Original Research Article

A study of prevalence of anemia and associated risk factors in pregnant women of tribal community attending antenatal clinic at Trivandrum district, Kerala, India

M. S. Ponny[1,2], V. R. Nandini[1]*, C. Nirmala[1], Brahmanandan Mayadevi[1]

[1]Department of Obstetrics and Gynaecology, Government Medical College, Trivandrum, Kerala, India
[2]Department of Obstetrics and Gynaecology, Meditrina Hospitals, Kollam, Kerala, India

*Correspondence:
Dr. V. R. Nandini,
E-mail: nandini_2470525@yahoo.com

ABSTRACT

Background: Anemia is a major preventable public health concern among the pregnant women worldwide. The present study aims at determining the prevalence of anemia among tribal pregnant women at Trivandrum district, Kerala and identifying its socioeconomic and gynaecological risk factors.

Methods: A cross sectional study was conducted among tribal women attending antenatal clinics of Vithura and Kuttichal Government hospitals at Kerala, India. Sample size was calculated as 117. All consecutive subjects fitting the inclusion criteria were included in the study until the sample size was achieved. Patients were interviewed using a semi structured questionnaire which includes socio demographic, cultural and nutritional factors. Hemoglobin measurement was done while first antenatal visit using semi auto hemo-analyzer. Data obtained were analyzed using SPSS software. Statistical test used was either Chi-square test or student t-test.

Results: The prevalence of anemia among the tribal pregnant women attending primary health care in Trivandrum during the study tenure was 53.33%. The prevalence of mild, moderate and severe anemia was observed as 26.66%, 25% and 1.66% respectively. The mean serum haemoglobin level among the study group was found to be 10.64 gm%. The major risk factors associated with anemia were figured out to be low body mass index, low family income, high parity, joint family, exposure to passive smoking and pan chewing, irregular intake of iron and folic acid supplements, hyperemesis and absence of deworming.

Conclusions: Focus shall be given on creating awareness among tribal women regarding the need for dietary and lifestyle modification to decrease the prevalence of anemia among them.

Keywords: Anemia, Habit disturbances, Standard of living, Pregnant Women, Prevalence studies, Tribal population

INTRODUCTION

Of the many health problems affecting pregnant women in India, anemia is considered as a major public health concern. Internationally it was pronounced that, out of all the population at-risk of anemia, it is only among pregnant women that anemia is a public health problem.[1] According to the world health organization report, the prevalence of anemia is estimated to be in a range of 41.96-57.19% with an average of 50.13% among pregnant women in India.[2] According to NFHS 4 data of Kerala state, the prevalence of anemia among women of all age group is 34.3% which is lower when compared to other Indian states.[3] The maternal mortality rate of Kerala was 61 in the year 2011 which has been reduced to 42 by the year 2019.[4] This might be attributed to a very strong primary health care system prevalent in Kerala with

excellent infrastructure development and social development indices at par with the western world.

There is a vicious link exists between prevalence of anemia and socioeconomic status of the people. It is obvious but factual that the occurrence of anemia is more in rural areas as compared to urban areas.[5] The prevalence further increases in demeaned population such as in tribal population.[6] According to the 2011 census report, 10.4% of Indian population is made up of scheduled tribes. The population of scheduled tribes in Kerala state is 4,84,839 (1.45% of the total state population) which includes 246,636 females. As per the latest survey, Trivandrum occupies of about 17185 people in 5183 tribal families which comes around 4.03% of total tribal population in Kerala. Majority of the tribal population in Trivandrum comprises of Kanikars. Nearly one fifth of Kanikkar community is settled in Vithura grama panchayat.[7] Various Government/NGO sponsored community health programs have not reached among the marginalized tribal population because of their geographic distribution, illiteracy, social and cultural practices and lack of awareness. Although a handful of reports are available on anemia among women and adolescent girls in urban and rural areas, there are hardly any community level studies done so far to address this burning issue among the pregnant women of tribal community. Hence this study was undertaken with the objective of estimating the prevalence of anemia and identifying its socioeconomic and gynecological risk factors among pregnant women of tribal community presenting in primary care centers at Trivandrum district, Kerala.

