



## **Gestational Anaemia and its Associated Factors in Normal Pregnant Women**

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### **Authors' contributions**

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

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## **ABSTRACT**

**Objectives:** To determine the hemoglobin levels in normal pregnant women and investigate the association of anemia with gestational age, number of antenatal visits, obstetrical complications and mode of delivery.

**Methodology:** This is a cross-sectional study conducted at the Lady Willingdon Hospital, Khairpur Mirs, Pakistan from May 2021 to August 2021. A total of 139 normal pregnant women were recruited during antenatal visits. Patients were grouped into normal and anemic groups based on serum hemoglobin levels. Gestational age, obstetrical complications, mode of delivery and fetal outcome were recorded to find its association with anemia. Data was analyzed on SPSS 20.0 and p-value < 0.05 was considered as statistically significant.

**Results:** Out of n=139 normal pregnant women, n=26 women had normal hemoglobin levels, n=49 were mild anemic, n=46 had moderate anemia whereas n=18 had severe anemia. Overall, the prevalence of gestational anemia was 81%. There was significant association between hemoglobin status and number of antenatal visits and complications in previous pregnancies. Hemoglobin

status was not significantly associated with gestational age and mode of delivery.

**Conclusion:** In conclusion, we found that gestational anemia is highly prevalent in Pakistan. Early detection of anemia and its correction via supplementations are recommended.

*Keywords: Gestational anemia; hemoglobin; pregnant women; factors.*

## 1. INTRODUCTION

Gestational anaemia is a global problem, affecting half billion women in their reproductive age. According to the 2011 statistics, 38% of pregnant women suffered from anaemia worldwide and the highest prevalence was recorded in South Asia and Central and West regions of Africa [1]. Anemia during pregnancy may lead to higher maternal mortality and morbidity and obstetrical complications including miscarriage, prematurity, low birth weight and stillbirth especially in developing countries [2], [3]. In Pakistan, the prevalence of anemia among reproductive age women has been showed around 41% to 77%, with higher frequency in women from rural areas [4].

Anemia impairs the blood capacity of transporting oxygen in the body and indicates poor nutrition and health. The risk factors and the cause of gestational anaemia are iron deficiency [1] that may be due to insufficient dietary intake, malabsorption, increased requirements during pregnancy, iron losses due to menstruation. Other causes include infections, worm infestations, genetic predisposition and lower socio-economic conditions [5,6]. Apart from that, thalassemia and hemoglobinopathies may be the underlying cause among women presenting with anemia during pregnancy. It has been estimated that the prevalence of haemoglobinopathies in Pakistan were about 28.4%, out of which the most prevalent was thalassaemia trait (25.6%), followed by thalassaemia major (1.4%) and HbS or HbD (1.4%) [7].

According to the World Health Organization (WHO), regularly iron and folic acid supplementations are required in pregnancy to prevent anaemia [8]. The hemoglobin status and prevalence of anemia is the main indicator of public health especially in the most vulnerable group of pregnant women. This indicator also assess the impact of effective interventions carried out in reducing the anemia during pregnancy and monitoring of reproductive health. In developing countries like Pakistan, anemia in pregnancy remains a major health burden and due to lack of research no effective policy or

intervention has been carried out to reduce its prevalence [9]. This study was therefore aimed to determine the hemoglobin levels in normal pregnant women and investigate the association of anemia with gestational age, number of antenatal visits, obstetrical complications and mode of delivery.

## 2. METHODOLOGY

It was a cross-sectional study conducted at the Lady Willingdon Hospital, Khairpur Mirs, Pakistan from May 2021 to August 2021. A total of 139 normal pregnant women visiting out-patient gynecology units for antenatal visits were recruited by convenient random sampling. Patients were grouped into normal and anemic groups based on serum hemoglobin levels. Anemia was defined as serum haemoglobin concentration <11.0 g/dl. Further anaemia was categorized into mild anemia (haemoglobin = 9–10.9 g/dl), moderate anemia (haemoglobin = 7.0–8.9 g/dl) and severe anemia (haemoglobin <7.0 g/dl) [10]. Pregnant women of reproductive age with a singleton pregnancy were included in study. Pregnant women with chronic medical disorders, multiple gestation and obstetric complications in present pregnancy were excluded. Complete blood count, red cell indices and hemoglobin (Hb) electrophoresis were used to exclude thalassemia and hemoglobinopathies. Gestational age, previous history of obstetrical complications, mode of delivery and fetal outcome were recorded to find its association with anemia. Data was analyzed on SPSS 20.0 (IBM Corp., Armonk, N.Y., USA) [11]. Frequency/percentage were calculated and chi square test applied to find significance, p-value < 0.05 was considered as statistically significant.

