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Original Research Article

Risk factors of severe anemia among the pregnant women from an underprivileged rural area of northern India: a multivariate analysis

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ABSTRACT

Background: India serves as a home to 45.7% of anemic pregnant women (aged 15-49) with anemia of any grade during the course of their pregnancy. This study aims to estimate the prevalence of anemia and associated risk factors of severe anemia among pregnant women.
Methods: Eligible antenatal women irrespective of period of gestation were screened for presence of anemia with help of hemoglobin (Hb) value at the time of admission. Typing of anemia was done. Detailed history was followed by physical examination. Univariate and multivariate analysis was done to study the risk factors of severe anemia among the study subjects.
Results: Of total, 22.1% women were found to be severely anemic. Severely anemic women having residence in a rural area without road had odds more than twice (AOR=2.14) compared to severely anemic women having residence in a rural area connected with road (p=0.018). Similarly, severely anemic women aged <25 years (AOR=2.70), Illiterate (AOR=3.12), marriage age <18 years (AOR=2.33), having age at 1st pregnancy as <19 years (AOR=1.93), undergone ≤3 ANC visits (AOR=3.95). Anemic women with gravida score ≥4 had more than 4 times risk (AOR=4.15).
Conclusions: The significant risk factors of severe anemia among pregnant women as observed in this study were having residence in a rural area without road, age <25 years, illiteracy of mother, marriage age (<18 years in completed years), age at 1st pregnancy as <19 years, ≤3 ANC visits, gravidity ≥4 and non-sanitary type toilet facility at home.

Keywords: Anemia, Maternal, Prevalence, Pregnancy

INTRODUCTION

India still remains a home to 45.7% of anemic pregnant women (aged 15-49) with anemia of any grade during the course of their pregnancy.[1] Moreover anemia in pregnancy among Indian women have remained stubbornly resistant to improvement despite multiple efforts. Anemia in pregnancy is recognized as a major public health problem in India leading to high maternal morbidity and mortality, low birth-weight and high infant mortality.[2] In our country, 16% of maternal deaths are directly due to anemia.[3]

In addition to being a medical condition, anemia is an important socio-economic issue. A complex relationship of political, ecological, social, and biological factors determines the prevalence of anemia in a population. The most common cause of anemia in pregnancy worldwide is iron deficiency.

Its predisposing factors include grand multiparity, low socioeconomic status, malaria infestations, human immuno-deficiency virus (HIV) infection and inadequate child spacing, younger age, lower nutritional status, lactation/breastfeeding, poor access to nutritious diet during pregnancy.[4]

Mewat (Nuh) in Haryana has been declared as the most backward district of the country according to latest ranking done by Niti Aayog.[5] In areas like Nuh district, indicators are even worse. According to DLHS-4, pregnant women (15-49 years aged) in urban having anemia is 63.2% and in rural it is 67.9%, out of three, pregnant woman having severe anemia are 17.4% while in rural it is 17.5%.[6] Better understanding of the burden and underlying risk factors of anemic pregnant women will help us in better management and prevention of the anemia. Paucity of literature from this underprivileged area also warrants this investigation. Therefore, we planned this study to estimate the prevalence of anemia and associated risk factors with severe anemia in pregnant women seeking care at a tertiary care centre of northern India.

METHODS

The present cross-sectional study was planned and rolled out under the aegis of department of obstetrics and gynecology at a tertiary care teaching medical college and hospital situated at a lone aspiration district Nuh of southern Haryana. Study was conducted for a period of six months from May 2020 to October 2020.

During the study period, all antenatal women irrespective of period of gestation, admitted in department of obstetrics and gynecology were screened for presence of anemia with help of hemoglobin (Hb) value at the time of admission. On the basis of the hemoglobin levels, anemia was classified into mild (Hb 10.0-10.9 gm%), moderate (Hb 7.0-9.9 gm%) and severe (Hb <7.0 gm%). Women with Hb levels <11 gm% were classified as anemic, according to Indian Council of Medical Research (ICMR) and World Health Organization (WHO) classification.[7]

Typing of anemia was done on the basis of morphological findings on peripheral blood smear examination by the same pathologist for all cases. Venous sample was collected from all the cases in ethylenediaminetetraacetic acid (EDTA) vacutainer and analysed with an automated 5-part haematology analyzer Horiba Pentra XL 80 in the pathology department of the central laboratory.

