EUROPEAN JOURNAL OF PHARMACEUTICAL
AND MEDICAL RESEARCH
www.ejpmr.com

ANEMIA'S STRANGLEHOLD ON EXPECTING MOTHERS IN INDIA – EVIDENCE FROM THE FIFTH INDIAN DEMOGRAPHIC HEALTH SURVEY

Gurdeep Singh*[1], Manjot Kaur[1], Dr. Raj Narayan[2] Dr. Dharmendra Kumar Yadav[2] and Dr. Praveen K. Chokhandre[3]

[1]Centre for Public Health, Panjab University, Chandigarh-160014, India.
[2]Department of Statistics and Demography, National Institute of Health and Family Welfare New Delhi-110067, India.
[3]Assistant Professor, Population Research Centre Jss Institute Of Economic Research, Koushalya Building, Vidyagiri, Dharwad – 580 004 Karnataka, India.

*Corresponding Author: Gurdeep Singh

Centre for Public Health, Panjab University, Chandigarh-160014, India.

ABSTRACT

Background: Anemia is a serious public health issue that affects both developed and developing nations. Anemia is linked to low socioeconomic status, high parity, poor diet, lack of health awareness, and high incidence of infections and parasites. **Objective:** This study aimed to determine the prevalence of anemia in pregnant women in India, as well as identify contributing factors. **Method:** The National Family Health Survey (NFHS) 2019–21 data provided the basis for the investigation. The NFHS-5 included 27,318 pregnant women aged 15 to 49. Analytical and descriptive analyses were employed. To determine the relationship between background characteristics and anemia prevalence, bivariate logistic regression model was utilised. **Results:** The prevalence of anemia was found to be 51.91% in pregnant women. Among the population of pregnant women, moderate anemia was found to be the most prevalent condition, with a prevalence rate of 26.11%. **Conclusion:** The prevalence of anemia has increased, with age, educational level, children ever born, BMI, religion, caste, residence and tobacco consumption being its significant determinants.

KEYWORDS: Anemia, Pregnant women, NFHS-5, Prevalence, NACP.

INTRODUCTION

Anemia is a serious public health issue that affects both developed and developing nations.[1] Anemia incidence is among the highest in the world among South Asian nations, with India having the highest prevalence (87%).[2] Anemia has been linked to a number of conditions, including low socioeconomic position, high parity, a short birth interval, a poor diet in both quantity and quality, a lack of health and nutrition awareness, and a high occurrence of infectious illnesses and parasite infestations. Underprivileged persons in underdeveloped nations frequently have limited access to medical treatment and preventive measures, increasing their chance of becoming anaemic and leading to increased maternal mortality. The most frequent haematological issue during pregnancy is anemia.[3] Anemia affects almost two-thirds of pregnant women in developing countries and contributes to maternal mortality and low birth weight.[4] According to the World Health Organization, the prevalence of anemia among pregnant women in wealthy nations is around 14%, but it remains as high as 51% in underdeveloped countries.[1] Globally, over 32.4 million pregnant women were anaemic, while Southeast Asia and Africa accounted for approximately 48.7% and 46.3% of the anemia burden, respectively.

The Sub-Saharan area has the greatest prevalence of anemia during pregnancy, with 17.2 million pregnant women estimated to be anaemic. [5] The main cause of anemia during pregnancy are nutritional deficiencies (iron, vitamin B12, folate), parasitic infections, (hookworm and malaria etc.) [6] and acute blood loss. [7] Anemia has been known to be responsible for a number of maternal and foetal complications. Apart from decreasing the woman's reserve to tolerate bleeding either during or after childbirth, it has been known to be associated with low birth weight, premature delivery, intrauterine growth retardation and thus increased perinatal mortality. [5]

In India, the prevalence of anemia in pregnant women has been reported to be in the range of 33% to 89%. [8] According to population-based research, 28.4% of the 14,300 Indian teenagers were anaemic, with vitamin B12 deficiency (25.6%), iron deficiency (21.3%), dimorphic anemia (18.2%), and anemia with inflammation (3.4%). Socioeconomic variables such as poor economic position, adolescent level of education, housing condition, and cleanliness habits have all been demonstrated in studies to increase the incidence of anemia. [9] Apart from maternity-related difficulties,

anemia has serious implications for human health as well as social and economic development. [10]