## 3. RESULTS

Among n=139 normal pregnant women, n=37 women were <34 weeks of gestational age, n=43 women between 34-36 weeks and n=59 women between 37-42 weeks of gestational age. Out of n=139 normal pregnant women, n=26 women had normal hemoglobin levels, n=49 were mild anemic, n=46 had moderate anemia whereas n=18 had severe anemia (Fig. 1). Overall, the

prevalence of gestational anemia was 81%. The hemoglobin status according to gestational age has been shown in Table 1, Fig. 2. Among the pregnant women, who had normal hemoglobin levels, majority had more than 4 antenatal visits (39%). Whereas, most of the pregnant women with anemia had no visit or less than 4 visits (Table 2). Majority of the anemic pregnant

women had complications in previous pregnancies such as abortion, stillbirth, preterm, anemia (Table 3), as compare to normal pregnant women without anemia (p-value<0.001). No significant association was observed between mode of delivery and hemoglobin status.

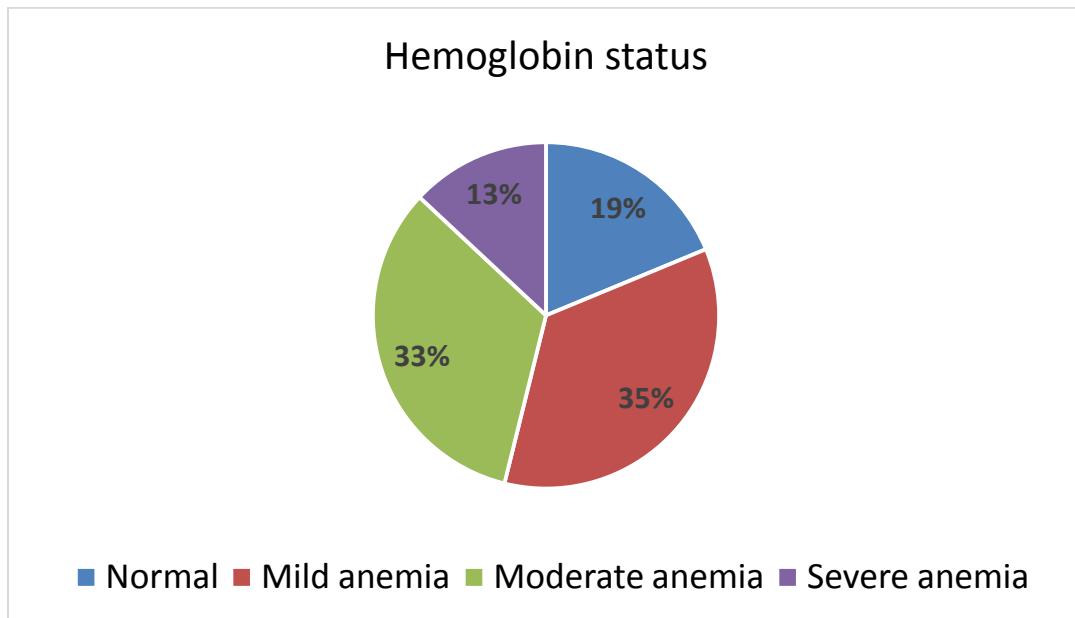


Fig. 1. Hemoglobin status in normal pregnant women

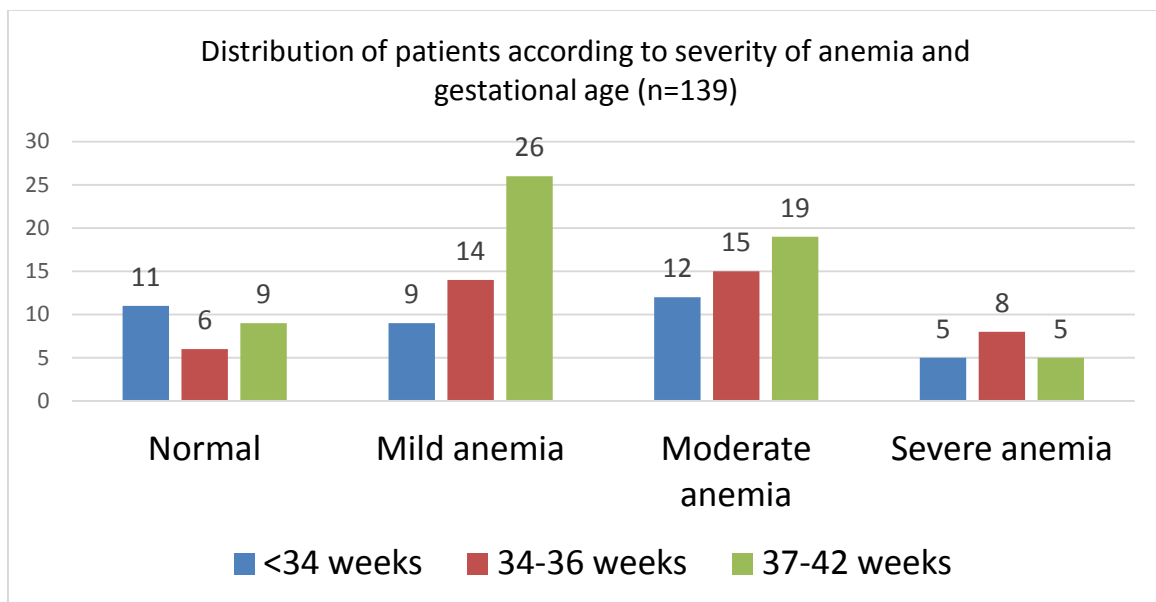


Fig. 2. Number of patients according to severity of anemia and gestational age

**Table 1. Distribution of patients according to gestational age and hemoglobin status**

Hemoglobin status	Gestational age n (%)			p-value
	<34 weeks n=37	34-36 weeks n=43	37-42 weeks n=59	
Normal	11 (29.8%)	6 (13.9%)	9 (15.3%)	0.239
Mild anemia	9 (24.3%)	14 (32.6%)	26 (44.1%)	
Moderate anemia	12 (32.4%)	15 (34.9%)	19 (32.2%)	
Severe anemia	5 (13.5%)	8 (18.6%)	5 (8.4%)	

