A Cross-sectional Study on Prevalence and Determinants of Preconception Anemia in Women of Reproductive Age Group at Gandhinagar, Gujarat, India

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Abstract:

Introduction : Nutritional anemia is a major public health issue that affects women of all ages, notably those of reproductive age (15-49 years). Anemia has an adverse effect on the outcome of pregnancy including miscarriage, intrauterine growth retardation, low birth weight, post-partum hemorrhages and stillbirth. **Objectives:** It is to estimate prevalence of anemia and to investigate socio-demographic and obstetric factors associated with the prevalence of anemia during preconception period. **Method:** We conducted a cross-sectional study among 306 reproductive age group (15-49 years) women who were residing in field practice area of Urban Health Training Center (UHTC) in sector-24, Gandhinagar, Gujarat, India who are planning to conceive within a year. Study participants were selected from the records of the female health worker according to our inclusion and exclusion criteria for the study. **Results:** Out of 306 participant women, 76% were found to be anemic, out of which, 31% had mild, 55% had moderate and 14% had severe level of anemia. Education level significantly associated ($P < 0.05$) with presence of anemia as women with lower level of education had higher presence of anemia – 81.97% in primary education group and 79.17% among illiterate women. BMI, parity and family type was also found to be significantly ($P < 0.05$) associated with the severity of anemia. **Conclusion:** Nearly three fourth Women who planned to conceive within a year had anemia. Out of women who had anemia, nearly three fourth had moderate to severe anemia. Education had significant association with presence of anemia and low BMI, Parity and type of family had significant association with severity of anemia.

Keywords: Anemia, Preconception, Reproductive women

Introduction:

India is one of the countries with a very high prevalence of anemia in the world, especially nutritional anemia due to iron deficiency. NFHS-4 data suggest that anemia is widely prevalent among all age groups and 53% of women in the reproductive age group (15-49 years) are affected by it.[1] In Gujarat state, 65% of women in the reproductive age group have anemia, including 26% having mild anemia, 35% having moderate anemia, and 4% having severe anemia.[2] Numerous factors contribute to the development of anemia. In developing countries like India, early onset of childbearing, high number of births, short intervals between births, poor access to

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antenatal care, and insufficient iron supplementation significantly contribute to the occurrence of anemia during pregnancy. [3]

Anemia has an adverse effect on the outcome of pregnancy. Severe anemia during pregnancy impairs oxygen delivery to the fetus and interferes with normal intra-uterine growth, resulting in intrauterine growth retardation, stillbirth, low birth weight and neonatal deaths.[4] It predisposes to premature delivery, increased perinatal mortality and increased risk of death during delivery and postpartum.[5] Anemia contributes to postpartum hemorrhages[6] and affects the children by permanent reductions in children's cognitive capacity.[7] To mitigate the consequences of anemia, prophylactic iron and folic acid supplementation is provided weekly to all women of reproductive age and daily to pregnant women in India.[8] However, NFHS-4[1] data suggests inadequate adherence to this supplementation - only 30.3% of the pregnant women had consumed prophylactic iron and folic acid supplementation for at least 100 days.

Pregnancy is also one of the contributors for causing anemia. Pregnancy causes a disproportional increase in plasma and RBC volume, which produces a state of hemodilution. And also at term, there is a fall of about 2gm% hemoglobin from the non-pregnant value, called physiological anemia.[9] On top of that, iron demands are high during pregnancy and if anemic woman gets pregnant, it is very difficult to replenish her iron store later on.[5, 10] Hence when anemic women are planning to conceive within short duration without treating anemia, their anemia deteriorates further during pregnancy, potentially resulting in an unfavorable pregnancy outcome for both mother and child. Therefore, the women who are already anemic or have depleted iron stores just before conception, are to be investigated for anemia and if found anemic, advice should be given to postpone the pregnancy till the correction of the anemia.

With this background, study was conducted among the reproductive age women who were residing in a field practice area of an Urban Health Training Centre (UHTC) in sector 24, Gandhinagar and planning to conceive within a year. This study was done to determine the socio-demographic and obstetric factors associated with prevalence of anemia and also the severity of anemia so that targeted awareness efforts can be planned.

