57.6%) to moderate anaemia (41.4%). Just 0.5% of the expectant mothers had severe anaemia. The current study suggests that anaemia during pregnancy in D.I. Khan is a very important health issue. Mild to moderate anaemia affected the majority of women who went for prenatal checkups during the research period.

Keywords: Anaemia, Pakistan, Pregnant women, Hospital

1. Introduction

Anemia is one of the common nutritional deficiencies that affects more than a quarter of the world's population. "A condition in which blood does not have enough healthy red blood cells or hemoglobin, this condition is known as anemia" (Edwin et al., 2024). When anemia occurs, the person's blood has a hemoglobin content lower than normal for a person's age, gender, and environment (Hailu et al., 2019; Nurnaningsih et al., 2022). It is one of the major health problems around the globe, which has serious consequences on human health, irrespective of age and gender (Nyarko et al., 2023). Children and women are at a greater risk of developing anemia, and most commonly the women of reproductive age are more at risk (Delil et al., 2018). Anemia affects most women during pregnancy (Geta et al., 2022). Globally, the estimate of the prevalence of anemia is 47% in children aged more than 5 years, and 30% in non-pregnant women aged 15-49 years, and in pregnant women, the estimate is about 42%. High-risk groups in Asia and Africa account for about 85% of absolute anemia (Cane et al., 2022; Pohan, 2022).

During pregnancy, many physiological changes occur in a woman's body as the fetus grows inside the mother's uterus and obtains nutrients for growth from the mother's body throughout the nine months until birth (Dutta et al., 2023; Liyew et al., 2021; Mahmudiono et al., 2022). This is a natural process that starts at the eighth week of gestation and continues until the 32nd to 34th week of gestation (Kassa et al., 2017). According to the WHO criteria, the minimum hemoglobin level during pregnancy should be 11g/dl (Adilah et al., 2023; Kefiyalew et al., 2014). Anemia during pregnancy is further divided into mild anemia (hemoglobin level ranges from 10-10.9g/dl), moderate anemia (hemoglobin level ranges from 7.0-9.9g/dl), and severe anemia (hemoglobin level < 7) (Joshi et al., 2023). According to the World Health Organization, anemia was the major root of disease in women and girls in developing countries in 1993 (Berhe et al., 2019). According to the estimates, the rates of maternal mortality due to anemia range from 34/100,000 in Nigeria to 194/100,000 in Pakistan (Dodzo et al., 2022; Um et al., 2023).

Anemia involves the actual decrease of red blood cell volume, either due to loss of RBCs in bleeding, or it can also occur when the destruction of red cells occurs because of malaria, UTI (urinary tract infection). Nutritional deficiencies like iron, folic acid, and vitamin B12 deficiency also contribute to absolute anemia (Aznam & Inayati, 2021; Mbule et al., 2013). The deficiency of vitamin B12 may not be an identified factor for anemia in sub-Saharan Africa because the dietary plans of this population mainly depend on grains, and many people have a

very less intake of foods from animal origin, which are the main sources of vitamin B12 (Dewi et al., 2022).

Anemia during pregnancy can sometimes be asymptomatic. In order to detect anemia, some routine investigations are required during pregnancy to determine the level of anemia, the type of anemia and the symptoms of anemia. Symptoms of anemia are usually not specific; feeling tired is the most common symptom (Gibore et al., 2021; Taj et al., 2021). Other common symptoms of anemia include weakness, fatigue, and increased heart rate (palpitation). Women also feel lethargic, swelling on the hands and feet occurs and color becomes pale (Ahmad et al., 2022, 2023; Ahmed et al., 2024; Al Mohaini et al., 2022; Fatima et al., 2020; Fatima, Malkani, et al., 2021; Fatima, Muzammal, et al., 2021; Hayat et al., 2023; Mohaini, Farid, Muzammal, et al., 2022; Muzammal, Ahmad, et al., 2021; Muzammal, Ali, et al., 2021; Muzammal et al., 2024; Muzammal, Firoz, et al., 2022; Muzammal, Khan, Mohaini, et al., 2022). Indigestion and inflammation of the mucous membrane of the mouth (stomatitis) are also symptoms of anemia (Abriha et al., 2014; Susmita et al., 2023).

