Research Article

A cross-sectional study of anemia among women of reproductive age group (15-49 years) in a rural population of Tamil Nadu

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ABSTRACT

Background: Iron deficiency is the most common nutritional disorder in the world, affecting particularly the women of reproductive age group in tropical and subtropical zones. In India, 20-40% of maternal deaths are due to anemia, and more than 50% of women do not have adequate iron stores for pregnancy. **Objectives:** To estimate the prevalence of anemia among women in the reproductive age (15-49) in a rural population and to find out the association with selected variables. **Materials and Methods**: This was a population-based cross-sectional study conducted in a rural population served by primary health center, Ulundai in Kadambathur block of Thiruvallur district in Tamil Nadu among women in reproductive age group of 15-49 years from February 2007 to May 2007. Sample size was calculated to be 381 and participants were selected by simple random sampling. Data were collected using a pre-tested interview schedule. **Results:** Out of 400 women, 390 women were only willing to give blood sample giving a response rate of 97.5%. The overall prevalence of anemia among reproductive age group women 15-49 years was found to be 53.3%. Prevalence of anemia decreased with increase in age and was found to be statistically significant. Maternal occupation and menstrual and obstetric factors such as age at menarche, amount of menstrual bleeding, length of menstrual cycle, pelvic inflammatory disease, number of live births, contraception use, pregnancy, and iron and folic acid (IFA**)** use were found to have statistically significant association with anemia. Women who were underweight, taking vegetarian diet, using open field for defecation, and passed worms in stools were found to have statistically significant association with anemia. Similarly, age at menarche 13-14 years, normal menstrual bleeding, taking mixed diet, regular wearing of footwear, taking deworming tablets recently (<6 months), and using sanitary latrines were found to be at lower risk of anemia. **Conclusion:** It is inferred from this study that sociodemographic, menstrual, obstetric, contraceptive, dietary, environmental, and behavioral factors were associated with anemia in reproductive age group. Hence, preventive measures such as IFA supplementation for adolescent girls and improving the environmental conditions have to be adopted to reduce the burden of the disease.

KEY WORDS: Anemia; Prevalence; Reproductive Age; Women; Tamil Nadu

INTRODUCTION

According to the World Health Organization (WHO, 1972).[1] Anemia is defined as, "a condition in which the hemoglobin concentration in the blood is below a defined level, resulting in a reduced oxygen carrying capacity of red blood cells." The most common type of anemia is due to nutritional factors and is also found especially among women of childbearing age group (15-49 years), pregnant, and lactating mothers.[2] Nutritional anemia is a worldwide problem, with the highest prevalence in developing countries.[3] Iron deficiency is the most common nutritional disorder in the world.[4] During the reproductive years, women are at risk of iron deficiency due to blood loss from menstruation.[5] The detrimental public health effects of iron deficiency anemia are retarded infant

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development, increased maternal and fetal mortality and morbidity, and reduced work performance.[6] In the world (excluding China), women among 15-49 years, 288.4 million (35% of non-pregnant and 43.9 million [51%] of pregnant) women are anemic.[7] In India, 20-40% of maternal deaths are due to anemia.[8] More than 50% of women do not have adequate iron stores for pregnancy.[9] According to the National Health Survey (NFHS-3, 2005-2006),[10] the prevalence of anemia among reproductive age group women of 15-49 years in overall Tamil Nadu was 53.3% and the prevalence was slightly higher in rural than urban areas. Hence, this study was chosen in a rural area of Tamil Nadu for identifying prevalence of anemia among reproductive age group women 15-49 years and the association of certain socioeconomic and cultural factors in anemia.

Objectives

1. To estimate the prevalence of anemia among women in the reproductive age group (15-49) in a rural population
2. To find out the association of certain socioeconomic and cultural factors with anemia.