Method:

This cross-sectional study was carried out in the field practice areas of UHTC of Department of Community Medicine, GMERS Medical College, Gandhinagar during May-June 2016.

Total eligible couples as per records of the female health worker in the area were 1955, out of which authors have made a list of probable study participants according to inclusion criteria which included reproductive age women who were non-pregnant and non-lactating at that time, but planning to conceive within a year and hence not using any sort of contraception so sample size turned to be 352. Then home visits were done to ascertain their eligibility for the study, those who had not given informed written consent and during 3rd time home visit if probable participant was not present at home then we had included them in non-responder and they were excluded from the study. So, at the last total 306 eligible participants were invited to participate in the study. A pre-form validated questionnaire was used to collect the data. Questionnaire had two parts; one had oral questionnaire and the other included physical examination and investigation. Oral questionnaire was filled by authors themselves which included the basic demographic details like age, education, occupation and socio-ecomic status calculated from revised modified BG Prasad socioeconomic classification Scale, 2016. It included obstetrics history of the participant also. A complete general examination and systemic examination was done by lady medical office of urban health training center to exclude any existing illness.

BMI (Body Mass Index): Weight was measured in kilograms with standard digital weighing machine.

Weighing scales were standardized against known weight. The height was measured between top of the head (vertex) and bottom of the feet in upright position without footwear and headgear. It was measured in centimeters to exact point using calibrated fixed scales. BMI is used as the criterion for classifying nutritional status. BMI (also called Quetelet Index) is derived by dividing weight in kilograms by the square of height in meters. WHO guidelines were used for classifying the nutritional status of the participant.[11] Weight and height was measured by Medical social workers of the department of community medicine posted at UHTC.

Blood Examination: Participants were explained about the procedure for blood sample collection and their consent was taken for the same. Capillary blood was taken after finger prick by sterile lancet. Hemoglobin concentration was measured on the field using portable Sahli's hemoglobin method. Anemia grade was assessed adopting WHO recommended classification.[12] Hemoglobin estimation was done by trained public health nurse and laboratory technician of the community medicine department posted at the UHTC. Emergency kit was made available to them and training was done to deal with any emergencies related to needle prick.

Data Entry and Statistical Analysis: Data entry and analysis was done in software Epi Info version 7.0. Chi-square test was used to find statistical significance.

Ethical Issues

Written informed consent was taken from the study participants. Anybody found to be having illness was treated for the same. Institutional ethical clearance was obtained for the study. Participants were also given an informed consent sheet to sign and a participant information sheet, without which, further proceedings were not carried out.

Results :

Out of 306 participant women, 234 (76.47%) had anemia of varying severity. Table 1 shows that out of all anemic women, 30.77% had mild anemia,

Table 1: Prevalence of anemia in reproductive age-group of 15-49 years who are planning to conceive

Anemia	Number (%)
Mild (11-11.9 gm/dl)	72 (30.77 %)
Moderate (8-10.9 gm/dl)	128 (54.7 %)
Severe (<8 gm/dl)	34 (14.53 %)
Total	**234**

54.7% had moderate anemia, and 14.53% had severe anemia. (Table 1)

Table 2 shows the distribution of several socio demographic factors (like age, education, family size etc.) in participant women and prevalence of anemia in each group. Among all 306 participant women, 38.56% were in the age group of 20–24 years, followed by 31.37% women in age group 25-29 years. Majority of women had low level of education with 39.86% having primary education and 31.37% being illiterate. Hindus constituted majority 97.38% among the participants with other religions constituting 2.61%. 89.22% women worked as housewives and 66.0% women lived in joint family. Majority were belonged to low socioeconomic class.

High prevalence of anemia was found among the age group of 25-29 years (82.29%) compared to other age groups, although the difference was not statistically significant. Significant negative association was found between the level of education and prevalence of anemia. Women with lower level of education had higher presence of anemia – 81.97% in primary education group and 79.17% among illiterate women. Whereas the women with higher level of education showed less prevalence of anemia and this difference was found to be statistically significant (P<0.05). Other socio-demographic factors including occupation, religion and type of family and socioeconomic status did not show considerable association with anemia.