METHODS

Current study was conducted as a hospital based cross-sectional study in two primary care centers within Trivandrum district, Kerala. Tribal women attending Vithura and Kuttichal Government hospitals located in Trivandrum district for antenatal care (ANC) aged between 15-49 years were included in the study after taking informed consent. Those women who have undergone chemotherapy or radiotherapy in the past six months were excluded. The study period was from April 2018 to October 2019. The required sample size for the study was calculated using the formulae for sampling proportions and percentage.

$$n=4pQ/D^2$$

Where p was the expected prevalence character (from published literature), Q was 100-p and D was the precision. Taking the prevalence of anemia among tribal pregnant women as 92% as per the study conducted by Corrêa et al.[8] and with absolute precision of 5%, the sample size was calculated as 117. Using convenient sampling, 120 pregnant tribal women were interviewed. Data collection was done using a semi-structured questionnaire. Each subject was interviewed individually in Malayalam language since Malayalam is the local language in Kerala, and later converted to English for documentation. Data on physical characteristics, socioeconomic variables, antenatal factors and menstrual history were included in the questionnaire. Hemoglobin values measured on their booking visit was documented. Both institutions use semi auto hemo-analyser with electrical resistance method for hemoglobin measurement. BMI was measured using stadiometer corrected to 0.1 cm and weighing machine corrected to 0.5 kg. Anemia was defined and classified according to WHO criteria. Anemia in pregnancy was defined as hemoglobin less than 11 g%. Severity was categorized as mild 10 g%-10.9 g%, moderate 7 g%-9.9 g% and severe <7 g%.[9]

Data entry and analysis was done on SPSS version 15. Chi-square test and regression were used for analysis. Quantitative variables were represented using mean or standard deviation, p<0.05 was considered to be significant.

RESULTS

The prevalence of anemia in the study population (N=120) was found to be 53.33% (Figure 1A). The relative prevalence of mild, moderate and severe anemia was estimated as 26.66%, 25% and 1.66% respectively. The mean hemoglobin value among the 120 subject samples studied was 10.64 gm%.

The median hemoglobin was found to be 10.8±1.38 gm% (Figure 1B). Among 120 pregnant tribal women participated in the study, the mean age of study group was 25.8 with majority subjects (46.7%) lies within 20-24 age group. Age of the study group did not show any significant association with the occurrence of anemia (Table 1).

Table 1: Association of age group and prevalence of anemia (n=120).

Age (years)	Anemia				Total		χ²	df	P value	OR	95% CI for OR	
	No		Yes									
	N	%	N	%	N	%					Lower	Upper
<25	31	55.4	29	45.3	60	50	1.205	1	0.272	1.50	0.73	3.08
>25	25	44.6	35	54.7	60	50						
Total	56	100	100	64	100	120						

Table 2: Bivariate analysis of physical characteristics of study population.

| Variables | Anemia | | | | Total | | χ^2 | df | P value | OR | 95% CI for OR | |
| | No | | Yes | | | | | | | | | |
	%	N	%	N	%	N					Lower	Upper
BMI												
Normal or over weight	58.9	33	37.5	24	47.5	57	5.499	1	0.019*	2.39	1.15	4.99
Under weight	41.1	23	62.5	40	52.5	63						
Total	100	56	100	64	100	120						
Body weight (kg)												
>40	83.9	47	73.4	47	78.3	94	1.937	1	0.164	1.89	0.77	4.66
<40	16.1	09	26.6	17	21.7	26						
Total	100	56	100	64	100	120						
Age at marriage												
>20	89.3	50	79.7	51	84.2	101	2.065	1	0.151	2.12	0.75	6.03
<20	10.7	06	20.3	13	15.8	19						
Total	100	56	100	64	100	120						
Parity												
Primi/second gravida	91.1	51	73.4	47	81.7	98	6.203	1	0.013*	3.69	1.26	10.79
Multi	8.9	05	26.6	17	18.3	22						
Total	100	56	100	64	100	120						

*p< 0.05 considered statistically significant.

Table 3: Bivariate analysis of Socioeconomic variables in study population.

| Variables | Anemia | | | | Total | | χ^2 | df | P value | OR | 95% CI for OR | |
| | No | | Yes | | | | | | | | | |
	%	N	%	N	%	N					Lower	Upper
Educational status of the subject												
High school and above	92.9	52	89.1	57	90.8	109	0.517	1	0.472	1.60	0.44	5.77
Primary or below	7.1	4	10.9	7	9.2	11						
Total	100	56	100	64	100	120						
Economic status as per government norms												
APL	5.4	03	4.7	3	5	6	0.028	1	0.867	1.15	0.22	5.95
BPL	94.6	53	95.3	61	95	114						
Total	100	56	100	64	100	120						
Monthly income of the family (Rs.)												
>10000	50	28	29.7	19	39.2	47	5.172	1	0.023*	2.37	1.12	5.01
<10000	50	28	70.3	45	60.8	73						
Total	100	56	100	64	100	120						
Type of family												
Nuclear	50	28	34.4	22	41.7	50	3	1	0.083	1.91	0.92	3.98
Joint	50	28	65.6	42	58.3	70						
Total	100	56	100	64	100	120						
Pan chewing habit for the subject												
No	98.2	55	78.1	50	87.5	105	11.02	1	0.001*	15.40	1.95	121.38
Yes	1.8	01	21.9	14	12.5	15						
Total	100	56	100	64	100	120						
Passive smoking												
No	91.1	51	46.9	30	67.5	81	26.593	1	<0.001*	11.56	4.08	32.75
Yes	8.9	05	53.1	34	32.5	39						
Total	100	56	100	64	100	120						

