**ORIGINAL ARTICLE**

# Risk factors for Anemia in Pregnant Women in a rural area of Bahawalnagar Pakistan- a Descriptive Cross Sectional Study

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## ABSTRACT

**Background:** Anemia is the most common hematological complication of pregnancy. In developing countries, demographic, cultural, and socioeconomic factors could affect the occurrence of anemia in pregnancy.

**Aim:** To determine the risk factors for anemia in pregnant women of a rural population (Area Mcleod Gunj, Distt. Bahawal Nagar, Pakistan)

**Methodology:** A descriptive cross sectional study was conducted among the pregnant ladies coming at Rural Health Center (RHC) Mcleod Gunj Distt. Bahawalnagar, Punjab, Pakistan. The study was carried out on 127 women who came to RHC Mcleod Gunj, during January 2017 –May 2017.Information regarding socio-demographic background, Age, BMI (body mass index), parity, nutrition and previous obstetrical history were recorded through well-structured questionnaires to evaluate the risk factors for anemia in the women coming at the above said Rural Health Center(RHC).Data was analyzed by SPSS 20 and Pearson's correlation

**Results:** Hemoglobin concentration have a negative significant correlation (P≤0.01) with factors like Age (-0.239), Parity(-0.344), Abortions(-0.343) and PPH(-0.262). Some other factors such as Level of Education, Meat intake, and intake of oral supplements have significant(P≤0.01) positive correlation with hemoglobin concentration.(Level of education= 0.345, red meat intake= 0.300 , Oral supplements intake= 0.322). Factors such as BMI, Fruits intake, PIH, Gestational diabetes, IV iron and Blood Transfusions do not have any significant correlation with hemoglobin concentration. There was significant decrease in the hemoglobin concentration with each additional increase in parameters as age (R=-0.049 ± 0.018; significance level 0.007), parity(R= -0.244 ± 0.060; significance level 0.000), abortions/miscarriages(R= -0.271± 0.066; significance level 0.000) and postpartum hemorrhage/PPH (R= -0.998 ± 0.329; significance level 0.003).

**Conclusion:** Hemoglobin concentration was found to have been significantly reduced with factors like increasing age, parity, abortions/miscarriages and PPH. Hemoglobin concentration was found to have been significantly increased with factors like increasing level of education, improved nutritional status i.e., more red meat intake and taking oral supplements regularly.

**Keywords:** Anemia, hemoglobin, risk factors, pregnancy, developing countries, rural population.

## INTRODUCTION

Anemia is usually defined as a decrease in the total amount of red blood cells (RBCs) or hemoglobin in the blood[1,2]. Anemia is one of the most common disorders in the world. Globally, 1.62 billion people (95% CI: 1.50–1.74 billion) suffer from anemia, which corresponds to 24.8% of the population (95% CI: 22.9–26.7%)[3].

Anemiais the most common hematologic complication of pregnancy and is defined as hemoglobin and hematocrit lower than 11% and 33% in the first trimester, 10.5% and 32% in the second trimester, and 11% and 33% in the third trimester[4]. Normal physiologic changes in pregnancy affect the hemoglobin (Hb), and there is a relative or absolute reduction in Hb concentration.

The prevalence of anemia in women is about 36% worldwide[1]. Moreover, 41.8 % of pregnant and 30.2% of non-pregnant women were found anemic [3]. In Pakistan, anemia prevalence among women age 15 to 44 is 26% in urban areas and 47% in rural areas[5]. The prevalence of anemia among pregnant women in urban areas is even higher, ranging from 29%[6] to 50% among pregnant women attending antenatal clinics in Karachi [7,8].

In developing countries, demographic, cultural, and socioeconomic factors could affect the occurrence of anemia in pregnancy. In addition, previous studies have found a significant association between maternal anemia and adverse perinatal outcomes such as placenta previa, placental abruption, preterm birth, and low birth weight[9,10]. Iron deficiency anemia is the most common type of

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anemia worldwide[11]. The causes of iron deficiency anemia are multifactorial, but the primary cause is iron deficiency secondary to chronic inadequate dietary intake and menstruation, heightened by the physiologic demands of the fetus and maternal hemodilution & volume expansion during pregnancy[12,13].

