RGUHS
Journal of Nursing Sciences

ORIGINAL ARTICLE

Prevalence and Risk Factors of Anemia among Antenatal Mothers Registered at a District Hospital in North India: A Cross-sectional Record Based Study

Rajesh Kumar Kotwal[1], Rakesh Kotwal[2], Kiran Bala[3], Bhavna Sahni[4*]

[1]Department of Health, P.H.C Bhatni, District Ramban, J&K, India.

[2]Department of Health, P.H.C Atholi, District Kishtwar, J&K, India.

[3]Department of Community Medicine, Government Medical College, Jammu, J&K, India.

[4]Department of Community Medicine, ASCOMS and Hospital, Sidhra, Jammu, J&K, India.

***Corresponding author**

Dr. Bhavna Sahni, Associate Professor, Department of Community Medicine, ASCOMS and Hospital, Sidhra, Jammu, India. E-mail: bhavnasahni@gmail.com

Received date: May 29, 2023; **Accepted date:** June 20, 2023; **Published date:** July 31, 2023

Abstract

Background: Anemia is the most common disorder which contributes significantly to high maternal mortality. Despite the availability of low-cost effective interventions for prevention and treatment of anemia among pregnant women, its prevalence is still high.

Objective: This study aimed to check the prevalence of anemia and its associated risk factors among pregnant women attending a secondary level health care center in North India.

Method: A cross-sectional, record-based study was carried out at a District Hospital in North India to study the prevalence and risk factors of anemia among the registered antenatal females.

Results: Mean age of antenatal females was 27.68±4.59 years (Range: 18 – 45 years). Around 89.38% females were fully immunized with tetanus toxoid (TT), 8.94% had taken only one dose and 1.68% were unimmunized. About 96.08% of pregnant women had taken iron folic acid (IFA) supplementation. 78.77% delivered normally while one-fifth delivered through lower segment Caesarean section (LSCS). 20% of registered females delivered neonates with low birth weight. 97.21% pregnant mothers were found to be anemic. 19.55%, 59.22% and 18.44% pregnant women had mild, moderate and severe anemia, respectively. Moderate anemia was highest in second order pregnancies while severe anemia was highest in third order pregnancies. Severe anemia was higher among caesarean deliveries (28.95%) in comparison to normal deliveries (15.60%). There was statistically significant difference between hemoglobin levels of women who delivered low birth weight and those who delivered normal weight babies (p=0.017) and also between females who had received TT and those who were unimmunized (p=0.002).

Conclusion: Anemia in pregnancy continues to be a major public health challenge. Rigorous efforts for implementation of various maternal health schemes at grass root level are imperative to reduce its catastrophic consequences.

Keywords: Anemia, Antenatal, Cesarean, Low birth weight, Tetanus toxoid, Iron folic acid

Introduction

Anemia is one of the common diseases prevalent in all age groups affecting majority of population in India and globally, especially women, children and elderly, due to its multifactorial etiology including nutritional causes viz., deficiency of iron, vitamin B_{12}, folic acid and protein; blood loss due to hemorrhoids, ulcers, trauma, surgery, menstruation, delivery; drug related, especially anticancer drugs; genetic disorders like thalassemia, sickle cell anemia, etc. Thus anemia has multifactorial causation; however, iron deficiency is undoubtedly the most significant cause of nutritional anemia globally.[1]

According to United Nations (U.N.) declaration in 1997, anemia is a major public health problem. Globally two million people suffer from anemia or iron deficiency.[2] World Health Organization (WHO) estimated the prevalence of anemia in pregnant women to be 14% in developed and 51% in developing countries, while it was estimated to be 65% -75% in India.[3] Anemia in pregnancy accounts for 1/5th of maternal deaths globally and India alone has a major share of about 80% of the maternal deaths in South Asia.[4] About 50% of maternal deaths occur in the first 24 hours following birth, mostly due to PPH (post-partum hemorrhage), of which anemia is one of the most important causes.[5]