*p< 0.05 considered statistically significant.

Physical characteristics of subjects

Among the study population, 63% were found to be underweight and the mean weight of the study population was 43.51 kg. The median weight was 42±6.9 kg. The mean BMI of the study population was 18.87 kg/m^2. Our study reported that around 2.39 times more chance of developing anemia in women who are underweight compared to those with normal BMI (p=0.019). Among the primi-gravidas 54.8% had no anemia whereas, 25.85% and 17.7% of them had mild and moderate

anemia respectively. In second gravida group, the percentage of mild and moderate anemia increases to 30.6 and 22.2% respectively. In multi gravidas women the percentage of mild and moderate anemia further increased to 22.7% and 50% respectively. Multiparous women have 3.69 times more chance of developing anemia compared to primi-gravida and second gravid subjects (p=0.013). Body weight of the subjects and the age of the marriage do not have any significant impact on the prevalence of anemia (Table 2).

Table 4: Bivariate analysis of antenatal risk variables in study population.

Variables	Anemia				Total		χ²	df	P value	OR	95% CI for OR	
	No		Yes									
	%	N	%	N	%	N					Lower	Upper
Iron folic acid intake by the subjects												
Regular	100	56	67.2	43	82.5	99	22.273	1	<0.001	Odds ratio could not be calculated#		
Irregular	0	0	32.8	21	17.5	21						
Total	100	56	100	64	100	120						
Regular deworming												
Yes	71.4	40	35.9	23	52.5	63	15.086	1	<0.001	4.46	2.06	9.65
No	28.6	16	64.1	41	47.5	57						
Total	100	56	100	64	100	120						
Hyperemesis gravidarum occurence												
No	83.9	47	67.2	43	75	90	4.464	1	0.035	2.56	1.05	6.17
Yes	16.1	09	32.8	21	25	30						
Total	100	56	100	64	100	120						
Time of registration for antenatal care												
First trimester	50	28	48.4	31	49.2	59	0.029	1	0.864	1.07	0.52	2.18
Second or third trimester	50	28	51.6	33	50.8	61						
Total	100	56	100	64	100	120						

*p<0.05 considered statistically significant, #there were no study Subjects without anemia and an irregular intake of iron and folic acid supplements.

Table 5: Bivariate analysis of menstrual variables in study population.

Variables	Anemia				Total		χ²	df	P value	OR	95% CI for OR	
	No		Yes									
	N	%	%	N	%	N					Lower	Upper
History of heavy menstrual bleeding												
No	85.7	48	50	32	66.7	80	17.143	1	<0.001*	6.0	2.45	14.68
Yes	14.3	08	50	32	33.3	40						
Total	100	56	100	64	100	120						
Age at menarche (years)												
>12	53.6	30	40.6	26	46.7	56	2.011	1	0.156	1.69	0.82	3.48
≤12	46.4	26	59.4	38	53.3	64						
Total	100	56	100	64	100	120						
Menstrual cyclicity												
Regular	60.7	34	62.5	40	61.7	74	0.04	1	0.841	0.93	0.44	1.94
Irregular	39.3	22	37.5	24	38.3	46						
Total	100	56	100	64	100	120						

*p<0.05 considered statistically significant.

Socio economic factors

We observed that 90.83% of the subjects under study have education status up to high school or above but could not correlate it significantly with the severity of anemia (p=0.472). 95% of our study population comes under below poverty line (BPL) as per the local government norms. The women with anemia in families with monthly income less than Rs. 10000 ($135) were found to have 25.8% mild and 35.5% moderate anemia. It further reduced to 26.7% mild anemia and 14.9% moderate anemia in women belonging to families with monthly income more than Rs.10000 ($135). Statistically we report that women from low-income family have 2.47 times more chance of developing anemia than that from a high-income family (p=0.023). Among the 15 women (12.5%) who have the habit of pan chewing among the study subjects, 33.3% have mild anemia and 53.3% have moderate anemia. Similarly, out of 39 subjects exposed to smoking or passive smoking, 30.8% and 53.8% of them had mild and moderate anemia respectively. Further we showed that, pan chewing and passive smoking (30.8%) were found to have closely associated with the prevalence of anemia with an odd ratio of 15.40 (p<0.001) and 11.56 (p<0.001) respectively (Table 3).