To prevent anemia in pregnant women, India became the first developing country to implement a National Nutritional Anemia Prophylaxis Program (NNAP). NNAPP was established in 1970 as part of the fourth 5-year health plan with the goal of lowering anemia prevalence to 25%. The Government of India advises that a total of 100 iron and folic acid pills be provided during pregnancy. As part of Maternal and Child Health (MCH) services, India has a public health program that distributes iron pills to pregnant women (during the final trimester) and preschool children. Despite the availability of this effective, low-cost strategy for prevention and treatment, the high prevalence of anemia among pregnant women remains highest. [3]

The current study's objectives are to ascertain the anemia prevalence among pregnant women in India and to pinpoint the variables that can be responsible for anemia in expectant mothers.

MATERIALS AND METHOD
Study design, location and duration: NFHS-5 was a cross-sectional national survey conducted in a representative sample of households throughout India. The survey provided data for 28 states and 8 UTs. The survey was conducted in 2019-2021.

Selection criteria of the sample: The study included all women between the ages of 15 and 49 who were pregnant, totalling 27,264 individuals.

Data collection: Health investigators took blood samples for anemia testing from qualified women between the ages of 15 and 49. Women who were eligible for the test were asked for their consent. A drop of blood from a finger prick was used to draw blood samples, which were then collected in a microcuvette. On-site haemoglobin assay was done using a portable, battery-operated HemoCue Hb 201+ analyzer.

The NFHS divided anemia into three categories: mild, defined as a haemoglobin level between 10.0 and 11.9 g/dl; moderate, described as a haemoglobin level between 7.0 and 9.9 g/dl; and severe, explained as a haemoglobin level below 7.0 g/dl. To be deemed anaemic, the Hb level must be under 12.0 g/dl.

Dependent variable: The dependent variable taken for the study is 'anemia among women' which was dichotomous having 0 as "No anemia" and 1 as "Yes anemia". For the bivariate analysis, three levels of anemia were considered – Severe, Moderate and Mild.

Independent variables: The predictor variables for the study include demographic factors, age, educational level, number of children ever born, BMI, religion, caste, household size, wealth index, background characteristics, tobacco use, smoking habits, alcohol consumption, and residence, all taken as independent variables.

Ethical approval: No ethical approval was required for this research because it only used secondary data and the NFHS-5 is a freely accessible source of data.

Statistical analysis: To conduct the analysis, SPSS version 26 was employed. We used both analytical and descriptive statistics. For categorical variables, percentages and proportions were presented. For risk analysis to pinpoint variables influencing anemia, binomial logistic regression and odds ratios with accompanying 95% confidence intervals were used.

RESULTS
Table 1: Distribution of Socio-demographic Characteristics among Pregnant Women Aged 15-49 years in India, 2019-21.

Background Characteristics	Number	Percentage
Age		
15-19	2,875	10.5
20-24	10,697	39.3
25-29	8,808	32.3
30-34	3,458	12.7
35-49	1,426	05.2
Educational Level		
No education	4,477	16.4
Primary	2,978	10.9
Secondary	15,420	56.6
Higher	4,389	16.1
Children Ever Born		
0	11,071	40.6
1	8,838	32.4
>=2	7,355	27.0
BMI		
Thin	2,966	10.9
Normal	18,639	68.4

Overweight	4,590	16.8
Obese	1,069	03.9
Religion		
Hindu	19,352	71.0
Muslim	4,307	15.8
Other	3,605	13.2
Caste		
SC	5,404	19.8
ST	5,880	21.6
OBC	10,079	37.0
Others	5,901	21.6
Household Size		
<4	5,881	21.6
4-7	16,600	60.9
>7	4,783	17.5
Wealth Index		
low	13,085	48.0
Middle	5,528	20.3
High	8,651	31.8
Tobacco		
No or sometimes	26,320	96.5
Almost every day	944	03.5
Smoking		
No	27,172	99.7
Yes	92	00.3
Alcohol		
No	27,124	99.5
Almost every day or once a week	140	00.5
Residence		
Urban	5,277	19.4
Rural	21,987	80.6
Total	**27,264**	**100**