The rationale of the present study was to get benefit in addressing the causes of anemia in pregnancy and improving both fetal and maternal outcomes

The present study was conducted to determine whether the risk factors: socio-demographic background, age, BMI, and parity are associated with abnormal hemoglobin concentrations in rural population

## MATERIALS AND METHODS

A descriptive cross sectional study was conducted among the pregnant ladies coming at Rural Health Center (RHC) Mcleod Gunj Distt. Bahawalnagar, Punjab, Pakistan. The study was carried out on 127 women who came to RHC Mcleod Gunj, during January 2017 –May 2017. Hb was checked through hand held device (Hb checker by Abbot which has precision of ±0.6gm/dl). Anemia was defined as a decrease in the total amount of red blood cells (RBCs) or hemoglobin (< 12gm/dl) in the blood.

The respondents were categorized regarding educational level (0, illiterate; 1, less than primary; 2, primary; 3, middle; 4, matric; 5, intermediate;6, bachelors and 7, masters). Approximately 50 gm red meat twice weekly was taken as adequate meat intake. A woman who takes seasonal fruit daily was considered as the woman who has adequate fruit intake.Iron, folic acid and Vitamin A were regarded as supplements (recommended dose: folic acid 0.4 mg; iron: 30 mg daily and vit A 10000 units per day or 25000 IU per week).Regarding previous history; parameters like Postpartum Hemorrhage (PPH), Pregnancy induced hypertension (PIH) and Gestational Diabetes (GD) were recorded. 7.9% women had history of PPH, 12.6% had history of PIH, and 1.6% had history of gestational diabetes in previous pregnancies (Table. 8).

Information regarding socio-demographic background, Age, BMI (body mass index), parity, nutrition and previous obstetrical history were recorded through well-structured questionnaires to evaluate the risk factors for anemia in the women coming at the above said Rural Health Center (RHC). Data was analyzed by SPSS v20 and Pearson's correlation and regression analysis was done by using the software.

## RESULTS

The frequency distribution regarding different demographic parameters is given in Table 1-9.

Most of the women included in the study were of age group 21-25 years (44.88%) followed by age group 26-30 years (22.83%), age group 16-20 years (18.89%) and age group 31-35 years (11.02%), with minimum no. of respondents from age group 36-40 years (2.36%).(Table.1).

Maximum No. of respondent women under study were illiterate (44%); followed by Primary (22.83%), Matric (19.68%), Middle (5.51%), Intermediate (3.93%), Bachelors (2.76%) and there was only woman having master's degree (Table 2).

Nearly half of the respondents had Body Mass Index(BMI) within range of 20.0-23.9 (48.81%) and 15.0-19.9 (41.73%); followed by 24.0-27.9(5.51%) and minimum no. of respondents were of BMI 28.0-31.9(3.94%) (Table 3)

Majority of the women visited RHC had very low meat intake (no or once per week, 69%) followed by 18.2% women who had meat intake twice weekly, 6.8% women took meat thrice weekly, 1.5% who had meat intake four times a week. Only 0.8% women had daily meat intake during pregnancy (Table 4a). Regarding Fruits intake; 29.1% women had very less intake of seasonal fruit (once or no fruit per week), 32.3% women had fruit once a week, 17.3% women had fruits twice weekly, while 14.2% women had daily fruits intake (Table 4b). Fair majority of women (72.4% ) were not taking oral supplements(folic acid, Iron and Vitamin A) regularly, while 27.6% women were taking oral supplements regularly (Table.5).

Regarding personal history (Gravidity, Parity and abortions/miscarriage), 21.3% women were primigravida, 22% were Gravida 2, 23.6% were Gravida 3, 12.6% were gravida 4, 4.7% were Gravida 6, followed by Gravida 5 & 7 both 7.1% each and Gravida 8 & 9 both were 0.8% each. Approximately 31% women were in Para 1, 19.7% were Para 2, 13.4% were Para 3, 6.3% were Para 4, 4.7% were Para 5 and 0.8% were Para 6. 70.9% women had no history of abortion, 17.3% had history of single abortion, 8.7% had abortions two times previously, 2.4% had abortions 3 times while 0.8% had 4 previous abortions/miscarriages (Table 6).