Anemia is the most common disorder which contributes significantly to high maternal mortality besides various other adverse effects on the mother and her fetus like developmental anomalies, IUGR (intra-uterine growth retardation), abortions, preterm deliveries, low birth weight, and even intra-uterine, perinatal and neonatal deaths, besides various other associated maternal symptoms such as palpitations, tachycardia, breathlessness, pre-eclampsia, PPH, sepsis and increased cardiac output leading to cardiac stress which may in-turn cause cardiac failure.[6]

Hb estimation is the most practical and cost-effective method of diagnosis of anemia. As per World Health Organization, anemia in pregnancy is categorized into three categories based on measurement of Hb concentration viz., (i) Mild – 10-10.9 gm% (ii) Moderate - 07-9.9 gm% and (iii) Severe – lower than 07 gm%.[7]

Iron deficiency is probably the most common nutritional deficiency in the world and it exists ubiquitously among all kinds of anemia during pregnancy due to high fetal demands for iron. Besides iron deficiency, other risk factors associated with anemia in pregnancy are malnutrition, unhealthy lifestyle, hemoglobinopathies, age (<20 years or > 35 years), twin or multiple pregnancies, repeated and closely-spaced pregnancies, smoking, alcohol abuse, history of menstrual disorders or past infections.[8,9]

India became the first developing nation to take up National Nutritional Anemia Prophylaxis program (NNAP) to prevent anemia among pregnant women which was initiated in 1970 during the 4th five- year plan with the aim of reducing prevalence of anemia to 25%.[10] Supply of free iron pills, free investigations and treatment, conduct of regular Antenatal care (ANC) clinics under various schemes like Janani Surakhsha Yojna, Janani Sishu Surakhsha Karyakaram, Pradhan Mantri Surakshit Matritva Abhiyan (PMSMA) is being provided to pregnant mothers in India.

As per guidelines of Ministry of Health & Family Welfare, Government of India, a daily dose of 100 mg of elemental iron with 0.5 mg folic acid is recommended for 180 days during second and third trimesters and is adequately available in all government health institutions across India.[10] Irrespective of the availability and affordability of low cost effective interventions for prevention and treatment of anemia among pregnant women, its prevalence is still high in India.[3] With this background, the present study was conceptualized with the objective of studying the prevalence of anemia and its associated risk factors among pregnant women attending a secondary level health care center in North India.

Materials and Methods

A retrospective study of records maintained in Antenatal Care register at District Hospital Udhampur, in Udhampur district of the union territory of Jammu and Kashmir from 01/03/2018 to 28/02/2019 i.e., one year, was conducted to study the prevalence of anemia among registered pregnant females. Permission for collection of data was taken separately from the concerned hospital authority.

The relevant information for each registered case/ antenatal female from the antenatal register including age, order of pregnancy, last menstrual period, expected date of delivery, number of antenatal check-ups, tetanus-toxoid immunization, iron-folic acid supplementation, weight and blood pressure measurement, hemoglobin estimation, date and type of delivery, pregnancy outcome and weight at birth was recorded. All the data was scrutinized and compiled in MS-Excel. The registered females were further grouped according to age, religion, immunization status, order of pregnancy

etc. using percentages and proportions. The association of anemia with variables such as age of mother, order of pregnancy, tetanus toxoid immunization, iron folic acid intake, type of delivery, pregnancy outcome and birth weight was studied using Chi square test for trends in an open-source software Open Epi version 3.01.

