

# Varying Patterns of Societal Discriminations in Anaemia among Women in India: Findings from Third and Fourth Rounds of NFHS Survey

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## ABSTRACT

**Introduction:** In a society where the status of women is poor, women face both hidden and open discrimination within family. India has always been a country with a high prevalence of anaemia. Iron deficiency anaemia (IDA) is the most common nutritional deficiency in pregnant women.

**Objectives:** To investigate the patterns of societal differences in anaemia among women of reproductive age in India.

**Method:** Cross-sectional surveyed data, which was nationally representative from the 2005/2006 and 2015/2016 National Family Health Surveys of India. Multivariable logistic regression models and relative risk were used to assess trends and social inequalities in anaemia. Anaemia status defined by haemoglobin level (<12 g/dl in non-pregnant women, haemoglobin<11 g/dl for pregnant women).

**Results:** Over the 10-year period, anaemia prevalence decreased significantly from 56.1% (95% CI 55.4% to 56.8%) to 53.1% (95% CI 52.9% to 53.3%) among Indian women.

**Conclusions:** The significant state variation was marked in prevalence of anaemia. In two subsequent surveyed data, anaemia was positively associated with lower wealth status, lower education and belonging to scheduled tribes and scheduled castes.

**Keywords:** Anaemia, NFHS, Wealth index, Caste, Education.

## Introduction

Anaemia continues to be a major public health problem worldwide, particularly among females of reproductive age in developing country settings. In India, prevalence ranges between 33-89 percent<sup>1</sup>. The rural women were suffering higher prevalence of anaemia compared to urban women, particularly among the lower income groups, and that women with low body mass index (BMI; <18.5 kg/m<sup>2</sup>)<sup>2</sup>. Pattern of variations were observed for the prevalence and determinants of blood haemoglobin level in different anaemic categories like; mild, moderate, and severe anaemic mother<sup>3</sup>. Anaemia among India's women during this recent period is a matter of concern, and in contrast, women's health and nutritional status. While socioeconomic inequalities in anaemia continue a matter of concern over a period

of time<sup>4</sup>. Economic status of families, especially poor families, is a prerequisite to the improvement of anaemia among adolescent girls and the level of education is also a major factor<sup>5</sup>. Anaemia continues to be a significant public health concern in India in women, across the lifespan. Between 2006 and 2016, improvement was slow. There was a moderate decline in anaemia prevalence among pregnant women and lactating women. However, there was nearly no decline in anaemia prevalence among adolescents, women of reproductive age<sup>6</sup>

Therefore, we set out to examine the national and state trends in anaemia prevalence and examine how societal discriminations in anaemia among women of reproductive age have changed over time during a recent 10-year period. In view of existing several literature

review, there were various societal discrimination reflected nationally, state as well as community level. In this context, literature review framed the research question like, is there any discrimination on pattern of anaemia in India and its states. What are the causes among reproductive age of women in Indian society, those are affected with anaemia? Is increasing or decreasing?

### Objective

The specific objectives of the study are to

1. To investigate the pattern of societal differences in anaemia among women of reproductive age in two subsequent survey of India.
2. To investigate the state wise pattern of anaemia in two subsequent survey.

### Method

We used data from the National Family Health Survey (NFHS) of India carried out in 2005/2006 (NFHS-3) and 2015/2016 (NFHS-4). These nationally representative cross-sectional surveys collect detailed information relating to population, health and nutrition. The surveys use a stratified cluster multistage sampling design, with generally two stages in rural areas and three stages in urban areas. In brief, in rural areas, in the first stage, primary sampling units (PSU) are selected using a probability proportional to population size; in the second stage, households are systematically selected for inclusion in the survey. In urban areas, in the first stage, wards are selected using a probability proportional to population size; in the second stage, a census enumeration block is selected randomly from each ward; and in the third stage, households are selected randomly from each census enumeration block for inclusion in the survey. More details of the sampling methodology are described elsewhere, NFHS-3 and NFHS-4 included all women aged 15–49 years<sup>7</sup>. Both surveys were carried out by trained fieldworkers using standardized questionnaires and methodologies, and the household response rate was greater than 95% in both surveys

**Dependent Variable:** Anaemia level was considered as outcome variable, which was categorized dichotomously for analysis purpose, any type of anaemic women and moderate/severe level anaemic women.