MATERIALS AND METHODS

This was a population-based cross-sectional study conducted in a rural population served by primary health center, Ulundai in Kadambathur block of Thiruvallur district. This area is about 40 kms away in the north of Chennai city. The primary health center, Ulundai has six subcenters (Ulundai, Kottaiyur, Pannur, Mappedu, Kannur, and Thirumanikuppam) with total population of 28,475, of which 13,649 were males and 14,826 were females. Pannur subcenter was chosen for the pilot study. Hence, Ulundai subcenter was selected randomly from the remaining five subcenters, except Pannur subcenter. The selected subcenter (Ulundai) had five villages with a total population of 6259, with a target population (reproductive age group women of 15-49 years) of 1202. The data were collected over a period of 3 months extending from February 2007 to May 2007. All women in the reproductive age group of 15-49 years were included in the study.

Sample Size and Sampling

Based on a prevalence of 54%[10] in Tamil Nadu with limit of accuracy as 5%, the sample size worked out to be 381. The anticipated non-response in providing blood samples was 5%, and accordingly, the final sample size arrived at was 400. The women in the age group of 15-49 years were listed out from the village wise family register of the selected subcenter and were serially numbered. Using this as the sampling frame, 400 women were selected by simple random sampling method.

Development of Interview Schedule

An interview schedule was prepared and was pre-tested among 25 women in the reproductive age group of 15-49 years in Pannur village of Pannur subcenter in Ulundai primary health center area. The interview schedule used for the main study included identification number for the women, open- and closed-ended questions for collecting information from the reproductive age group women of 15-49 years regarding sociodemographic and cultural factors, menstrual disorders, obstetric history, contraceptive practices, diet and personal hygiene, and environmental sanitation of the women.

Ethical Issues and Data Collection

Permission to conduct the study was obtained from the Sri Ramachandra College and Research Institute Medical Ethics Committee and also from Deputy Health Services, Thiruvallur District. The purpose of the study was explained to the respondent individually and oral informed consent was obtained. Data were collected from reproductive age group women of 15-49 years by house-to-house visits with the help of the social health worker. The women were clinically examined for the presence of pallor in tongue, nails and conjunctiva, blood pressure, and pulse rate, which were also recorded. Anthropometric measurements, height and weight, and hemoglobin estimation of each woman were taken with the help of laboratory technician for estimating hemoglobin level. Estimation of hemoglobin level was done by finger prick method for collecting blood using sterile single use disposable lancet. The laboratory technician took 20 microliters of blood with micropipette and added 5 ml of Drabkin's solution. After 3 min, hemoglobin level was estimated by cyanmethemoglobin method with the help of colorimeter.

Measurement Techniques

The anthropometric data collected included height and weight.

1. Height: Standing height was measured to the nearest centimeter using a semi-flexible measuring tape. The measurement of height was made after removal of footwear and making the women stand upright on the flat floor near the wall with feet's together and with heel, buttocks, shoulder, and back touching the wall. The height was recorded by marking the upper limit using a scale
2. Weight: Weight was measured to the nearest kilograms using a portable weighing machine after removing footwear and other heavy accessories. Zero correction was verified before each measurement. The same weighing machine was used for all the women.

Data Analysis

The data entry and analysis was done using the statistical software IBM SPSS Version 20 software. Descriptive statistics such as percentages were used. Analysis was done using Chi-square test. Odds ratio with 95% confidence interval (CI) were calculated for the association between certain variables and anemia. $P < 0.05$ was taken as statistically significant.

Operational Definitions

Women education

As per census of India, "any person who is able to read and write with understanding in any languages" is considered as literate.

Pelvic inflammatory disease (PID)

PID in reproductive age group women was assessed based on three characteristics

- Chronic lower abdominal pain
- Fever
- Abnormal vaginal discharge.

When any two of the above were present, then suspected PID of the women was considered to be present.