Women with mild anemia may have HB levels ranging from 10-10.9g/dl. Women with moderate anemia have Hb levels ranging from 7.09.9g/dl. Women with severe anemia face many difficulties during pregnancy (Al Hawaj et al., 2022; Ayaz et al., 2023; Gul et al., 2021; J. Alsalman, Farid, Al Mohaini, A. Al Hawaj, et al., 2022; J. Alsalman, Farid, Al Mohaini, Muzammal, et al., 2022; Khan et al., 2022; Mohaini, Farid, Alsalman, et al., 2022; Muzammal, Ali, et al., 2022; Muzammal, Di Cerbo, et al., 2022; Muzammal et al., 2019; Muzammal, Khan, Fatima, et al., 2022; N. Alhashem et al., 2022; Ullah et al., 2023). Increased heart rate and short breathing are the symptoms of severe anemia (Abid et al., 2022; Ali et al., 2022; Hussain et al., 2022). An Hb level below 7 is considered severe anemia. Severely anemic women may not be able to survive excessive blood loss during pregnancy or labour, which may lead to death (Karami et al., 2022; Pusporini et al., 2021; Sunguya et al., 2021).

The present study aimed to categorize the prevalence of anemia among antenatal females of Dera Ismail Khan who visited the hospital for checkups during pregnancy. A study was used to assess the different parameters affecting the hemoglobin levels of antenatal females and the severity of anemia caused by those factors.

2. Methodology:

A cross-sectional study was conducted at DHQ Zanana Hospital, D.I.Khan. The study population included all the pregnant women who were attending the antenatal care at DHQ Zanana Hospital. The study was carried out from June 2024 to August 2024.

2.1.Clinical History:

A questionnaire form was developed to obtain patient history and other clinical details.

2.2.Sample Collection:

Blood samples of pregnant women were taken to check the prevalence of anemia by testing the subsequent hemoglobin levels. 5 ml of blood was taken in an EDTA tube for processing.

2.3.Sample Processing:

The chemical analyzer method was used to determine hemoglobin concentration. 10 microlitres of blood were added to the test tube. 2.5 microlitre Hb reagents were added to the tube containing the blood sample. The mixture was then allowed to stand for 5 minutes until the color of the solution had changed. When the color turned light purple, the solution was loaded into the chemical analyzer with the help of a small tube connected to the analyzer. A small tube from the analyzer was dipped into the solution containing the test tube, and the analyzer received the particular amount of sample to be tested for Hb level.

Before loading the solution, a few drops of water were loaded into the analyzer in order to wash the residues of the previously tested sample. Then the test for Hb level was selected on the screen of the chemical analyzer. After 5 minutes, the result of the Hb level was shown on the screen, and the reading was noted.

2.4.Data Analysis:

Data collected from the patients was analyzed using the Microsoft Excel program.

3. Results:

A total of 551 pregnant women were enrolled in this study, who were attending antenatal care. History was collected from the patients through a questionnaire to check the effect of selected variables on anemia.

3.1.Effect of Trimester on Anemia

Out of 551 patients, pregnant women who appeared in the 1st trimester were 67, among whom 47(70.1%) were mildly anemic and 20(29.8%) were moderately anemic. There was no case of severe anemia in the 1st trimester, and also no woman appeared with a normal Hb level, i.e., 11gm/dl or more.

There were a total of 245 pregnant women who appeared in the 2nd trimester; 144(58.7%) were mildly anemic, 95(38.7%) were with moderate anemia, and 3(1.2%) patients had severe anemia. 2(0.8%) women were having normal Hb levels. 239 women were in their 3rd trimester, 124(51.9%) had mild anemia and 113(47.2%) were with moderate anemia. No

case of severe anemia was reported in the 3rd trimester. 2(0.8%) women had normal Hb levels during their last trimester (Table 1).