Antenatal risk factors of anemia

Our study claims that 82.5% of the study population had regular intake of iron and folic acid supplements. Undoubtedly, we report that irregular intake of iron and folic acid supplementation during pregnancy significantly foster the chance for anemia (p<0.001). Anemia was less prevalent in those women who had followed regular de worming schedule. Among those women who have not taken anti-helminths, the percentage of mild and moderate anemia patients was as high as 28.1% and 40.4 % respectively. We also reported that anemia is more common (2.56 times) in those women whose pregnancy is complicated with hyperemesis gravidarum (p=0.03). Those women with hyperemesis gravidarum are complicated by 26.7% mild anemia and 36.7 % moderate anemia (Table 4).

Menstrual history

In our study, 33.3% of the study population had heavy menstrual bleeding. Those subjects with a history of heavy menstrual flow showed high prevalence of mild (42.5%) and moderate anemia (32.5%) in our study. Those women with heavy menstrual bleeding had six times more chance of developing anemia during gestation compared to those with normal menstrual bleeding (p<0.001). We could not find any significant association between age of menarche and irregular menstrual cycles with the development of anemia (Table 5).

The multivariate association of various statistically significant factors like deworming, exposure to pan-chewing and history of heavy menstrual bleeding, shows they are independent risk factors for anemia (Table 6).

Table 6: Multivariate analysis of association of risk factors for the prevalence of anemia.

Variables	B	SE	Wald	df	P value	OR for anemia	95% CI for OR	
							Lower	Upper
BMI-under weight	0.421	0.481	0.765	1	0.382	1.523	0.593	3.907
Parity multi	0.996	0.656	2.303	1	0.129	2.708	0.748	9.803
Income <10000 Rs. ($135)	0.724	0.5	2.098	1	0.148	2.062	0.774	5.494
HMB	2.125	0.551	14.891	1	<0.001*	8.374	2.846	24.644
Hyperemesis	0.729	0.544	1.793	1	0.181	2.072	0.713	6.019
Pan chewing	2.303	1.108	4.322	1	0.038*	10.002	1.141	87.683
Deworming	1.318	0.485	7.398	1	0.007*	3.736	1.445	9.658
Constant	-2.286	0.552	17.146	1	0	0.102		

*p<0.05 considered statistically significant.

DISCUSSION

Kerala has been widely honoured for better medical care system among other Indian states and has the highest literacy rate and the improved infant and maternal mortality rate. In the current study we found that the relative prevalence of anemia among the 120 study subjects of pregnant women of tribal population at Trivandrum district is 53.33%. Among the anemic persons, majority cases were of mild anemic (26.66%) immediately followed by moderate anemia (25%) and a small proportion of population who had severe anemia (1.66%). In a cross-sectional study conducted at Karnataka in 2019, majority (89%) of the tribal women under study had anemia in which 62% and 11% of tribal women had moderate and severe anemia, respectively.[10] A very high anemia burden of 92.4% was reported by Correa et al among pregnant women in the forested tribal areas of Andhra Pradesh, Telangana and Chhattisgarh in India.[8] The prevalence of anemia has decreased in our study compared to the previous studies probably because of improved access to health care system or the various healthcare projects implemented at the grass root level to outreach the marginalized tribal populations.

The current study did not show any significant association between the marriage age of tribal women and prevalence for anemia in contrast to the results obtained