RESULTS

Out of 400 women, 390 women were only willing to give blood sample giving a response rate of 97.5%. The overall prevalence of anemia among reproductive age group women 15-49 years was found to be 53.3% (95% CI = 48.4-58.3) (Table 1). Table 2 shows that in terms of grades of anemia, 130 (33.3%), 64 (16.4%), and 14 (3.6%) had mild, moderate, and severe anemia, respectively. Total pregnant women in the study were 31 (7.9%). The prevalence of anemia among pregnant women was 21 (67.7%) (95% CI = 51.3-84.1) and 14 (45.2%) and 7 (22.5%) of them had mild and moderate anemia, respectively, and none of the pregnant women had severe anemia. Prevalence of anemia among non-pregnant women was 187 (52.1%) (95% CI = 46.94-57.26). In terms of grades of anemia, 116 (32.4%), 57 (15.9%), and 14 (3.8%) had mild, moderate, and severe anemia, respectively among non-pregnant women.

Distribution of anemia by the age of the women was found to be statistically significant and it was found that as the age increases, the risk of anemia decreases. Certain socioeconomic factors such as maternal occupation and menstrual and obstetric factors such as age at menarche, amount of menstrual bleeding, length of menstrual cycle, PID, number of live births, contraception use, pregnancy, and iron and folic acid (IFA) use were found to have statistically significant association with anemia. Women who were underweight, taking vegetarian diet, using open field for defecation, and passed worms in stools were found to have statistically significant association with anemia. Similarly, age at menarche 13-14 years, normal menstrual bleeding, taking mixed diet, regular wearing of footwear, taking deworming tablets recently (<6 months), and using sanitary latrines were found to be at lower risk of anemia (Table 2).

Table 1: Prevalence of anemia in pregnant and non-pregnant women in the reproductive age group (15-49 years)

Anemia	Pregnant (%)	Non-pregnant (%)	Total (%)
No	10 (32.3)	172 (47.9)	182 (46.7)
Mild	14 (45.2)	116 (32.4)	130 (33.3)
Moderate	7 (22.5)	57 (15.9)	64 (16.4)
Severe	0 (0)	14 (3.8)	14 (3.6)
Total	31 (100)	359 (100)	390 (100)

DISCUSSION

The present study shows that the overall prevalence of anemia among reproductive age group women (15-49 years) in this rural population (Ulundai primary health center area) is high to the extent of 53.3%. This was also similar to study reported in NFHS-3 (2005-2006) for India (56.2%)[11] and Tamil Nadu (53.3%).[10] Prevalence of mild, moderate, and severe anemia were 33.3%, 16.4%, and 3.6%, respectively, similar to the study conducted in Andhra Pradesh where the prevalence of mild, moderate, and severe anemia were 32.4%, 14.2%, and 2.2%, respectively.[12] A study done in rural area of Amphoe Phon, Khonkaen in Thailand[13] showed that anemia prevalence among women in age group of 30-65 years was 26.4%and Nepal was 12.1%.[14] Prevalence of anemia in non-pregnant and pregnant women were 52.1% and 67.7%, respectively, which was slightly higher than the prevalence of anemia in pregnant women in India (49.7%)[11] and Tamil Nadu (57.1%)[10] and studies from Kathmandu,[15] Nigeria,[16] Indian Council of Medical Research study in India.[17] Studies in developed countries such as Mexico,[18] the United States,[19] Trinidad, and Tobago[20] showed the prevalence of anemia among pregnant and non-pregnant women were low compared to this study. This difference in prevalence may be attributed to the different geographical and socioeconomic, cultural, and dietary factors.

High prevalence of anemia was seen among illiterate women (65.9%) when compared to literate women (52.4%) as seen in studies in India (illiterate 56% and literate 40%)[11] and in Tamil Nadu (illiterate 62% and literate 40%)[10] by NFHS III. This reveals that women's educational status plays an important role in the prevalence of anemia in the reproductive age group, which can be attributed to better knowledge of literate women on the importance of taking iron rich diet and the importance of personal hygiene and environmental sanitation. Women who attained menopause were significantly of lower risk for anemia (35.1%) compared to women who did not attain menopause (55.2%). This is because of no menstrual loss in menopausal women, pregnancy, and other related factors. A similar study in Northern Mexico[18] among reproductive age group women (12-49 years) showed mean hemoglobin level is higher in post-menopausal women.