Table 1: Data revealed that the majority of the women who appeared in the 1st, 2nd and 3rd trimester had mild anemia.

Trimester	Anemia (n)%				Normal (n)%	Total (n)
	Mild	Moderate	Severe	Total		
1st	47 (70.1)	20 (29.8)	0	67	0	67
2nd	144 (58.7)	95 (38.7)	3 (1.2)	242	3 (1.2)	245
3rd	124 (51.9)	113 (47.2)	0	237	2 (0.8)	239

3.2.Effect of meat consumption on Hb level

Data was also collected from patients about their meat consumption per week during pregnancy. 185 women reported their meat consumption as 1 time per week, among which 104 (56.2%) had mild anemia, and 80(43.2%) had moderate anemia. No case of severe anemia was present in the women taking meat 1 time per week. 1 patient had a normal Hb level. Women consuming meat 2 times per week were a total of 222 out of 551 patients, among whom 122(54.9%) were suffering from mild anemia, 95(42.7%) were moderately anemic, and 2(0.9%) had severe anemia. Only 3(1.3%) patients had normal Hb levels while taking meat 2 times per week. Women having no meat consumption during their pregnancy were 144, 89(61.8%) were mildly anemic, 53(36.8%) had moderate anemia, and 1(0.7%) was suffering from severe anemia. 1(0.7%) pregnant woman had a normal Hb level (Table 2).

Table 2: Shows anemia does not totally rely on the meat consumption

Meat consumption (Per week)	Anemia (n)%				Normal (n)%	Total (n)
	Mild	Moderate	severe	Total		
1 time per week	104 (56.2)	80 (43.2)	0	184	1 (0.5)	185
2 times per week	122 (54.9)	95 (42.7)	2 (0.9)	219	3 (1.3)	222
No meat consumption	89 (61.8)	53 (36.8)	1 (0.7)	143	1 (0.7)	144

3.3.Effect of age on Hb levels during pregnancy

Women were divided into 6 age groups, and the prevalence of anemia was checked in each group separately. In the age group less than 20 years, a total women were 51, of which 32(62.7%) had mild anemia, 19(37.2%) were moderately anemic, and no case of severe anemia was present in this age group. In the age group 20-24 years, a total of 119 women were present,

of whom 71(59.6%) were suffering from mild anemia, and 46(38.6%) had moderate anemia. Only 2(1.6%) had normal Hb levels. In the age group 25-29 years, a total of 169 women were present, among whom 93(55.0%) were mildly anemic, 73(43.1%) had moderate anemia, and 3(1.8%) women had severe anemia.

While in the age group 30-34 years, 107 women were present, 84(78.5%) had mild anemia, 23 (21.4%) had moderate anemia, and no woman with severe anemia was present in this age group. In the age group of 35-39 years, a total of 59 women were present, who visited for antenatal checkup; 34(57.6%) had mild anemia, and 23(38.9%) patients had moderate anemia. 2(3.4%) patients were reported as having no anemia. In the age group of 41-45 years, only 6 patients were reported, among which 3(50%) were mildly anemic, 2(33.3%) had moderate anemia, and 1(16.6%) patient was with normal Hb level (Table 3).

Table 3: Shows age-group-wise distribution of anemia

Age (years)	**Anemia (n)%**				**Normal (n)% Total (n)**	
	Mild	**Moderate**	**Severe**	**Total**		
<20	32 (62.7)	19 (37.2)	0	51	0	0
20-24	71 (59.6)	46 (38.6)	0	117	2 (1.6)	119
25-29	93 (55.0)	73 (43.1)	3 (1.8)	169	0	169
30-34	84 (78.5)	23 (21.4)	0	107	0	107
35-39	34 (57.6)	23 (38.9)	0	57	2 (3.4)	59
41-45	3 (50)	2 (33.3)	0	5	1 (16.6)	6

In the present study, it was also shown that with the increase in age, the Hb level of the patient also increased. Women aged 41-45 years were less anemic compared to other age groups (see Fig. 1).