Regarding mode of delivery, 22.8% deliveries via C-Section ( 17.3% had 1 C-section, 5.5% had 2 C-sections) while 55.1% deliveries were via Spontaneous Vaginal Deliveries( SVD) 7.3% had 1 SVD, 12.6% had 2 SVDs, 14.2% had 3 SVDs, 5.5% had 4 SVDs, 4.7% had 5 SVDs, 0.8% had 6 SVDs (Table 7).

Regarding previous history; parameters like Postpartum Hemorrhage (PPH), Pregnancy induced hypertension (PIH) and Gestational Diabetes were recorded. 7.9% women had history of PPH, 12.6% had history of PIH, and 1.6% had history of gestational diabetes in previous pregnancies (Table 8). For correction of severe anemia; 19.7% women had received IV Iron and 31.5% had blood transfusion previously(Table.9).

Frequency distribution of Hemoglobin among all respondents is given as under (Table 10).

Hemoglobin concentration have a negative significant correlation (P≤0.01) with factors like Age (-0.239), Parity (-0.344), Abortions (-0.343) and PPH (-0.262) (Table 10).Some other factors such as Level of Education, Meat intake, and intake of oral supplements have significant(P≤0.01) positive correlation with hemoglobin concentration.(Level of education= 0.345, red meat intake= 0.300 , Oral supplements intake= 0.322). Factors such as BMI, Fruits intake, PIH, Gestational diabetes, IV iron and Blood Transfusions do not have any significant correlation with hemoglobin concentration. Regression analysis of Hemoglobin and Risk Factors is presented in Table 10.

There was significant decrease in the hemoglobin concentration with each additional increase in parameters as age (R=-0.049±0.018; significance level 0.007), parity (R=-0.244±0.060; significance level 0.000), abortions/miscarriages(R=-0.271±0.066; significance level 0.000) and postpartum hemorrhage/PPH (R=-0.998±0.329; significance level 0.003). Significant increase in hemoglobin concentration was observed with each additional increase in parameters as level of education(R=0.189 ± 0.046; significance level 0.000), red meat intake(R=0.278±0.079; significance level 0.001) and regular oral supplements intake (R=0.741±0.195; significance level 0.000) (Table 11). Correlation between hemoglobin and risk factors is described as under (Table 12).

Table 1: Age of respondents

| Age in years | Frequency | %age |
|---|---|---|
| 16-20 | 24 | 18.89 |
| 21-25 | 57 | 44.88 |
| 26-30 | 29 | 22.83 |
| 31-35 | 14 | 11.02 |
| 36-40 | 3 | 2.36 |

Table 2: Level of education

| Level of education | Frequency | %age |
|---|---|---|
| Illiterate | 56 | 44 |
| less than primary | 1 | 0.79 |
| Primary | 29 | 22.83 |
| Middle | 7 | 5.51 |
| Matric | 25 | 19.68 |
| F.A | 5 | 3.93 |
| B.A | 3 | 2.36 |
| Masters | 1 | 0.79 |

Table 3: Body Mass Index

| BMI(Range) | Frequency | %age |
|---|---|---|
| 15.0-19.9 | 53 | 41.73 |
| 20.0-23.9 | 62 | 48.81 |
| 24.0-27.9 | 7 | 5.51 |
| 28.0-31.9 | 5 | 3.94 |

Table 4a: Frequency Of Meat Intake per week

| Meat intake per week | Frequency | %age |
|---|---|---|
| Less than 1 | 43 | 32.6 |
| 1 | 48 | 36.4 |
| 2 | 24 | 18.2 |
| 3 | 9 | 6.8 |
| 4 | 2 | 1.5 |
| 7 | 1 | .8 |