Excessive and scanty menstruations were directly related to anemia in reproductive women. Increased loss of iron is the main cause of anemia in women with excessive menstrual

Table 2: Association of prevalence of anemia with selected variables

Independent variable	Number of anemic women	Prevalence of anemia (%)	OR	95% CI of OR	χ^2
Age groups (years)		64.3	2.48	1.09-5.70	5.63
15-19	27	57.7	1.88	1.05-3.35	5.23
20-29	79	52.8	1.54	0.86-2.79	2.40
30-39	65	42.0	1.00		
40-49					
Religion	37	53.9	1.31	0.62-2.74	0.57
Hindus	174	47.2	1.00		
Muslims	17	54.8	1.36	0.46-3.99	0.39
Christians	17				
Women education		61.0	142	0.70-2.89	1.08
Illiterate	25	52.4			
Literate	183				
Occupation		52.5	3.04	1.21-7.90	6.87
Unskilled	93	58.5	3.87	1.53-10.05	10.49
Semiskilled	107	26.7	1.00		
Skilled	8				
Marital status		55.1	1.52	0.86-2.69	2.38
Currently married	179	44.6			
Others	29				
Type of family		56.7	1.64	1.02-2.63	4.74
Nuclear	160	44.4			
Joint	48				
Age at menarche (years)		65.7	2.04	1.14-3.68	6.58
≤12	46	48.4	1.00		
13-14	124	59.4	2.45	0.86-2.82	2.45
≥15	38				
Menopause		55.2	2.28	1.07-4.90	5.44
Not attained	195	35.1			
Attained	46				
Amount of menstrual bleeding		85.7	15.41	7.27-33.40	75.95
Excessive	66	28.0	1.00		
Normal	58	79.2	9.81	5.42-17.87	74.22
Scanty	84				
Length of menstrual cycle		72.7	2.42	0.57-11.69	1.77
>35 days	8	52.4	1.00		
Normal	194	66.7	1.81	0.40-9.30	0.71
<21 days	6				
PID		79.7	4.14	2.03-8.56	19.36
Yes	47	48.6			
No	161				
Pregnancy status		67.7	1.93	0.84-4.54	2.81
Pregnant	21	52.1			
Non-pregnant	187				
Number of live births		65.9	2.24	1.29-3.92	9.41
Nil	54	46.2	1.00		
≤2	110	62.9	1.97	1.10-3.53	5.99

(*Contd...*)

Table 2: *Continued...*

Independent variable	Number of anemic women	Prevalence of anemia (%)	OR	95% CI of OR	χ^2
>2	44				
Abortions		62.5	1.54	0.79-2.99	1.89
Yes	30	52.0			
No	178				
IFA tablets		62.1	2.59	1.66-4.04	20.09
Not completed	151	38.8			
Completed	57				
Contraception					
Not used	125	61.5	1.66	1.06-2.60	5.51
Used	83	49.0			
Contraceptive method					
Intrauterine device	28	59.6	1.74	0.87-3.48	2.88
Tubectomy	94	45.9			
Dietary habits			2.66	1.62-4.36	17.44
Vegetarian	63	64.9			
Mixed	145	49.5			
Passage of worms in stools			7.79	2.55-26.60	19.18
Yes	31	88.6			
No	177	49.9			
Weight status					
Underweight	58	96.6	30.19	7.0-182.05	46.31
Normal	146	51.0	1.00		
Overweight	4	12.5	0.15	0.04-0.46	15.52