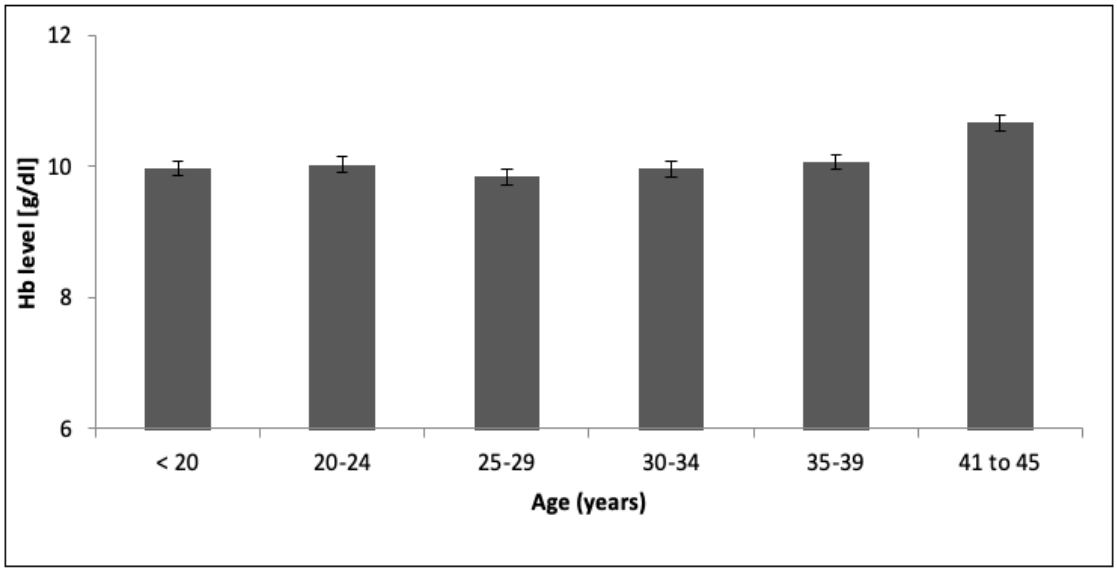

Fig 1: Effect of age on Hb levels. The graph shows that with the increase in age, Hb levels of the patients also increased

3.4.Effect of earnings on Hb levels

A total of 171 women reported that they had no income source and were living in the joint family system. 91(53.2%) were suffering from mild anemia, 77(45.0%) had moderate anemia and 1(0.5%) patient was with severe anemia. Only 2(1.2%) patients appeared with normal Hb levels. 205 women reported having a monthly income ranging from 1000 to 15000. Among them, 119(58.0%) had mild anemia, 83(40.0%) had moderate anemia, and 1(0.5%) had severe anemia. 2 (0.10%) had normal Hb levels. Women who had a monthly income ranging from 16000 to 30,000 were a total of 140. Among them, 85 (60.7%) had mild anemia, 54(38.6%) had moderate anemia, and 1 (0.7%) had severe anemia. None of the patients had normal Hb levels. 20 out of 551 women reported that they had a monthly income ranging from 31000 to 35000. 10(50%) were suffering from mild anemia, and 9 (45%) had moderate anemia. No case of severe anemia was present, and 1(5%) patient had a normal Hb level. Only 15 patients reported that their monthly income was more than 45000. Among them, 10(66.7%) had mild anemia, and 5(33.3%) had moderate anemia. No case of severe anemia was present (Table 4).