**Table 2. Number of antenatal visits according to hemoglobin status**

Hemoglobin status	Antenatal visits n (%)			p-value
	No visit (n=52)	1-3 (n=46)	4 and more (n=41)	
Normal	5 (9.6%)	5 (10.9%)	16 (39%)	0.009
Mild anemia	19 (36.5%)	20 (43.5%)	10 (24.4%)	
Moderate anemia	20 (38.5%)	16 (34.8%)	10 (24.4%)	
Severe anemia	8 (15.4%)	5 (10.8%)	5 (12.2%)	

**Table 3. Complications in previous pregnancies and hemoglobin status**

Hemoglobin status	Complications in previous pregnancies n (%)		p- value
	Yes (n=47)	No (n=92)	
Normal	3 (6.4%)	23 (25%)	<0.001
Mild anemia	12 (25.5%)	37 (40.2%)	
Moderate anemia	20 (42.6%)	26 (28.3%)	
Severe anemia	12 (25.5%)	6 (6.5%)	

**Table 4. Mode of delivery and hemoglobin status**

Hemoglobin status	Mode of delivery n (%)		P value
	NVD (n=77)	Caesarean section (n=62)	
Normal	12 (15.5%)	14 (22.6%)	0.191
Mild anemia	27 (35.1%)	22 (35.5%)	
Moderate anemia	24 (31.2%)	22 (35.5%)	
Severe anemia	14 (18.2%)	4 (6.4%)	

#### 4. DISCUSSION

In normal pregnancy blood parameters including, hemoglobin, hematocrit, plasma ferritin, and unsaturated iron-binding capacity are altered making the diagnosis and differentiation of pathological anemia from physiological anemia difficult. Iron-deficiency anemia and megaloblastic anemia due to folate deficiency are the common causes of pregnancy anemia, that are frequent in women with nutritional deficiencies and who do not receive antenatal

iron and folate supplementations. Other less frequent causes of pregnancy anemia are aplastic anemia, hemolytic anemia, thalassemia and sickle cell disease [12]. The prevalence of thalassemia trait in pregnant females have been found 3.5% and 4.9% in previous studies in Pakistan [13].