Over 72% of the sample's female participants are between the ages of 20 and 29, whereas younger women (15–19) and older women (35–49) make up lesser percentages. The percentage of people with secondary education is significant (56.54%), but 16.45% have never attended school. 40.6% of the women have not given birth to any children, which is concerning and may be a sign of delayed childbearing or possible fertility problems. The majority (68.36%) have a normal BMI, although a sizable portion (16.84%) are overweight. Hindus make up the majority (70.98%) of the population in terms of religion, and the largest caste groupings are OBC (Other Backward Classes) and Others, each with a population of about 21.64%. Household sizes tend to be between 4 and 7 members (60.89%), and 47.99% of households fall into the low category of the wealth index, which is biased towards the lower end. Finally, the majority of women (80.64%) live in rural regions and do not regularly use tobacco (96.54%), smoke cigarettes (99.66%), or drink alcohol (99.49%). (Table 1)

Table 2: Prevalence of Anemia among Pregnant Women by States-wise, India, 2019-21.

States/India	Severe	Moderate	Mild	Any anemia
Jammu & Kashmir	0.19	13.46	20.46	34.12
Himachal Pradesh	0.19	11.25	25.26	36.70
Punjab	1.57	26.58	23.69	51.84
Chandigarh	0.00	66.62	1.92	68.54
Uttarakhand	2.00	21.33	19.49	42.83
Haryana	2.19	29.25	25.04	56.48
NCT of Delhi	0.89	22.84	18.27	42.00
Rajasthan	1.52	22.20	22.58	46.31
Uttar Pradesh	1.74	22.67	21.54	45.95
Bihar	1.88	32.27	28.84	62.99
Sikkim	0.00	8.49	28.37	36.86
Arunachal Pradesh	0.31	9.97	12.25	22.52
Nagaland	0.20	8.67	10.14	19.01

Manipur	0.00	12.14	19.52	31.66
Mizoram	1.03	9.10	23.09	33.22
Tripura	1.71	31.20	28.98	61.89
Meghalaya	2.77	20.03	19.27	42.08
Assam	1.08	26.89	26.29	54.26
West Bengal	0.35	34.31	27.54	62.20
Jharkhand	1.00	28.59	27.18	56.77
Odisha	1.62	29.51	30.78	61.91
Chhattisgarh	1.18	24.21	26.38	51.77
Madhya Pradesh	2.08	25.42	25.40	52.90
Gujarat	2.22	36.27	24.09	62.57
Dadra & Nagar Haveli	0.00	31.82	28.84	60.66
Maharashtra	1.45	25.10	19.15	45.70
Andhra Pradesh	1.23	28.07	24.41	53.71
Karnataka	0.86	21.66	23.11	45.63
Goa	0.00	22.75	18.24	40.99
Lakshadweep	2.28	5.95	12.67	20.90
Kerala	0.00	9.37	21.91	31.28
Tamil Nadu	0.47	21.88	25.82	48.17
Puducherry	4.30	18.62	21.44	44.36
Andaman & Nicobar Island	4.02	8.76	40.87	53.66
Telangana	0.92	26.07	26.30	53.28
Ladakh	0.00	9.02	16.00	25.02
India	**1.41**	**26.11**	**24.39**	**51.91**

Severe, moderate, mild, and any anemia (combining all three severity levels) were the four levels of anemia. From the statistics, a number of important conclusions were drawn. The prevalence of anemia varied significantly by location, with states like Gujarat, Haryana, Bihar, West Bengal, Tripura and Odisha having rates of anemia that were higher than 60%. States such as Kerala, Arunachal Pradesh, and Nagaland had significantly lower rates of anemia, below 30%. Second, Chandigarh and Dadra and Nagar Haveli stood out among the territories for having unusually high rates of anemia. (Table 2)

Table 3: Prevalence of Anemia among Pregnant Women by Background Characteristics, India, 2019-21.

Background Characteristics	Severe	Moderate	Mild	Any anemia
Age				
15-19	1.65	28.69	26.93	57.26
20-24	1.36	26.48	25.05	52.90
25-29	1.53	25.48	23.09	50.10
30-34	1.03	24.04	23.82	48.89
35-49	1.16	24.81	20.83	46.80
Educational Level				
No education	2.87	31.54	24.52	58.93
Primary	1.66	30.21	24.80	56.68
Secondary	1.26	26.35	25.03	52.64
Higher	0.38	18.17	22.10	40.65
Children Ever Born				
0	1.07	22.60	23.75	47.42
1	1.25	26.89	24.96	53.11
>=2	2.17	30.93	24.71	57.81
BMI				
Thin	2.06	27.98	25.50	55.55
Normal	1.47	26.75	24.45	52.67
Overweight	0.98	23.15	23.61	47.74
Obese	0.35	23.06	23.53	46.93
Religion				
Hindu	1.5	26.76	24.43	52.70
Muslim	1.01	23.64	24.29	48.95
Other	1.18	23.77	23.98	48.93