Table 4b: Frequency of fruit intake per week

| Fruit intake per week | Frequency | %age |
|---|---|---|
| Less than 1 | 37 | 29.1 |
| 1 | 41 | 32.3 |
| 2 | 22 | 17.3 |
| 3 | 4 | 3.1 |
| 4 | 3 | 2.4 |
| 5 | 1 | .8 |
| 6 | 1 | .8 |
| 7 | 18 | 14.2 |

Table 5: Supplements (taking or not)

| Description | Frequency | %age |
|---|---|---|
| not taking | 92 | 72.4 |
| Taking | 35 | 27.6 |
| Total | 127 | 100 |

Table 6: Personal History (Gravidity, Parity, Abortions)

| Gravidity | | | Parity | | | Abortions | | |
|---|---|---|---|---|---|---|---|---|
| Gravidity | Frequency | %age | Parity | Frequency | %age | Abortions | Frequency | %age |
| | 27 | 21.3 | 0 | 31 | 24.4 | 0 | 90 | 70.9 |
| 2 | 28 | 22.0 | 1 | 39 | 30.7 | 1 | 22 | 17.3 |
| 3 | 30 | 23.6 | 2 | 25 | 19.7 | 2 | 11 | 8.7 |
| 4 | 16 | 12.6 | 3 | 17 | 13.4 | 3 | 3 | 2.4 |
| 5 | 9 | 7.1 | 4 | 8 | 6.3 | 4 | 1 | .8 |
| 6 | 6 | 4.7 | 5 | 6 | 4.7 | | | |
| 7 | 9 | 7.1 | 6 | 1 | 0.8 | | | |
| 8 | 1 | 0.8 | | | | | | |
| 9 | 1 | 0.8 | | | | | | |

Table 7: Mode of delivery

| SVD | | | C-sections | | |
|---|---|---|---|---|---|
| **No. of SVDs** | **Frequency** | **%age** | **C-Sections** | **Frequency** | **%age** |
| 0 | 57 | 44 | 0 | 98 | 77.2 |
| 1 | 22 | 17.3 | 1 | 22 | 17.3 |
| 2 | 16 | 12.6 | 2 | 7 | 5.5 |
| 3 | 18 | 14.2 | | | |
| 5 | 6 | 4.7 | | | |
| 6 | 1 | .8 | | | |

Table 8: Previous history of PPH, PIH & gestational diabetes

| PPH | | | PIH | | Gestational Diabetes | |
|---|---|---|---|---|---|---|
| **Description** | **Frequency** | **Percent** | **Frequency** | **Percent** | **Frequency** | **Percent** |
| No | 117 | 92.1 | 111 | 87.4 | 125 | 98.4 |
| Yes | 10 | 7.9 | 16 | 12.6 | 2 | 1.6 |

Table 9: Women who received IV Iron or Transfusion

| Description | IV Iron | | Blood Transfusion | |
|---|---|---|---|---|
| | **Frequency** | **%age** | **Frequency** | **%age** |
| No | 102 | 80.3 | 87 | 68.5 |
| Yes | 25 | 19.7 | 40 | 31.5 |
| Total | 127 | 100 | 127 | 100 |

Table 10: Correlation between Hb and risk factors

| **Factors** | **Haemoglobin** |
|---|---|
| Age | -0.239* |
| BMI | 0.139 |
| Education | 0.345* |
| Parity | -0.344* |
| Abortion | -0.343* |
| Meat intake | 0.300* |
| Fruit intake | 0.105 |
| Oral supplementation | 0.322* |
| PPH | -0.262* |
| PIH | 0.129 |
| GD | 0.051 |
| IV iron | -0.099 |
| Blood transfusion | -0.017 |

*these variables have significance (P≤0.01).