Table 4 : Shows the correlation of anemia with the monthly income of the household, affecting lifestyle

Monthly Income (In thousands)	**Anemia (n)%**				**Normal (n)%**	**Total (n)**
	Mild	**Moderate**	**Severe**	**Total**		
No income	91 (53.2)	77 (45.0)	1 (0.5)	169	2 (1.2)	171
1 to 15	119 (58.0)	83 (40.4)	1 (0.5)	203	2 (0.10)	205
16 to 30	85 (60.7)	54 (38.6)	1 (0.7)	140	0	140
31 to 35	10 (50)	9 (45)	0	19	1 (5)	20
> 45	10 (66.7)	5 (33.3)	0	15	0	15

3.5.Effect of gravidity on Hb levels

The women who contributed to this study were divided into three groups according to their gravidity. Women with gravidity 1-5 were placed in the 1st group, women with gravidity 4-8 were placed in the 2nd group, and women with gravidity 9-12 were placed in the 3rd group. Women in the 1st group were a total of 427.

Among them, 246(57.6%) were mildly anemic, 174(40.7%) had moderate anemia, while 3 (0.7%) of them were suffering from severe anemia. 4 (0.9%) were with normal Hb levels. In the 2nd group, 111 women were present, 61 (54.9%) had mild anemia, and 48 (43.2%)

had moderate anemia. No case of severe anemia was present. 2(1.8%) patients had normal Hb levels. Women in the 3rd group were a total of 13 out of 551 patients. 6(46.1%) patients were suffering from mild anemia and 7(53.8%) had moderate anemia. No patient was present with severe anemia or a normal Hb level (Table 5).

Table 5: Shows the severity of anemia with respect to the gravidity of the female

Groups	Gravidity (n)	Anemia (n) %				Normal (n)%	Total (n)
		mild	moderate	severe	Total		
1st	1 to 4	246 (57.6)	174 (40.7)	3 (0.7)	423	4 (0.9)	427
2nd	5 to 8	61 (54.9)	48 (43.2)	0	109	2 (1.8)	111
3rd	9 to 12	6(46.1)	7(53.8)	0	13	0	13

Results of the study also revealed that the risk of anemia was less in women with increased gravidity. Those having a larger number of pregnancies or children were less anemic (Fig. 2).

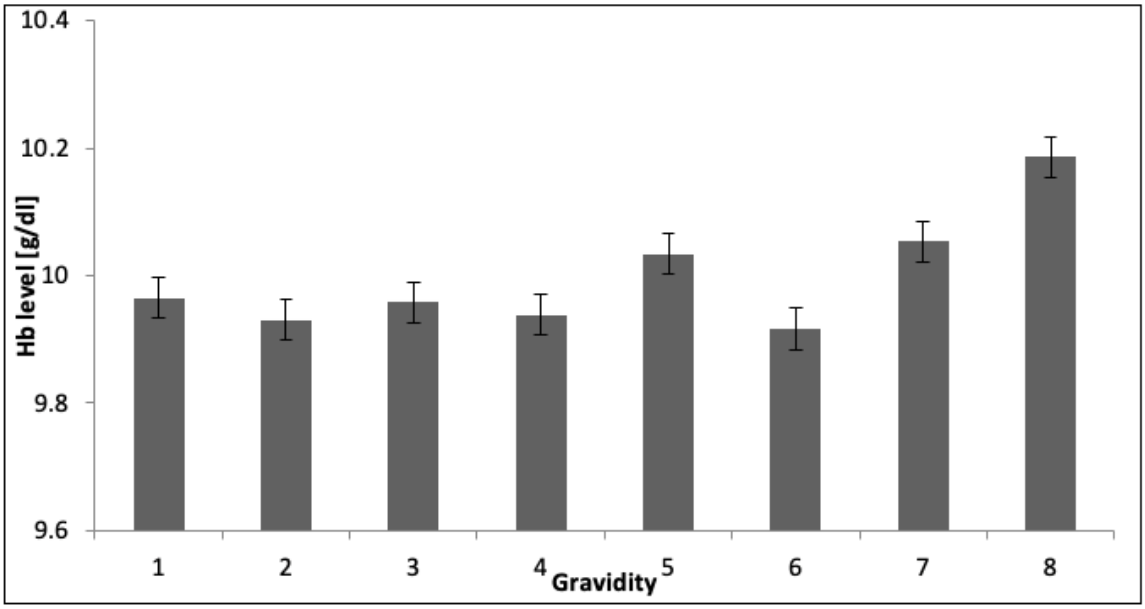

Fig 2: Effect of gravidity on Hb levels. The graph shows that in the present study, women with increased gravidity were less anemic compared to those who had fewer children**.**