Table 3 shows distribution of BMI and obstetric factors, and prevalence of anemia in each group.

Table 2: Association of socio demographic factors with anemia

Variable	Total N=306(%)	Anemia N=234(%)	Non-anemia N=72(%)	c^2 value p-value
Age (Years)				
<20	18 (5.88)	12 (66.67)	6 (33.33)	4.86
20-24	118 (38.56)	91 (77.12)	27 (22.88)	0.30
25-29	96 (31.37)	79 (82.29)	17 (17.71)	
30-34	47 (15.36)	33 (70.21)	14 (29.79)	
≥35	27 (8.82)	19 (70.37)	8 (29.63)	
Occupation				
Housewife	273 (89.22)	209(76.56)	64(23.44)	1.18
Laborer	19 (6.21)	14(73.68)	5(26.32)	0.76
Self-employed	12 (3.92)	10(83.33)	2(16.67)	
Employee	2 (0.65)	1(50)	1(50)	
Education				
Illiterate	96 (31.37)	76(79.17)	20(20.83)	13.99
Primary	122 (39.86)	100(81.97)	22(18.03)	0.003*
Secondary	77 (25.16)	54(70.13)	23(29.87)	
Higher secondary& above	10 (3.27)	4(40)	6 (60)	
Religion				
Hindu	298 (97.38)	228(76.51)	70(23.49)	0.37
Muslim	8 (2.61)	6(75)	2(25)	0.79
Family Type				
Nuclear family	104 (33.99)	75 (72.12)	29 (27.88)	1.66
Joint family	202 (66.01)	159 (78.71)	43 (21.29)	0.19
Socioeconomic Status				
Class 1 & 2	12 (3.92)	8 (66.67)	4 (33.33)	4.74
Class 3	39 (12.75)	25 (64.10)	14 (35.89)	0.19
Class 4	141 (46.08)	111 (78.72)	30 (21.28)	
Class 5	114 (37.25)	90 (78.95)	24 (21.05)	

* Denotes statistically significant finding (P < 0.05)

Majority of the 306 participant women (62.74%) had mid-range BMI, followed by low BMI (26.81%) and high BMI (10.46%). 87.9% women reported to have regular menstrual cycle. 19.28% women had abortion in the past whereas 17.97% chose not to answer. 78.1% nearly 50% women were multiparous.

Though the difference was not found to be statistically significant as the BMI <18.5 Kg/m^2 had higher prevalence of anemia (80.49%) compared to 18.5-24.9 (76.56 %,) and >24.9 (65.63%). Prevalence of anemia was found almost similar in Multiparous women, primiparous and nulliparous women. Women with and without a history of abortion also

Table 3: Association of BMI and obstetric factors with anemia

Variable	Total N=306(%)	Anemia N=234(%)	Non-anemia N=72(%)	c^2 value p-value
BMI (kg/m^2)				
<18.5	82(26.81)	66(80.49)	16(19.51)	2.83
18.5-24.9	192 (62.74)	147(76.56)	45(23.44)	0.24
>24.9	32(10.46)	21(65.63)	11(34.37)	
Parity				
Nulliparous	67(21.90)	52(77.61)	15(22.39)	0.06
Primiparous	85(27.78)	65(76.47)	20(23.53)	0.96
Multiparous	154(50.33)	117(75.97)	37(24.03)	
H/O Abortion				
Yes	59 (19.28)	47(79.66)	12(20.34)	0.43
No	192 (62.74)	145(75.52)	47(24.48)	0.81
Not-responded	55 (17.97)	42(76.36)	13(23.64)	
Menstrual History				
Menstrual cycle regular	269 (87.9)	206(76.58)	63(23.42)	0.0072
Menstrual cycle irregular	37 (12.1)	28(75.68)	9(24.32)	0.93

had similar presence of anemia (79.66% and 75.52%). Women with regular and irregular menstruation cycle had similar presence of anemia (76.58% and 75.68% respectively).