Results

Mean age of antenatal females was 27.68±4.59 years (Range: 18 – 45 years). As observed in Table 1, maximum number of pregnant women were in the age group of 25 to 34 years (n=122), and least in the age group of >35 years (n=13). Majority were Hindus by religion (93.30%) and first- time mothers (62.57%). About 160 (89.38%) had taken either two doses of TT or Booster in the current pregnancy and were considered fully immunized, while 16 (8.94%) had taken only the first dose and only three (1.68%) were unimmunized. There were only 3.92% of pregnant women who had not taken IFA supplementation. A total of 97.21% (n=174) pregnant mothers were found to be anemic in the present study. About 141women (78.77%) delivered normally and one fifth (n=38) delivered through LSCS. No still births were reported. Four-fifths of registered females delivered neonates with normal birth weight (≥2.5 kg) whereas approximately 20% delivered neonates with low birth weight (<2.5 kg).

As seen in Table 2, 35 (19.55%) pregnant women were mildly anemic, 106 (59.22%) had moderate anemia and 33 (18.44%) were severely anemic. More than half of females in each age group were moderately anemic. Moderate anemia was highest in second order pregnancies (62.5%) while severe anemia was highest in third order pregnancies (26.32%). When association of anemia was compared between age groups <25 years and ≥25 years and between first order and ≥ 2nd order pregnancies using Chi square for trends, both the groups were comparable as there was no statistically significant difference between the two groups. However, regarding TT immunization, there was statistically significant difference (p=0.002) between females who had received first, second or booster dose during current pregnancy and those who were unimmunized. Among women who had taken IFA, only 17.44% were severely anemic as against 42.86% severely anemic women among those who did not take IFA; but these differences were not statistically significant. Similarly, percentage of severe anemia was higher among caesarean deliveries (28.95%) in comparison to normal deliveries (15.60%). No still births were reported but there was statistically significant difference (p=0.017) between hemoglobin levels of women who delivered low birth weight babies and those who delivered normal weight babies.

Table 1: Distribution of pregnant women according to demographic and health variables (n=179)

Age-group (years)	Number of pregnant women registered (n=179)	Percentage (%)
18 – 24	44	24.58
25 – 34	122	68.16
>35	13	7.26
Religion		
Hindu	167	93.30
Muslim	8	4.47
Sikh	4	2.23
Order of pregnancy		
1st	112	62.57
2nd	48	26.82
3rd	19	10.61
TT immunization*		
Full immunization	160	89.38
Partial immunization	16	8.94
No immunization	3	1.68
IFA intake**		
Taken	172	96.08
Not taken	07	3.92
Severity of anemia		
No anemia	5	2.79
Mild	35	19.55
Moderate	106	59.22
Severe	33	18.44
Type of Delivery		
Normal	141	78.77
Cesarean Section	38	21.23
Pregnancy outcome***		
Live Birth	179	100.00
Still Birth	Nil	Nil
Birth weight		
<2.5 kg	35	19.55
≥2.5 kg	144	80.45
Total	**179**	**100.00**

*Full TT (Tetanus Toxoid) immunization was taken as two doses of TT or booster; Partial immunization signifies one dose of T.T in the present pregnancy**Intake of IFA (Iron Folic Acid) for 100 days in the current pregnancy. ***There were no twin births or multiple pregnancies

Table 2: Association of hemoglobin levels of pregnant women with demographic and health variables (n=179)