Complete clinical history including socio-demographic data, obstetric history, menstrual history, dietary history, history of anemia in past, and any blood transfusion history was taken from all the participants. General examination was done. Special emphasis was given on the features important for anemia, such as pallor, angular cheilitis, glossitis, oedema, and koilonychia. All antenatal women with anemia (Hb<11 gm%) and /or any signs and symptoms of anemia were included in the study irrespective of period of gestation. Antenatal women with any complications (pre-eclampsia, multiple pregnancies, heart disease, bleeding diathesis or any other medical illness) were excluded from the study. Study tool was a slight modification of a questionnaire used in previous study.[8] Pilot testing was done on 10 subjects and based on that a few modifications were done in the questionnaire.

The study was instituted only after obtaining necessary clearance from institutional ethics committee of the medical college vide letter number EC/OA-61/2019 dated 24/10/2019. Anonymity and confidentiality were maintained during data collection as well as data storage by keeping file containing identity related details password protected. Any possible personal identifiers were delinked with the data before the analysis. Data collected was entered in Microsoft excel 7, and then data was analyzed using statistical package for social sciences (SPSS) 20.0 software package. Descriptive values were given as mean and standard deviation. Categorical variables have been expressed as the numbers of cases and percentage value. Severe anemia was considered as dependent variable in the study. Initially unadjusted analysis was performed to study the association of individual covariates with the outcome of interest. The final model was built using a parsimonious stepwise approach that combined all univariate associations with a p value of less than 0.05, discarding anywhere the p value increased to >0.05 in the multivariable model.

RESULTS

A total of 178 pregnant women were admitted, out of which 22 women did not give consent for the study. Among 156 women, 104 women were found to be anemic. Thus, data of 104 study subjects was included in final analysis. The overall prevalence of anemia in our study was found to be 66.67%. Further 22.1% women were found to be severely anemic, 44.2% were moderately and 33.6% were mildly anemic.

Out of 104 cases, most of them were in the age group of 18-24 years (54.8%) followed by 25-29 years (25%). 16.34% cases with severe anemia belonged to age group of 18-29 years. More than half of pregnant patients were illiterate (56.7%). Severity of anemia was found to be more in illiterate group, with 25% being moderately anemic and 12.5% with severe anemia.

Of total 104 all anemic pregnant women, 36 (34.62%) did not attain 18 years of age at the time of their marriage. Among them, twelve were found to be severely anemic. More than half of women had conceived for their first child before 19 years of age (56.7%). Frequency of all grades of anemia was higher in women with age at first conception less than 19 years, 20.2%, 26%, 10.6% with mild, moderate and severe anemia respectively.

Majority of study subjects were multiparous with parity ranging from 2-4 in 59.6% and grand multipara (>4

children) in 23% while 18 women (17.3%) were primigravida. 27 (25.9%) women reported to have taken no visits prior to admission in the hospital. While 21 women (20.1%) reported to have taken >3 visits. Severity of anemia was observed to be more (17.3%) in the group with no or inadequate (1-3) antenatal visits. At the place of stay of all 23 severely anemic pregnant mothers, 14 did not have sanitary type of toilet facility (Table 1).

Severely anemic women having residence in a rural area without road had odds more than twice (AOR=2.14, CI=0.55-5.38) compared to severely anemic women having residence in a rural area connected with road (p=0.018).

Similarly, severely anemic women aged <25 years (AOR=2.70, CI=1.05-6.65, p=0.025), illiterate (AOR=3.12, CI=1.18-7.09, p=0.040), marriage age <18 years (AOR=2.33, CI=1.07-4.42, p=0.045), having age at 1st pregnancy as <19 years (AOR=1.93, CI=1.14-6.80, p=0.031), undergone ≤3 ANC visits (AOR=3.95, CI=0.82-9.14, p=0.042). Anemic women with gravida score ≥4 had more than 4 times risk (AOR=4.15) of developing severe anemia as compared to women with gravida score <4. This observation was found to be statistically highly significant (p<0.001).

Having non sanitary type toilet facility at home was the only risk factor associated with a risk of developing severe anemia in the unadjusted analysis (COR: 2.38, 95% CI: 1.15-6.98, p=0.033), although this association did not persist in the multivariable analysis adjusting for all possible confounding factors (Table 2).

Table 1: Profile, pattern and prevalence of various grades of anemia among study subjects.