3.6.Overall prevalence of anemia

Among the total 551 pregnant women, the majority of the patients were suffering from mild (57.6%) and moderate (41.4%) anemia, whereas the percentage of patients with severe anemia (0.5%) or normal Hb level (0.9%) was less (Fig 3).

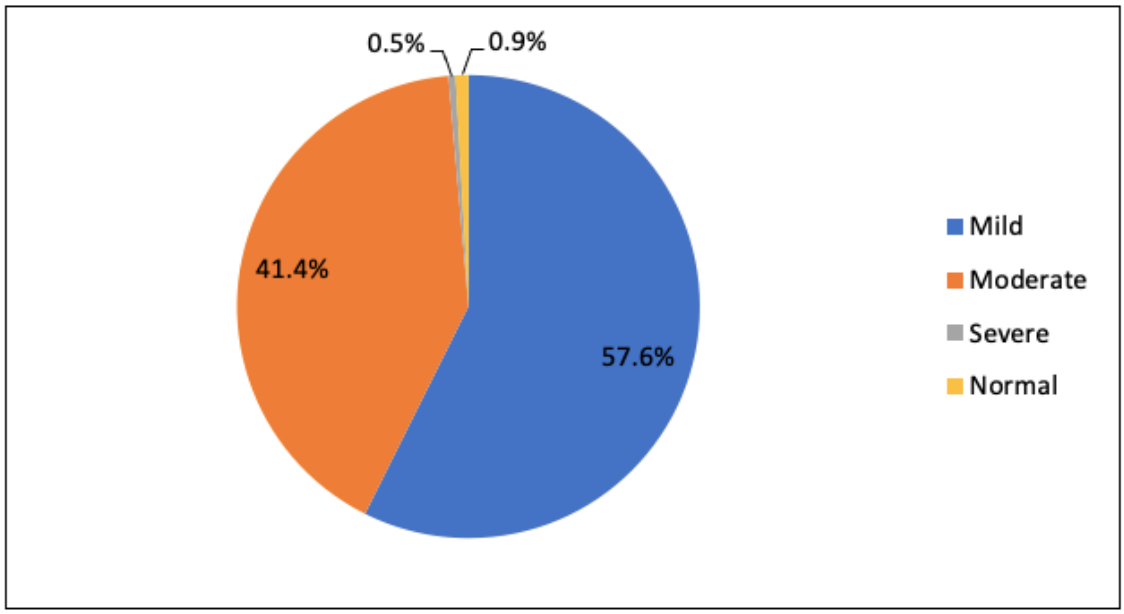

Fig 3: Overall prevalence of anemia among the antenatal population of D. I. Khan

4. Discussion:

The present study was conducted in District D.I. Khan, Khyber Pakhtunkhwa region of Pakistan over the period of 3 months to check the overall prevalence of anemia. The data revealed that out of 551 pregnant women, the majority (99%) of the pregnant women who visited for an antenatal checkup were suffering from anemia. Most of the pregnant women during the study period were mildly (57.6%) to moderately (41.4%) anemic. Only 0.5% of the pregnant women were severely anemic (see Fig 3). The percentage of anemic population in the present study is higher than that of the study conducted in Peru (50%), Western Maharashtra, India (92.38%), and most of the pregnant women of the developing countries (35-75%) (Accinelli et al., 2020; Aringazina et al., 2021; Arroyo-Laguna, 2017; Canchari, 2021). The difference might be due to the reason that in the present study area, women have less awareness about anemia and its consequences. This difference may also be due to the difference in educational status and nutritional intake between the study populations (Ayala et al., 2021).