Variable	Normal Hb (≥11.00 gm%) n=5	Mild anemia (10-10.9 gm%) n=35	Moderate (7-9.9 gm%) n=106	Severe (<7 gm%) n=33	Total	Percentage (%)
Age group (year)	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**n**	
18 -24	0	6 (13.64)	29 (65.91)	9 (20.45)	44	*$\chi 2$=1.83; p=0.176
25 -34	5 (4.10)	26 (21.31)	70 (57.38)	21 (17.21)	122	
≥35	0	3 (23.08)	7 (53.84)	3 (23.08)	13	
Order of pregnancy						
1st	5 (4.46)	22 (19.64)	66 (58.93)	19 (16.96)	112	*$\chi 2$=1.75; p=0.186
2nd	0	9 (18.75)	30 (62.50)	9 (18.75)	48	
3rd	0	4 (21.05)	10 (52.63)	5 (26.32)	19	
TT immunization*						
Taken	5 (2.84)	35 (19.89)	106 (60.23)	30 (17.04)	176	*$\chi 2$=9.48; p=0.002
Not taken	0	0	0	3 (100.00)	3	
IFA tablets						
Taken	5 (2.91)	34 (19.77)	103 (59.88)	30 (17.44)	172	*$\chi 2$=2.68; p=0.101
Not taken	0	1 (14.28)	3 (42.86)	3 (42.86)	7	
Type of Delivery						
Normal	4 (2.84)	28 (19.86)	87 (61.70)	22 (15.60)	141	*$\chi 2$=1.12; p=0.292
Cesarean section	1 (2.63)	7 (18.42)	19 (50.00)	11(28.95)	38	
Pregnancy outcome						
Live birth	5 (2.79)	35 (19.55)	106 (59.22)	33 (18.44)	179	NA
Still birth	0	0	0	0	0	
Birth weight						
Low (<2.5 kg)	0	7 (20.00)	14 (40.00)	14 (40.00)	35	*$\chi 2$=5.67; p=0.017
Normal (≥2.5 kg)	5 (3.47)	28 (19.45)	92 (63.89)	19 (13.19)	144	

*Extended Mantel-Haenszel Chi square for linear trend

Discussion

The present study revealed a very high prevalence of anemia i.e., 97.21% among pregnant mothers which is in accordance with the studies of Toteja GS *et al*. and Sharma JB *et al*. who reported the percentage of prevalence of anemia as 84.9% in 16 districts of 11 states of India and 96% in Delhi, respectively.[11,12] Faruk Ahmed reported the prevalence of anemia to be 49% among pregnant women in rural Bangladesh, whereas De Benoist *et al*. reported world-wide prevalence of anemia (1993-2005, WHO Global Database) as 41.8%.[13,14] Another national survey reported 47.5% of the pregnant mothers to be anemic, while another survey conducted in Ethiopia observed an overall prevalence of anemia as 21.3%; but these figures are much lower than the present study.[15,16]

In the current study, percentages of mild, moderate and severe anemia were recorded as 19.55%, 59.22% and 18.44%, respectively. However, Toteja G.S. *et al*. and Sharma JB *et al*. reported lower percentage of severe anemia to the tune of 13.1% and 5.3%, respectively, while EN Nwizu *et al*. reported 12.7% and 4.3% of the women to be having mild and moderate anemia, respectively.[11,12,17]

Regarding overall immunization coverage, the present study revealed that 98.32% of pregnant females received at least one dose of tetanus toxoid (T.T.) immunization. Banerjee reported that 80% of pregnant mothers were immunized for T.T., which is in concordance with the present study.[18] Another study in Jammu region also reported that 86.7% of pregnant women were covered under TT immunisation.[19] In contrast, a lower coverage for T.T. (42%) was recorded in Bihar by Yadav and Singh.[20] Regarding full immunization, the present study showed that 89.38% pregnant females were fully immunized which is in contrast to the findings of other

studies conducted in Ethiopia and Delhi that reported 51.8% uptake of T.T among mothers who gave birth in the past 12 months and 54.6% among pregnant females, respectively.[21,22] Metgud *et al*, found that 70.77% pregnant females had received either two doses or one booster dose, whereas Singh and Yadav (2000) reported that 53% of pregnant women had taken either both the doses of T.T. immunization or a booster dose.[23,24] Similarly, Rafiq *et al*. observed in his study that only 50.9% of pregnant women were fully immunized in Srinagar.[25] The present study also revealed that only 8.94% of pregnant mothers were partially immunized which is in contrast to a much higher percentage of 49.41% and 42.6% found by Rafiq *et al*. and Talwar *et al*., respectively in their studies.[22,25] Also 1.68% pregnant women were not immunized in this study whereas 10.8% was the observed proportion for the same by Agarwal OP *et al*.[26]