Table 11: Regression Analysis of Hb and risk factors

| **Factors** | **Regression** | **Significance** |
|---|---|---|
| Age | -0.049 ± 0.018 | 0.007 |
| BMI | 0.047 ± .030 | 0.000* |
| Education | 0.189 ± 0.046 | 0.000* |
| Parity | -0.244 ± 0.060 | 0.000* |
| Abortion | -0.271 ±0.066 | 0.000* |
| Meat intake | 0.278 ± 0.079 | 0.001* |
| Fruit intake | 0.047 ±0.039 | 0.241 |
| Oral supplementation | 0.741± 0.195 | 0.000* |
| PPH | -0.998 ± 0.329 | 0.003* |
| PIH | 0.399 ± 0.275 | 0.149 |
| GD | 0.418 ± 0.737 | 0.572 |
| IV iron | -.255 ±0.230 | 0.269 |
| Blood transfusion | -0.039 ±0.198 | 0.845 |

*Significance level <0.05 is regarded as significant regression.

Table 12: Frequency distribution of hemoglobin

| **Hemoglobin** | **Frequency** | **%age** |
|---|---|---|
| 6.6 | 1 | 0.8 |
| 6.7 | 1 | 0.8 |
| 6.8 | 1 | 0.8 |
| 7.0 | 2 | 1.6 |
| 7.1 | 2 | 1.6 |
| 7.2 | 1 | 0.8 |
| 7.3 | 4 | 3.1 |
| 7.4 | 1 | 0.8 |
| 7.6 | 4 | 3.1 |
| 7.8 | 2 | 1.6 |
| 7.9 | 3 | 2.4 |
| 8.0 | 4 | 3.1 |
| 8.1 | 2 | 1.6 |
| 8.2 | 6 | 4.7 |
| 8.3 | 1 | 0.8 |
| 8.5 | 4 | 3.1 |
| 8.6 | 11 | 8.7 |
| 8.7 | 1 | 0.8 |
| 8.8 | 3 | 2.4 |
| 8.9 | 4 | 3.1 |
| 9.0 | 4 | 3.1 |
| 9.1 | 4 | 3.1 |
| 9.2 | 5 | 3.9 |
| 9.3 | 1 | 0.8 |
| 9.4 | 3 | 2.4 |
| 9.5 | 5 | 3.9 |
| 9.6 | 9 | 7.1 |
| 9.7 | 4 | 3.1 |
| 9.8 | 6 | 4.7 |
| 9.9 | 5 | 3.9 |
| 10.0 | 3 | 2.4 |
| 10.1 | 2 | 1.6 |
| 10.2 | 7 | 5.5 |
| 10.3 | 2 | 1.6 |
| 10.4 | 1 | 0.8 |
| 10.6 | 6 | 4.7 |
| 10.8 | 1 | 0.8 |
| 10.9 | 1 | 0.8 |
| Total | 127 | 100.0 |

## DISCUSSION

The results of this study are similar to the previous studies on evaluation of risk factors for anemia in pregnant women[14]. This study shows that anemia is more prevalent in rural population due to low level of education leading to less awareness about additional nutritional requirements (meat, fruits, supplements) in pregnancy and increased parity. Another factor responsible for low level of hemoglobin or anemic conditions may be no or less availability of supplements in remote areas of Distt. Bahawalnagar. Inappropriate health facilities may lead to bad previous obstetrical history (PPH, PIH) and severe anemia (even IV iron replacement and blood transfusions were not able to correct anemia)[15]. Health education and appropriate health facilities should be provided to the remote rural population to overcome the risk factors for anemia in pregnant women.

## CONCLUSION

Depending upon all the data analysis, it is concluded that Hemoglobin concentration is significantly influenced by different demographic factors (Age, Level of Education, BMI, obstetrical history, nutritional factors (meat, fruits and oral supplements intake))as well as risk factors such as Postpartum Hemorrhage (PPH), Pregnancy Induced Hypertension (PIH) and the history of IV iron and blood transfusions. Hemoglobin concentration was found to have been significantly reduced with factors like increasing age, parity, abortions/miscarriages and PPH. Hemoglobin concentration was found to have been significantly increased with factors like increasing level of education, improved nutritional status i.e., increased red meat intake and taking oral supplements regularly. Many women had severe anemia, even intravenous iron therapy and blood transfusions could not increase their hemoglobin up to the mark. Health education and appropriate health facilities should be provided to the remote rural population to overcome the risk factors for anemia in pregnant women.

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