OR: Odds ratio, CI: Confidence interval, PID: Pelvic inflammatory disease, IFA: Iron and folic acid

bleeding and malnutrition and already existing anemia is the main cause for anemia in women with scanty menstruation. A similar study done by Theresa O school[21] stated that women are at risk of iron deficiency anemia due to blood loss from menstruation in reproductive years. Women who had menstrual cycle more than 35 days and <21 days were at higher risk of anemia (72.7%) when compared to women who had normal menstrual cycle (52.4%). The higher prevalence of anemia in women who had menstrual cycle more than 35 days is mainly due to under nutrition and already existing anemia and in women who had menstrual cycle <21 days may be due to heavy menstrual blood loss, deficient dietary intake, and increased need of iron and lack of awareness about anemia. A similar finding has been reported in a study in Northern Mexico.[18]

Similar to a study in Mumbai,[22] women having suspected PID were at significantly ($P < 0.001$) higher risk of anemia (79.7%) when compared with women not having any suspected PID which is a chronic disease and is aggravating or causing anemia. Women not having any live birth and more than 2 live births were at significantly ($P < 0.01$) higher risk of anemia (65.9%) when compared to women having one or more live births (46.2%). High prevalence of anemia in women not having any live birth is mainly due to excessive bleeding during delivery, closely spaced pregnancies, and inadequate dietary intake of iron. A similar study on prevalence of iron deficiency in the United States[19] reported that the prevalence of anemia increased with parity. Women who had completed the course of IFA tablets in their reproductive life are at significantly lesser risk of anemia (38.8%) when compared to women who did not complete the course (62.1%). This may be due to IFA tablets correcting the iron depletion and restoring the body iron stores. A similar study done in Northern Mexico[18] stated that substantial increase in iron requirements during the second and third trimester of pregnancy causes many women to develop anemia if they do not receive supplemental iron.

Women who used any type of contraception were at significantly lower risk of anemia (49.0) when compared to women who had not used any type of contraceptive (61.5%). Women using intrauterine device were at higher risk of anemia (59.6%) when compared to women who had undergone tubectomy (45.6%). The above two findings are also seen in a study done in Northern Mexico.[18] This may be because, use of contraception prevents excessive blood loss due to abortions and unwanted pregnancies and the higher prevalence of anemia among intrauterine device contraceptive users are attributed to excessive bleeding, low dietary intake of iron, poor personal hygiene, and infections.

Women taking vegetarian diet are at significantly higher risk of anemia (64.9%) than the women who were taking mixed diet (49.5%). Mehta et al.[23] reported a similar finding. The higher

prevalence of anemia among women taking vegetarian diet can be attributed to low dietary intake of heme iron. Women who had passed worms in stools were at significantly higher risk of anemia (88.6%) when compared to women who were not passing worms in stools (49.9%). The higher prevalence of anemia in women who passed worms in stools can be attributed to lack of personal hygiene, irregular use of footwear, open air defecation, lack of awareness about handwashing with soap before eating, and not taking deworming tablets at regular intervals. A similar study conducted by Stratton et al.[24] in the United States reported that parasitic infestation is related with maternal anemia and bad fetal outcomes. Underweight women were significantly higher risk of anemia (96.6%) when compared to women having normal weight (51.0%) similar to other studies in India[11] and Andhra Pradesh.[12]

This study was population based using simple random sampling method, which ensures generalizability of results to the entire population. It is inferred from this study that sociodemographic, menstrual, obstetric, contraceptive, dietary, environmental, and behavioral factors were associated with anemia in reproductive age group. Hence, preventive measures such as IFA supplementation for adolescent girls, improving the standard of living, and environmental conditions have to be adopted to reduce the burden of the disease. Health education should be imparted with emphasis on adequate dietary intake of iron, personal and environmental hygiene, use of sanitary latrines, regular use of footwear, handwashing with soap after defecation and before eating, and seeking medical help for periodic deworming and taking prophylactic IFA tablets.

CONCLUSION

It is inferred from this study that sociodemographic, menstrual, obstetric, contraceptive, dietary, environmental, and behavioral factors were associated with anemia in reproductive age group. Hence, preventive measures such as IFA supplementation for adolescent girls and improving the environmental conditions have to be adopted to reduce the burden of the disease.

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