The current study also showed that 96.08% pregnant women had taken iron-folic acid tablets, whereas studies conducted by other authors reported that 59.68%, 52.6% and 32.62% had taken IFA supplementation, respectively.[19,23,25] However, a much lower coverage of only 5.8% was reported by Lal *et al*. in his study,[27] while another study in East Delhi reported that 27.2 percent antenatal females did not receive any iron/folic acid tablets.[26]

The present study revealed that 100%, 95.9% and 100% mothers among all pregnant women were anemic corresponding to the age group of 18-24 years, 25-34 years and greater than 35 years, respectively. Alemayehu and Zewde observed in their cross-sectional study that 32.4%, 41.9% and 33.3% of pregnant mothers were anemic corresponding to the age range of 32-38 years, 39-45 years and >45 years, respectively.[16]

Regarding the pregnancy outcome, in the present study, 100% of live births were recorded and not even a single case of still birth was noted. This is in accordance with the study conducted by Manpreet Kaur *et al*. who also reported zero cases of still birth.[28]

The present study revealed that 19.55% neonates were born with low birth weight in contrast to the findings of Rahman MM *et al*. who reported 12% low-birth-weight babies overall in low and middle-income countries and attributed it to maternal anemia.[29]

Conclusion

It was concluded from the present study that anemia continues to be a major public health challenge and unrelenting measures should be taken to eradicate maternal anemia at individual and community levels, which include awareness of mothers regarding anemia, its causes and implications, nutritional supplementation, dietary intake of iron, proteins, locally available fruits and vegetables especially rich in iron, maximum compliance to prescribed iron supplements, antenatal visits, etc. This is achievable through frequent visits by the teams of ASHA, Anganwadi worker and ANM (Auxiliary Nursing Midwife) to the homes of pregnant mothers. Concerted efforts for thorough implementation of various national schemes and programs designed for antenatal females are the need of the hour so that the goal of 'anemia mukt bharat' is achieved.

Conflicts of Interests

Nil

References

1. De Maeyer EM, Gurney DP, Michael J, Hallberg L, Sood SK. Preventing and controlling iron deficiency anemia through primary health care: a guide for health administrators and programme managers. Geneva: World Health Organization; 1989. [Accessed June 20th 2022]. Available from: https://apps.who.int/iris/handle/10665/3984.
2. UNICEF & Micronutrient Initiative. Vitamin and mineral deficiency: a global progress report. Ottawa: Micronutrient Initiative and UNICEF; 2004.
3. Kalaivani K. Prevalence and consequences of anemia in pregnancy. Indian J Med Res 2009;130:627-33.
4. Beutler E. History of iron in medicine. Blood Cells Mol Dis 2002;29(3):297-308.
5. World Health Organization. WHO recommendations for the prevention and treatment of postpartum haemorrhage. Geneva: World Health Organization; 2012. [Accessed June 20th 2022]. Available from: https://apps.who.int/iris/bitstream/handle/10665/75411/9789241548502_eng.pdf.
6. Sharma JB, Shankar M. Anemia in pregnancy. JIMSA 2010;23:253-260.
7. WHO. Haemoglobin concentrations for the diagnosis of anaemia and assessment of severity. Vitamin and Mineral Nutrition Information System. Geneva: World Health Organization; 2011 (WHO/NMH/NHD/MNM/11.1). [Accessed June 13th, 2022]. Available from: http://www.who.int/vmnis/indicators/haemoglobin.pdf.