Variables	Severity of anemia, N (%)		
	Mild (n=35)	Moderate (n=46)	Severe (n=23)
Age (in years)			
<18	0 (0)	01 (0.96)	0 (0)
18-24	18 (17.31)	25 (24.04)	14 (13.46)
25-29	11 (10.58)	12 (11.54)	03 (2.88)
30-34	04 (3.85)	06 (5.77)	04 (3.85)
>34	02 (1.92)	02 (1.92)	02 (1.92)
Education			
Illiterate	20 (19.23)	26 (25)	13 (12.5)
Primary school	04 (3.85)	05 (4.81)	05 (4.81)
Secondary school	09 (8.65)	13 (12.5)	05 (4.81)
Graduate	02 (1.92)	02 (1.92)	0 (0)
Area of residence			
Rural with road	27 (77.14)	26 (56.52)	8 (34.78)
Rural without road	8 (22.86)	20 (43.48)	15 (65.22)
Urban	0 (0)	0 (0)	0 (0)
Age at marriage			
≥18	28 (80)	29 (63.04)	11 (10.6)
<18	7 (20)	17 (36.96)	12 (11.5)
Age at first pregnancy (years)			
<19	21 (20.2)	27 (26)	11 (10.6)
20-25	13 (12.5)	18 (17.3)	12 (11.5)
26-30	01 (0.96)	01 (0.96)	0 (0)
>30	0 (0)	0 (0)	0 (0)
Gravidity			
Primi	12 (11.5)	06 (5.7)	00 (0)
2-4	19 (18.2)	30 (28.9)	13 (12.5)
>4	04 (3.8)	10 (9.6)	10 (9.6)
Number of antenatal checkup visits			
0	06 (5.7)	14 (13.4)	07 (6.7)
1-3	20 (19.2)	25 (24)	11 (10.5)
>3	09 (8.6)	07 (6.7)	05 (4.8)
Toilet facility at home			
Sanitary type	27 (77.14)	34 (73.91)	9 (39.13)
Non sanitary type	8 (22.86)	12 (26.09)	14 (60.87)

Table 2: Risk factors associated with severe anemia during pregnancy.

Variable	All anemic women N (%)	Severely anemic women N (%)	Unadjusted OR (95% CI)	P value	Adjusted OR (95% CI)	P value
Area of residence						
Rural with road	61 (58.66)	8 (34.78)	1.00 (reference)	-	1.00 (reference)	-
Rural without road	43 (41.34)	15 (65.22)	2.35 (0.60 – 5.77)	0.073	2.14 (0.55-5.38)	0.044†
Age (in years)						
≥25	58 (55.77)	14 (60.87)	1.00 (reference)	-	1.00 (reference)	-
<25	46 (44.23)	09 (39.13)	3.01 (1.20-7.65)	0.071	2.70 (1.05-6.65)	0.025†
Educational status						
Literate	45 (43.27)	10 (43.48)	1.00 (reference)	-	1.00 (reference)	-
Illiterate	59 (56.73)	13 (56.52)	3.81 (0.93-7.24)	0.048†	3.12 (1.18-7.09)	0.040†
Marriage age (in completed years)						
≥18	68 (65.38)	11 (47.83)	1.00 (reference)	-	1.00 (reference)	-
<18	36 (34.62)	12 (52.17)	2.27 (1.38 – 5.05)	0.056	2.33 (1.07-4.42)	0.045†
Age at 1st pregnancy						
≥19	45 (43.27)	12 (52.17)	1.00 (reference)	-	1.00 (reference)	-
<19	59 (56.73)	11 (47.83)	2.03 (0.95-6.38)	0.022†	1.93 (1.14-6.80)	0.031†
ANC visits						
>3	83 (79.81)	18 (78.26)	1.00 (reference)	-	1.00 (reference)	-
≤3	21 (20.19)	05 (21.74)	4.74 (1.01-10.45)	0.080	3.95 (0.82-9.14)	0.042†
Gravida						
<4	78 (75.00)	13 (56.52)	1.00 (reference)	-	1.00 (reference)	-
≥4	24 (25.00)	10 (43.48)	4.70 (1.37-11.54)	0.019†	4.15 (1.61-12.33)	0.0001‡
Toilet facility						
Sanitary type	70 (67.31)	09 (39.13)	1.00 (reference)	-	1.00 (reference)	-
Non sanitary type	34 (32.69)	14 (60.87)	2.38 (1.15-6.98)	0.032†	1.75 (1.04-5.32)	0.067

†p<0.05, ‡p<0.001

DISCUSSION

The overall prevalence of anemia was found to be 66.67% in our study similar to Hameed et al and DLHS-4 for Nuh district.[6] The similar study done by Rajamouli et al and Arnold reported the prevalence to be 58.36% and 56.4% respectively.[8,9] The prevalence of severe anemia was 22.1% in the study which was in contrast to 6.4% found by Hameed et al.[10] The reasons could be small sample size, variation in socioeconomic background, different dietary habits of inter-country and intracountry regions. Similar prevalence of 22.1% severe anemia was reported by Gautam et al (22.8%).[11]