In our study, we found that there was significant association of hemoglobin status and number of antenatal visits during pregnancy and complications in previous pregnancies including

bad obstetrical history. However, association between gestational age and mode of delivery (normal vaginal delivery vs cesarean section) was non-significant. In the previous study, researchers found link of anemia and maternal and perinatal morbidity and mortality, which requires increase need of health care including fetomaternal intensive care. Anemia also increases risk of preeclampsia, induction of labor, cesarean section, blood transfusions, infections and fetal complications like preterm and small for gestational age births [14].

Heydarpour F et al. [15], found the higher risk of neonatal mortality and lower risk of cesarean section in anemic women during the first trimester. It was also noted that the risk of preterm delivery and abortion were significantly higher in anemic women during the third trimester. In another study, out of 2417 pregnant women, the gestational anemia was found in 13%. Among the anemic mothers, 31% delivered low birth weight babies, out of which 30% were preterm and 70% were term babies [16].

Sun C-F, et al. [17] found the overall incidence of gestational anemia about 30%. It was observed that 4.4% of gestational anemia occurred in first 12 weeks, 9.6% during 13 to 26 weeks and 16.2% after 27 weeks of gestation. It was found that only 24% to 30% of anemia occurring during first 26 weeks could be corrected in final stages of pregnancy.

In the present study, we found that number of antenatal visits had strong association with gestational anemia. It was observed that mothers who had normal hemoglobin levels were more frequently visiting in antenatal period for follow up. Similarly in patients with mild, moderate and severe anemia, majority of the women did not show antenatal visits history. It is clearly observed that women with more antenatal visits are screened early for anemia and are prescribed with iron and folate supplementations, which may reduce the severity of anemia in pregnancy.

In our study, we found the higher prevalence of gestational anemia i.e., 81% as compared to other studies that reported the prevalence of about 25% [18,19], which may be due to lower socioeconomic condition of our population.

Furthermore, we also found that women with gestational anemia had higher reporting of obstetrical complications in previous pregnancies

and bad obstetrical history. In a previously reported study, Rai S and Mishra S, [20] found that 66.5% of women suffered from gestational anemia due to iron deficiency (14.5% were mild anemic, 43% were moderate and 9% were severe anemic). It was observed that various predisposing factors such as heavy menstruation history before pregnancy, higher gravidity/parity and miscarriages were strongly associated with gestational anemia due to iron deficiency.

## **5. CONCLUSION**

In conclusion, we found that gestational anemia is highly prevalent in Pakistan. It is strongly associated with number of antenatal visits in pregnancy and history of previous pregnancies complications. Early detection of anemia and its correction via iron and folate supplementations are recommended to prevent and reduce maternal and neonatal morbidity and mortality.

## **DISCLAIMER**

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

## **CONSENT AND ETHICAL APPROVAL**

As per international standard or university standard guideline Patient's consent and ethical approval has been collected and preserved by the authors.

## **COMPETING INTERESTS**

Authors have declared that no competing interests exist.

## **REFERENCES**

1. Stevens GA, Finucane MM, De-Regil LM, Paciorek CJ, Flaxman SR, Branca F, et al. Global, regional, and national trends in haemoglobin concentration and prevalence of total and severe anaemia in children and pregnant and non-pregnant women for 1995–2011: a systematic analysis of