in a study by Perumal where they reported that increasing age at marriage is a significant protective factor of anemia among rural pregnant women in India.[11] This may be due to the extensive awareness campaigns and education programs by Government and social organizations which may have brought about some impact on the tribal population that the number of teenage marriages and pregnancies have come down to a great extent. High parity is among the factors with etiologic potential in causing anemia during pregnancy.[12] Current study observed that there is a statistically significant association between multi parity and development of anemia. In corroboration to our results, Al-Farsi et al stated that high parity is an important risk factor in the development of anemia in pregnancy based on a retrospective cohort study conducted in Oman. This could be due to the increased susceptibility to hemorrhage and maternal nutritional depletion syndrome associated with the multiple delivery.[13]
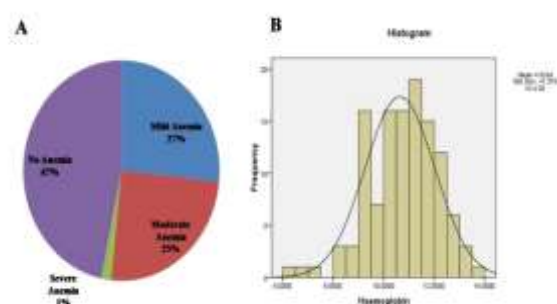
Figure 1: A) Pie diagram showing the prevalence of anemia among the tribal pregnant women of the study population (n=120), B) Histogram showing the mean and median hemoglobin level among the tribal pregnant women of the study population (n=120).

Present study did not show any significant difference in the incidence of anemia among women whether belonging to joint family or nuclear family or based on the economic strata they fit in. In contrast to the results we obtained, Ismail et al had showed a statistical significance with the higher socioeconomic class having less predilection for anemia.[14] Kerala being the state with the highest literacy rate in the country, the data analysis showed that 90.8% of the study subjects and 77.5% of their spouses were educated up to high school or above. Our study did not show significant relation between the educational status of husband and wife with the incidence of anemia unlike the result reported by Agarwal et al who had conducted study in various cluster populations within India and Lokare et al who had selected a study population from Aurangabad, India.[15,16]

Exposure to either or both passive smoking and pan-chewing are established as risk factors for the development of anemia among tribal pregnant women. In addition to the prevalence for anemia maternal exposure to tobacco whilst pregnancy has also been reportedly associated with still birth conditions and can increase the risk of low birth weight.[17] The higher prevalence rate of anemia with pan chewing and passive smoking obtained in our study may be attributed to the fact that these personal vices are quite common in public places and in workplaces especially in this part of our country and there are no strict laws prohibiting the use of smoke products at the public places. Similar results were reported in the study by Ismail et al, Shrinivasa et al and Goel et al.[6,14,18]

A cross sectional study among antenatal women attending municipal hospital at Ghana reported that women who had visited hospital during the first trimester were 8.2 times more protected for anemia than those who had visited later during the pregnancy.[19] However, in our study the statistical analysis did not show any significant correlation between late ANC registration and chance for anemia occurrence. Further we realized that those women with hyperemesis gravidarum during the antenatal period are 2.56 times more prone to develop anemia during their gestation. The association of hyperemesis gravidarum with the development of anemia could be influenced by the chronic *H. pylori* infection.[20] The regular intake of iron and folic acid supplements was associated with less incidence of anemia in the present study subjects compared with those who were noncompliant to supplementary iron. Recent study by Abiselvi et al also elicited that women having irregular intake of iron and folic acid supplements have 1.5 % times higher chance of developing anemia compared to the ones taking supplements regularly.[21] WHO recommends prophylactic dose of using single dose albendazole (400 mg) or mebendazole (500 mg), as a public health intervention for pregnant women.[22] Current study confirmed the importance of deworming which has a positive influence in preventing anemia among the pregnant subjects. Similarly has been reported by Abiselvi et al with an odd ratio of 12.4.[21] On analyzing the descriptive statistics of our study results, we revealed that women with history of heavy menstrual bleeding have six times more chance of developing anemia compared with those having normal menstrual flow. It was also identified as an independently significant variable on multivariate analysis. The excessive blood loss during the menstrual period may contribute to iron deficiency anemia (IDA) to the subjects.[23] Our study results are corroborating with the reports by Weldekedan et al.[24] It is a known fact there is a relationship between iron deficiency anemia and irregular cycles among the women, but we could not find any association between the irregularity in menstrual cycle with the prevalence of anemia in pregnant ladies of our study population. Study by Sreelekshmi et al also revealed similar results in a study conducted among tribal women at Palakkad district, Kerala.[25]

CONCLUSION

The prevalence of anemia among tribal women attending antenatal clinics in primary care hospitals at Trivandrum district was found to be 53.33%. The relative prevalence of mild, moderate and severe anemia were observed as

26.66%, 25% and 1.66% respectively. The main risk factors of anemia in pregnant women are figured out to be low body mass index, low family income, high parity, exposure to passive smoking and pan-chewing, irregular intake of iron and folic acid supplements, hyperemesis and absence of deworming. The data obtained in our study would provide an insight to the health status of tribal population of Kerala and further would help the policy makers for devoting to reduce the mortality and morbidity issues among them.

ACKNOWLEDGEMENTS

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