The findings of our study are in coherence with other studies where maximum no. of pregnant women were in the age group of 18-29 years.[12] Anemia among age group of 18–29 years in our study was found to be 57.25% (27.8% mild, 35.58% moderate and 16.34% severe). Majority of anemic women were illiterate (56.7%) in coherence with the study done by Rajamouli et al and Agarwal et al.[8,13]

The study observed that 25.9% women had taken no antenatal visits and 53.8% women took inadequate (1-3) visits prior to admission which indicates the lack of awareness regarding the importance of early registration of pregnancy and poor health seeking behaviour in the area. The severity of anemia was also found to be more in this group. Regarding risk factors of severe anemia among pregnant women, to the best of my knowledge only a few studies are available as published literature till date. Therefore, authors find it difficult in comparing the results of this study with others.

In this study we observed that, severely anemic women aged <25 years had greater odds (AOR=2.70) compared to the odds of exposure among controls. This observation was found to be statistically significant on multivariate analysis that was statistically not significant on univariate analysis. Contrary to our findings, a study conducted in Southern Malawi in which there was no significant association between young maternal age and severe anemia.[14]

We observed in our study that anemic women with gravida score ≥4 had more than 4 times risk (AOR=4.15) of developing severe anemia as compared to women with gravida score <4. A systematic review and meta-analysis on determinants of anemia among pregnant women observed that primigravida women were 61% less likely to develop anemia during pregnancy as compared to multigravida women.[15] For this finding, a probable explanation may be given as it is a consequence of depletion of iron reserves owing to repeated pregnancies.

On the other hand, contrary to our study findings, Singh et al did not find any such association with gravidity, whereas another community-based study could not establish any linkage with parity.[16,17]

Surprisingly, having non sanitary type toilet facility at home was the only risk factor associated with a risk of developing severe anemia in the unadjusted analysis, later on while performing multivariable analysis after adjusting for all possible confounding factors, this association did not persist. Another study from Maharashtra, observed that operational community toilets did not come out as a risk factor for community risk factors associated with anemia during pregnancy at village level data.[18] Another multivariate analysis from southern part of India observed that presence of maternal diseases (OR=5.21) and husbands educational status (illiterate versus literate, OR=3.20) were the two risk factors which had strong and significant association with severe anemia in pregnancy.[19]

This study observed that anemia was more prevalent (56.7%) in women who had their first conception at age <19 years, similar to other study.[11] Similar to earlier studies, severe anemia was more often seen when the age at first pregnancy was <19 years and gravidity >2.[11] As in other studies, severity of anemia was found to be inversely related to education status.[11,17] These factors are amenable to education of girls, delaying the age at marriage and adequate spacing between consecutive births.

Regarding strength of this investigation, first and foremost, we looked for risk factors of severe anemia among pregnant women attending government health centre in a underprivileged area that is declared as 'the most backward district of India' NITI Aayog (Government of India), itself adds strength to this study. Secondly, findings of this study may inform ongoing programme for better management and prevention of the severe anemia among pregnant females as this investigation has generated the data on burden of various grades of anemia as well as the underlying risk factors of the severe anemia among pregnant women.

Now, regarding limitation of this study, firstly, small sample size is definitely an evident limitation of this investigation. Secondly, the prevalence of various parasitic infestation and chronic illnesses were not studied, so it is difficult to comment on the causes of higher prevalence of anemia in these subjects. Finally, serum ferritin for confirmation of diagnosis of iron deficiency anemia, spectrophotometric analysis of haemoglobin to rule out haemoglobinopathies and HPLC could not be performed in the subjects due to resource constrained setting.

CONCLUSION

Higher prevalence of anemia in pregnant women (66.67%) indicates that anemia still continues to be a major public health problem in our setting. The significant risk factors of severe anemia among pregnant women identified after stepwise multiple logistic regression analysis were having residence in a rural area without road, age <25 years, illiteracy of mother, marriage age (<18 years in completed years), age at 1st pregnancy as <19 years, ≤3 ANC visits, gravidity ≥4 and non-sanitary type toilet facility at home. It is the time to realize various risk factors for anemia prevailing in the local community. A multipronged approach with community-based interventions needs to be undertaken and existing ones strengthened after tailoring them as per the needs of the community for better management and prevention of the severe anemia among pregnant females.

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