Table 4 shows prevalence of mild, moderate and severe anemia according to various factors. Mild anemia was found to be more common in elder women with age >24 years with highest presence in 25-29 years. Whereas moderate anemia was more common in lower age group, especially in <20 years age group (75%), followed by 20-24 years age group (65.93%). Severe anemia was higher in women >35 years of age (26.32%). But these differences were found to be not significant to show an association between age and severity of anemia. With increasing level of education, the severity of anemia was found to be decreasing, barring a few exceptions in education level of higher secondary and above where we had a sample size of only 4. Those with a history of abortion had more prevalence of severe anemia (21.28% as compared

to 14.48%), whereas women with abortion history showed higher prevalence of severe anemia. Women with irregular menstruation had more prevalence of severe anemia (21.43% as compared to 13.59%), whereas women with regular menstruation showed lower grade of anemia. However, menstruation cycle history, education level and abortion history didn't show a significant association with the severity of anemia. Women with low BMI (<18.5) had more moderate (59.10%) and severe types of anemia (22.73%) as compared to women with high BMI (>24.9) who had more mild anemia (52.38%), and this association was found to be statistically significant (P < 0.05).Severe anemia was more common in multiparous women (16.24%) than nulliparous women (9.62%), Women belonging to joint families had higher prevalence of severe anemia whereas women from nuclear families had more prevalence of moderate anemia. This trend was found to be statistically significant(P<0.05).

Table 4: Association of socio demographic, BMI and obstetrics factors with severity of anemia

Variable	Total N=234(%)	Mild N=72(%)	Moderate N=128(%)	Severe N=34(%)	c^2 value, p value
Age (Years)					
<20	12 (5.13)	2 (16.67)	9 (75)	1 (8.33)	14.35
20-24	91 (38.88)	21 (23.10)	60 (65.93)	10 (10.99)	0.07
25-29	79 (33.76)	31 (39.24)	34 (43.04)	14 (17.72)	
30-34	33 (14.1)	11 (33.33)	18 (54.55)	4 (12.12)	
≥ 35	19 (8.11)	7 (36.84)	7 (36.84)	5 (26.32)	
Education					
Illiterate	76 (32.47)	20 (26.32)	41 (53.95)	15 (19.73)	9.94
Primary	100 (42.73)	29 (29)	59 (59)	12 (12)	0.13
Secondary	54 (23.07)	22 (40.74)	27 (50)	5 (9.26)	
Higher secondary & above	4 (1.7)	1 (25)	1 (25)	2 (50)	
Family Type					
Nuclear	75 (72.12)	11 (14.67)	56 (74.67)	8 (10.67)	18.47
Joint	159 (78.71)	61 (38.36)	72 (45.28)	26 (16.35)	0.0001*
Socioeconomic Status					
Class 1 & 2	8 (66.67)	5 (62.5)	2 (25)	1 (12.5)	11.78
Class 3	25 (64.10)	10 (40)	11 (44)	4 (16)	0.066
Class 4	111 (78.72)	38 (34.23)	55 (49.55)	18 (16.22)	
Class 5	90 (78.95)	19 (21.11)	60 (66.67)	11 (12.22)	
Parity					
Nulliparous	52 (77.61)	27(51.92)	20(38.46)	5(9.62)	14.47
Primiparous	65(76.47)	18(27.69)	37(56.92)	10(15.38)	0.006*
Multiparous	117(75.97)	27(23.08)	71(60.68)	19(16.24)	
Abortion Status					
Yes	47 (20.08)	14 (29.79)	23 (48.94)	10 (21.28)	7.34
No	145 (61.96)	49 (33.79)	75 (51.72)	21 (14.48)	0.12
Non-responded	42 (17.94)	9 (21.43)	30 (71.43)	3 (7.14)	
BMI (kg/m^2)					
<18.5	66 (28.2)	12 (18.18)	39 (59.10)	15 (22.73)	12.36
18.5-24.9	147 (62.82)	49 (33.33)	80 (54.42)	18 (12.24)	0.01*
>24.9	21 (8.97)	11 (52.38)	9 (42.86)	1 (4.76)	
Menstrual History					
Menstrual cycle regular	206 (88.03)	65 (31.55)	113 (54.85)	28 (13.59)	1.4
Menstrual cycle irregular	28 (11.96)	7 (25)	15 (53.57)	6 (21.43)	0.5