In the present study, anemia was not significantly associated with the trimester, but the majority of the women who appeared in the 2nd trimester were suffering from anemia (see Table 1). These results are in accordance with the study conducted by (Louzado-Feliciano et al., 2020; Tokumura & Mejía, 2023). In the present study, women who had meat consumption during their pregnancy and those not take meat in their diet did not show any impact on Hb levels, as all the women were anemic, even those who were taking meat 2 times per week. The reason for this difference can also be the lack of iron supplementation during pregnancy, along

with other foods. During the study, the highest number of pregnant women were enrolled with the age of 25-29 years (30.6%). It was also shown that the prevalence of anemia was high among the younger age groups compared to the women of older age (Patil & Patil, 2020; Varma et al., 2020; Warang et al., 2014). The percentage of women aged 41-45 years was only 1% and they were also less anemic compared to the other age groups, which showed that as the age of women increased, the chances of anemia decreased in the study population (see Table 3, Fig 1). These findings are also in accordance with the study carried out in Ethiopia (Hernández-Vásquez et al., 2017; I., 2013; Westgard et al., 2021).

During the study, the gravidity of the pregnant women showed a relationship with the Hb levels to some extent, as the women with more children or pregnancies were likely to be less anemic than those with fewer children. Risk of anemia decreased as the number of pregnancies increased (see Table 5, Fig. 2). This result shows consistency with the study carried out by (Bajaj et al., 2022; Pande et al., 2023). Women with the gravidity 1-4 (77.4%) and 5-8 (20.1%) were more in number that enrolled during the study than those having more than 8 children 13 (2.3%). This might be due to the small sample size of the patients with more than 8 children. To determine the prevalence of anemia in women having more than 8 children, a larger number of cases should be studied to determine the significant relationship between multigravida and Hb levels.

5. Conclusion:

It may be concluded from the present study that anemia is a very serious health problem during pregnancy in D.I.Khan. The majority of the women who visited for an antenatal checkup during the study period were suffering from mild to moderate anemia. It was found that the gravidity and age of pregnant women had a significant impact on Hb levels during pregnancy. The reasons for the high prevalence of anemia in the study area can be the lack of awareness about anemia in pregnant women, inadequate nutrition, and lack of iron supplementation. Hence, it is highly recommended that women seek awareness about anemia and its consequences during pregnancy. Nutritional counseling on the intake of iron-rich food and oral iron or folic acid supplementation should be recommended to prevent anemia during pregnancy. Because even if the women had normal Hb levels and amount of iron intake in food before pregnancy, more amount of iron would be needed during pregnancy due to increased demand for iron as the mother shares her nutritional intake with the fetus for growth. This requirement of iron intake can't be fulfilled by food alone; that's why oral iron supplementation

must be done during pregnancy. Early visits for antenatal checkups should be reinforced for early detection of anemia.

6. Limitations of the Study:

The limitations of our study included the cross-sectional nature of the study and data collected from the patients, as the data were collected from only one hospital, which may not be the true reflection of the situation in the area. Results of the study also depend on the history taken from the patients and procedures carried out in the hospital for the determination of Hb levels. So, the study time period should be extended to check the prevalence of anemia in a large sample of the antenatal population, and efforts should be made to obtain error-proof results for better assessment.

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Conflict of Interest:

The authors declare no conflict of interest.

Ethical Approval and Consent to Participate:

The present study was approved by the institutional ethical review board of Gomal University, D.I.Khan, Pakistan. All the patients recruited in the study have given their consent to publish their clinical information and results.

Author's Contribution:

H.B.H., Conceptualization and Data curation, M.F., and M.H., Formal analysis, H.B.H., G.R.A., and S.K., Investigation, methodology, Project administration, Resources, Software, I.B.H., Supervision and Validation. H.B.H., I.B.H., and M.F., Writing – original draft, writing, and editing.

Data Availability Statement:

All the data is available and will be provided upon request.

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