- population-representative data. *The Lancet Global Health*. 2013;1(1):e16-e25.
2. DOI:[https://doi.org/10.1016/S2214-109X\(13\)70001-9](https://doi.org/10.1016/S2214-109X(13)70001-9)
  3. Brabin BJ, Hakimi M, Pelletier D. An analysis of anemia and pregnancy-related maternal mortality. *The Journal of Nutrition*. 2001;131(2S-2):604S-14S; discussion 14S. DOI: 10.1093/jn/131.2.604s
  4. Wemakor A. Prevalence and determinants of anaemia in pregnant women receiving antenatal care at a tertiary referral hospital in Northern Ghana. *BMC Pregnancy and Childbirth*. 2019;19(1):495. DOI:<https://doi.org/10.1186/s12884-019-2644-5>
  5. Ali SA, Abbasi Z, Shahid B, Moin G, Hambidge KM, Krebs NF, et al. Prevalence and determinants of anemia among women of reproductive age in Thatta Pakistan: Findings from a cross-sectional study. *PloS One*. 2020;15(9):e0239320. DOI:<https://doi.org/10.1371/journal.pone.0239320>
  6. Orish VN, Onyeabor OS, Boampong JN, Acquah S, Sanyaolu AO, Iriemenam NC. The effects of malaria and HIV co-infection on hemoglobin levels among pregnant women in Sekondi-Takoradi, Ghana. *International Journal of Gynecology & Obstetrics*. 2013;120(3):236-9. DOI:<https://doi.org/10.1016/j.ijgo.2012.09.021>
  7. Anderson A, Campbell D, Shepherd R. Nutrition knowledge, attitude to healthier eating and dietary intake in pregnant compared to non-pregnant women. *Journal of Human Nutrition and Dietetics*. 1993;6(4):335-53. DOI: <https://doi.org/10.1111/j.1365-277X.1993.tb00379.x>
  8. Mustafa A, Zulfiqar M, Ali BA, Naseem L. Frequency of  $\beta$ -thalassemia trait among pregnant women presenting at Pakistan Institute of Medical Sciences. *NJHS; National Journal of Health Sciences*. 2018;3(4):118-21. DOI:<http://dx.doi.org/10.21089/njhs.34.0118>
  9. Prevention and management of severe anaemia in pregnancy: report of a technical working group, Geneva, 20-22 May 1991. World Health Organization; 1993.
  10. Zehra T, Khan RA, Qadir F. Anemia in pregnancy a study of Karachi in a tertiary care centre. *Amer J Phytomed Clin Therap*. 2014;10(10):1224-33.
  11. Organization WH. Division of epidemiological surveillance and health situation trend assessment. *Global health situation and projections—estimates Geneva, Switzerland: World Health Organization*. 1992.
  12. IBM Corp. Released 2011. *IBM SPSS Statistics for Windows VA, NY: IBM Corp*.
  13. Sifakis S, Pharmakides G. Anemia in pregnancy. *Annals of the New York Academy of Sciences*. 2000;900(1):125-36.
  14. Khan H, Shah F, Khan K. Frequency of beta-thalassemia trait among pregnant women in their last trimester with hypochromic microcytic anemia. *Pak Journal of Public Health*. 2017;7(2):79-81.
  15. Smith C, Teng F, Branch E, Chu S, Joseph KS. Maternal and Perinatal Morbidity and Mortality Associated With Anemia in Pregnancy. *Obstet Gynecol*. 2019;134(6):1234-44. DOI:<https://dx.doi.org/10.1097/AOG.0000000000003557>
  16. Heydarpour F, Soltani M, Najafi F, Tabatabaee HR, Etemad K, Hajipour M, et al. Maternal anemia in various trimesters and related pregnancy outcomes: Results from a large cohort study in Iran. *Iranian Journal of Pediatrics*. 2019;29(1). DOI:<https://dx.doi.org/10.5812/ijp.69741>
  17. Shrestha A, Shrestha S. A correlative study between maternal hemoglobin concentration during third trimester and fetal birth weight of babies born at Kathmandu Medical College and Teaching Hospital. *Journal of Pathology of Nepal*. 2020;10(2):1756-9. DOI:<https://doi.org/10.3126/jpn.v10i2.30108>
  18. Sun C-F, Liu H, Hao Y-H, Hu H-T, Zhou Z-Y, Zou K-X, et al. Association between gestational anemia in different trimesters and neonatal outcomes: a retrospective longitudinal cohort study. *World Journal of Pediatrics*. 2021;17(2):197-204. DOI:<https://doi.org/10.1007/s12519-021-00411-6>
  19. Asrie F. Prevalence of anemia and its associated factors among pregnant women receiving antenatal care at Aymiba Health Center, northwest Ethiopia. *Journal of blood medicine*. 2017;8:35. DOI:<https://dx.doi.org/10.2147%2FJBM.S134932>

20. Mahamoud NK, Mwambi B, Oyet C, Segujja F, Webbo F, Okiria JC, et al. Prevalence of anemia and its associated socio-demographic factors among pregnant women attending an antenatal care clinic at kisugu health center iv, makindye division, Kampala, Uganda. *Journal of Blood Medicine*. 2020;11:13. DOI:<https://dx.doi.org/10.2147%2FJBM.S231262>
21. Rai S, Mishra S. Menstrual status and obstetrical history influencing prevalence of iron deficiency anemia among reproductive age women in rural area. *Materials Today: Proceedings*; 2021. DOI:<https://doi.org/10.1016/j.matpr.2020.12.966>

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