8. Fareh OI, Rizk DE, Thomas L, Berg B. Obstetric impact of anemia in pregnant women in UAE. J Obstet Gynecol 2005;25(5):440-4.
9. Baysal E. Molecular basis of Thalassemia in UAE. Haemoglobin 2011;35(5-6):581-8.
10. Kishore J. National Health Program of India 11th Edition. New Delhi: Century Publications; 2014.
11. Toteja GS, Singh P, Dhillon BS, Saxena BN, Ahmed FU, Singh RP, *et al*. Prevalence of anemia among pregnant women and adolescent girls in 16 districts of India. Food Nutr Bull 2006;27(4):311-5.
12. Sharma JB, Soni D, Murthy NS. Effect of dietary habits on prevalence of anemia in pregnant women of Delhi. J Obstet Gynecol Res 2003;29(2):73-8.
13. Ahmed F. Anaemia in Bangladesh: a review of prevalence and aetiology. Public Health Nutr 2000;3(4):385-93.
14. World Health Organization. Worldwide prevalence of anaemia 1993-2005: WHO global database on anaemia. Edited by Bruno de Benoist, Erin McLean, Ines Egli and Mary Cogswell. Geneva: World Health Organization; 2008. [Accessed June 13th, 2022]. Available from https://apps.who.int/iris/handle/10665/43894.
15. Bharati P, Som S, Chakrabarty S, Bharati S, Pal M. Prevalence of anemia and its determinants among non-pregnant and pregnant women in India. Asia Pac J Public Health 2008;20(4):347-359.
16. Jufar AH, Zewde T. Prevalence of anemia among pregnant women attending antenatal care at Tikur Anbessa specialized hospital, Addis Ababa Ethiopia. J Hematol Thromb Dis 2014;2:125.
17. Nwizu EN, Iliyasu Z, Ibrahim SA, Galadanci HS. Socio-demographic and maternal factors in anaemia in pregnancy at booking in Kano, northern Nigeria. Afr J Reprod Health 2011;15(4):33-41.
18. Banerjee B. Maternal care rendered at an urban health centre of a metropolitan city Indian J Community Med 2006;31:183–4.
19. Sahni B, Sobti S. Utilization of antenatal care among pregnant females registered at sub centre level in a rural area of Jammu in India. International J Healthcare Biomed Res 2013;1(4):269-78.
20. Yadav RJ, Singh P. Immunization status of pregnant women in Bihar. Indian J Community Med 1998;23(1):15-18.
21. Gebremedhin TS, Welay FT, Mengesha MB, Assefa NE, Werid WM. Tetanus toxoid vaccination uptake and associated factors among mothers who gave birth in the last 12 months in Errer district, Somali regional state, Eastern Ethiopia. Biomed Res Int 2020;2020:4023031.
22. Talwar R, Chitkara A, Khokhar A, Rasania SK, Sachdwa TR. Determinants of utilization of ante- natal care services, amongst attendees in a publication health and population sector hospital in Delhi. Health Popul Perspect Issues 2005;28(3): 154-163.
23. Metgud CS, Katti SM, Mallapur MD, Wantamutte AS. Utilization patterns of antenatal services among pregnant women: a longitudinal study in rural area of north Karnataka. Al Ameen J Med Sci 2009;2(1):58-62.
24. Singh P, Yadav RJ. Antenatal care of pregnant women in India. Indian J Community Med 2000;25(3):112-117.
25. Rafiq M, Bilquees S, Masoodi MA. Coverage evaluation survey of immunization programme in hilly and plain areas of field practice area of government medical college, Srinagar. JK Practitioner 2004;11(2):149-158.
26. Aggarwal OP, Kumar R, Gupta A, Tiwari RS. Utilization of antenatal care services in peri urban area of East Delhi. Indian J Community Med 1997;22(1):29-32.
27. Lal S, Kapoor S, Vashisht BM, Punja MS. Coverage and quality of maternal and child health services at sub center level. Indian J Community Med 200;26(1):16-20.
28. Kaur M, Chauhan A, Manzar MD, Rajput MM. Maternal anemia and neonatal outcome: a prospective study on urban pregnant women. J Clin Diagnostic Res 2015;9(12):QC04.
29. Rahman MM, Abe SK, Rahman MS, Kanda M, Narita S, Bilano V, *et al*. Maternal anemia and risk of adverse birth and health outcomes in low- and middle-income countries: systematic review and meta-analysis. Am J Clin Nutr 2016;103(2): 495-504.