Caste				
SC	1.78	27.98	25.80	55.56
ST	2.27	32.04	24.52	58.83
OBC	1.25	24.21	24.27	49.73
Others	0.93	25.25	23.14	49.32
Household Size				
<4	1.25	24.82	23.71	49.78
4-7	1.46	26.18	24.6	52.24
>7	1.42	27.27	24.47	53.16
Wealth Index				
low	2.03	30.86	25.92	58.81
Middle	1.3	25.38	23.85	50.53
High	0.69	20.67	22.81	44.17
Residence				
Urban	0.75	21.75	23.06	45.56
Rural	1.63	27.57	24.84	54.03
Smoking				
No	1.4	26.12	24.39	51.91
Yes	5.55	19.66	25.88	51.08
Tobacco				
No or sometimes	1.36	25.96	24.42	51.74
Almost every day	3.88	34.63	22.89	61.4
Alcohol				
No	1.41	26.09	24.39	51.88
Almost every day or once a week	0.00	40.17	24.28	64.45
Total	**1.41**	**26.11**	**24.39**	**51.91**

The occurrence of anemia decreased with age, and women between the ages of 15 and 19 have the highest prevalence of any anemia (57.26%). Education level is another factor; individuals with no education or only an elementary education had greater anemia rates. The highest anemia rates, at 57.81%, were among women who have given birth to two or more children. The highest anemia rates were seen in slim people (55.55%), whereas the lowest was found in obese people (46.93%), according to BMI. Additionally, there are differences based on caste and religion, with ST (Scheduled Tribe) members having the highest incidence of anemia (58.83%). In general, anemia rates are lower among urban (45.56%) than among rural populations (54.03%). Notably, smoking and tobacco usage, especially for those who smoke virtually daily, are linked to increased anemia prevalence. Higher anemia rates have been associated with alcohol use, particularly in individuals who drink once or twice a week or nearly every day. (Table 3)

Table4: Odds of any Anemia among Pregnant Women by Independents variables, India, 2019-21.

Independent Variables	Odds Ratio	95% Confidence Interval		p- value
Age				
15-19[®]	1.000			
20-24	0.834	0.764	0.910	0.000
25-29	0.660	0.599	0.727	0.000
30-34	0.572	0.510	0.643	0.000
35-49	0.462	0.399	0.535	0.000
Educational Level				
No education[®]	1.000			
Primary	0.861	0.783	0.947	0.002
Secondary	0.771	0.716	0.831	0.000
Higher	0.651	0.590	0.719	0.000
Children Ever Born				
0[®]	1.000			
1	1.333	1.254	1.417	0.000
>=2	1.540	1.427	1.663	0.000
BMI				
Thin[®]	1.000			
Normal	0.909	0.839	0.984	0.018

Overweight	0.855	0.776	0.943	0.002
Obese	0.925	0.799	1.070	0.295
Religion				
Hindu®	1.000			
Muslim	0.744	0.692	0.801	0.000
Other	0.545	0.499	0.596	0.000
Caste				
SC®	1.000			
ST	0.877	0.806	0.954	0.002
OBC	0.877	0.819	0.939	0.000
Others	0.872	0.804	0.945	0.001
Household Size				
<4®	1.000			
4-7	1.044	0.980	1.112	0.184
>7	1.121	1.034	1.215	0.006
Wealth Index				
Low®	1.000			
Middle	0.831	0.777	0.889	0.000
High	0.816	0.761	0.875	0.000
Residence				
Urban®	1.000			
Rural	1.084	1.013	1.161	0.021
Smoking				
No®	1.000			
Yes	0.612	0.392	0.957	0.031
Tobacco				
No or sometimes®	1.000			
Almost every day	1.238	1.077	1.422	0.003
Alcohol				
No®	1.000			
Almost every day or once a week	0.926	0.654	1.311	0.664
Constant	1.837	1.586	2.128	0.000