* Denotes statistically significant finding (P < 0.05)

Discussion:

This study shows that the overall prevalence of anemia among reproductive age group women (15-49 years) was 76.47%. The result is higher than anemia reported in NFHS-4 (2015-16) for India (53%)[1] and in NHFS-5 (2019-20) for Gujarat (65%).[2] Prevalence of mild, moderate and severe anemia were 30.77%, 54.7% and 14.53% respectively, compared to the data of Gujarat[2] where it was 26%, 35% and 4% respectively. The high prevalence of anemia found in this study can be attributed to the population of this study which was more sampled from urban slum having more people from lower socio-economic background.

In the present study, there was significant association (P < 0.05) found between education level and prevalence of anemia as high prevalence of anemia was seen among illiterate women (79.17%) as compared to literate women (75.6%) as seen in studies in NFHS-4 India (illiterate 56% and literate 40%).[1] and data of NFHS-5 Gujarat 2019-20.[2] The prevalence of severe anemia was found to be slightly lower in educated women compared to illiterate women. This could be because gaining education may assist women in adopting healthy lifestyle patterns, access to a variety of meals rich in vitamins and minerals and hygiene routines, which can help them prevent anemia. This finding is also supported by other study.[13]

Study also found no link between women's age and anemia, similar to a study by Gautam et al.[14] In contrast, other studies conducted in Africa and Asia show correlation between women's age and anemia.[10-15] We posit that different geographical areas have different social, cultural, and dietary norms which may affect the results.

Women from joint families were found to have higher prevalence of anemia and we found significant association between family type (nuclear or joint) and severity of anemia. Ponny et. Al.[16] also found significant association between family type and anemia. Women belonging to lower socioeconomic class had higher prevalence and severity of anemia, although it wasn't statistically significant as reported by Sharma et al.[17]

In our study, underweight women with low BMI were slightly more likely to be anemic (80.49%) compared to women of midrange BMI which was also found in the study conducted by Hemamalini et al.[18] and also severe anemia was found more in the underweight women compared to women with midrange and high BMI (P<0.05). The finding was consistent with other studies done in developing countries of South Asia also. [19]

In this study, however, no significant association, women with a history of abortion were found to be slightly more anemic (79.66%) than the women with no abortion history (75.52%). This is inline with the study done by Uche-Nwachi et al.[20] Significant association was found by Sinha et al.[21] between miscarriage and severe anemia in contrast to this present study, although we found that history of abortion had a slightly higher rate of severe anemia. Study found that multiparous women were more prone to severe anemia than nulliparous women and this statistically significant result is consistent with the results Azhar et al.[22] also suggested that high parity exposes women to more frequent hemorrhage which could reduce iron store in the body and increase the risk of anemia.

In our study, we found no association between the irregularity of menstruation cycle and the prevalence of anemia. An earlier study by Miiller et al.[23] also argued that menstruation cycle has no significant correlation with iron deficiency. However, for women with heavy menstrual bleeding, increased loss of iron can lead to anemia.[24] Present study also observed that women with a normal menstrual cycle tended to have a milder form of anemia, whereas women with an irregular menstrual cycle had more severe form of anemia. But this trend was not statistically significant.

Conclusion:

The present study revealed that anemia is a major health problem among reproductive age group women who are planning to conceive in the urban slums of Gandhinagar. Women who are less educated had higher prevalence of anemia. Also, severity of the anemia is more prevalent among the women with low BMI, joint family or higher parity. Recommendation:

Before conception all the women should undergo hemoglobin estimation and after achieving desirable hemoglobin concentration women should plan for conception. Low BMI is associated with severity of anemia as well as it is itself a known risk factor for adverse outcome of pregnancy government need to be strengthen the health program for both. For broader and longer effects, women education should be promoted, especially in lower socio-economic communities, to ensure overall healthy lifestyle and lower risk of anemia related concerns before, during, and after pregnancy.

Declaration:

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Conflict of Interest: Nil

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