The likelihood of developing anemia decreased with the increase in the age of women. Women in the age group 35-49 years had only 46% chance to develop anemia when compared to women aged 15-19 years. Women with higher education were 35% less likely to suffer from anemia than women with no education. Women with children 2 or more were 1.5 times more prone to develop anemia than women with no child. There was no significant association between being obese and anemia. Women of other religions than the Hindu and Muslims were more prone to anemia during pregnancy by almost 55%. No discernible difference was observed in the odds of anemia among various groups of caste, household size, wealth index, residence and tobacco use. Surprisingly, the probability of anemia was 61% in women who smoke as compared to women who don't smoke. No significant association was found between alcohol consumption and anemia. (Table 4)

DISCUSSION
The study was carried out to better understand the anemia prevalence and the influence of several demographic parameters, including socio-economic, age, educational level, number of children born, BMI, religion, caste, family size, wealth index, background characteristics, and risk factors. Regional diversity in anemia prevalence suggests that anemia is a substantial concern in the majority of Indian states. The transition from NFHS-3 to NFHS-5 reveals that the majority of states have a very bad outcome in terms of anemia prevalence, and the prevalence rate rises over time. Aside from the high incidence of anemia, the prevalence rate differs between geographical zones and states. OBC, SC & ST, and general.[11]

According to the study's findings, the prevalence of anemia during pregnancy was 51.91%. The Nutrition Foundation of India found an overall frequency of anemia among pregnant women of 84% in research conducted across seven states. [12] According to research done in an urban context among a sample of pregnant women getting prenatal care at a public sector hospital, the overall prevalence of anemia was 33.9%[4] and a similar study carried out in Delhi for the prevalence of anemia among pregnant women was reported a higher prevalence of anemia 96.5% and a majority 50.9% had moderate anemia.[13] The prevalence of mild, moderate, and severe anemia was found to be 1.41%, 26.11%, and 24.39%, respectively, in the current study, which was comparable to a previous study that found a prevalence of light, moderate, and severe anemia to be 27%, 34%, and 3%.[2]

According to the current study's findings, Haryana has an abnormally high prevalence of anemia (56.48%) while Chandigarh has a frequency of 68.54%. An abnormally high incidence of anemia (98% in rural Haryana) was discovered in research to determine the prevalence of anemia among pregnant women in rural India. [1] According to research on the factors associated with persistent anemia in impoverished urban pregnant women in Chandigarh, 67% of pregnant women had haemoglobin less than 11 g/dl and were anaemic. [14] There was no discernible trend showing a decrease in the prevalence of anemia between NFHS 2, 3, and 4. Between NFHS 2 and 4, there was an increase in the prevalence of anemia in various States, including Himachal Pradesh and Delhi. The National Anemia Control Programme (NACP) and National Iron Plus Initiative (NIPI) recommendations were not well implemented, which was the cause of the lack of reduction in the prevalence of anemia between the three surveys.[15]

Our data suggest that women with the poorest socio-economic backgrounds had a higher prevalence of severe anemia and among the women who consume alcohol and tobacco, all three levels of anemia have the highest prevalence. when compared to previous research that had similar results. [16] It can be ascribed to the fact that women from the richest and most well-off households had superior nutritional status and were less likely to develop anemia. This proves the fact that socio-economic status becomes an important determinant of how anemia and malnutrition are distributed across the states.

According to the present study the majority of anaemic patients belonged to the age group of 15-19 years (57.26%), which was comparable to studies that had reported the majority of anaemic patients belonging to the age group of 26-30 years (48.4%). According to the study, 45.56% of anaemic pregnant women were found in the Urban Population and 54.03% in the Rural Population as compared to the previous study 68% of anaemic pregnant women belonged to the Rural Population and 32% in the Urban population.[17]

CONCLUSION

Our study has identified several major risk factors for anemia in pregnant Indian women, including age, education, number of children, religion, caste, money, domicile, smoking, and tobacco use. Individuals with anemia should place a high priority on maintaining frequent prenatal exams, encouraging iron-rich diets, discouraging foods and beverages that interfere with iron absorption, staying hydrated, and managing stress. At the community level, a program should be initiated to raise awareness among people about the dangers of anemia and the importance of consuming iron-rich diets. The program should aim to provide access to proper healthcare and diagnosis, promote nutrition programs and iron-fortified foods, establish maternal support groups, and execute community-based iron supplementation under the guidance of professionals. Collaboration between the medical community, the local community, and the government enables a comprehensive strategy to combat anemia.

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