**Independent Variables:** The demographic, socioeconomic, cultural and behavioral variables included in the analysis with its categories were Age (years): 15–19, 20–24, 25–29, 30–34, 35–39, 40–44, 45–49; Marital status: Currently married, Formerly married; Parity: 0, 1, 2, 3, 4, 5+; Religion: Hindu, Muslim, Christian, Sikh, Buddhist, Other/missing; Caste: SC, ST, OBC, General, Other/missing; Employment: Not working, Non manual, Agricultural, Manual; Residence: Rural, Urban; Wealth: Poorest, Poorer, Middle, Richer, Richest; Education (years): None, 1–5, 6–10, 11–12, ≥13; BMI: Underweight, Normal, Overweight, Obese; Contraceptive use: Not using, CP, IUD, Female sterilization, Other; Vegetarian: No, Yes; Alcohol: No, Yes; based on a review of the existing literature.

### Statistical Analysis

Multivariable logistic regression analysis and relative risk used with 95% confidence interval to identified relative changes from NFHS -3 to NFHS-4.

### Results and Discussions

The weighted distribution of anaemia level and non anaemic women through different predictors. The fourth round of national family health survey identified at national level severe anaemic women was 7060 (1.0%), moderate level was 84299 (12.4%), mild level was 269332 (39.6%) and not anaemic women was 318755 (46.9%). Next, we examined the changes in the prevalence of anaemia (**table 1**). Any type of anaemic women were identified 45238 (56.1%) from NFHS-3 (2005/2006) and it's declined in next round survey NFHS-4 (2015/2016), which was 360692 (53.1%). In sequence, moderate and severe anaemic women were reported 13298 (17.2%) from NFHS-3 and 91360 (13.4%) from NFHS-4. Accordingly, prevalence was reported in table 2 with different predictor variables.

We found marked regional variation in anaemia prevalence, which was in NFHS-3 (56.1%; 95% CI: 55.4 to 56.8) and NFHS-4 (53.1%; 95% CI: 52.9 to 53.3) with relative risk (RR = 0.95 and 95% CI: 0.94 to 0.95) in India. There was a significant increase in the relative risk of anaemia over time. In the states wise prevalence varies across the states in subsequent survey and for other states, which was mentioned in (**table 2**), information not available for NFHS-3. Most of the states

and its relative prevalence of anaemia varies over this 10-year period. **Table 3** shows the adjusted multivariable logistic regression analysis for two subsequent survey. In view of wealth index of women, richer, middle, poorer and poorest were significantly more likely to have any anaemia in comparison to richest from both survey NFHS-3 and NFHS-4. Education; uneducated, 1 to 5 years educated and 6 to 10 years educated were significantly more likely to have any anaemia in comparison to greater than equal to 13 year education, respectively. Caste; Schedule caste (SC) and schedule tribe (ST) were significantly more likely to have any anaemic in comparison to general caste.

**Table 1: Descriptive characteristics of any anaemia and moderate/severe anaemia prevalence among ever-married women aged 15–49 years from the 2005/2006 and 2015-16 NFHS surveys**

	Women aged 15-49		Any anaemia		Moderate/severe anaemia	
	2005	2015	2005	2015	2005	2015
	N	N	n (%)	n (%)	n (%)	n (%)
Overall	85403	699686	45238 (56.1)	360692 (53.1)	13298 (17.2)	91360 (13.4)
<b>Age (years)</b>						
15–19	4541	121552	2770 (62.9)	63652 (54.1)	951 (21.3)	15169 (12.9)
20–24	13570	122966	7700 (59.2)	63820 (53.5)	2548 (19.8)	16962 (14.2)
25–29	16604	115043	8825 (55.8)	58907 (52.7)	2536 (17.0)	15068 (13.5)
30–34	15593	96769	7913 (53.6)	48917 (52.0)	2178 (15.7)	12232 (13.0)
35–39	14492	90890	7435 (54.7)	46806 (53.0)	2092 (16.3)	11735 (13.3)
40–44	11736	77969	6053 (54.7)	40575 (53.4)	1753 (16.4)	10914 (14.4)
45–49	8867	74497	4542 (55.1)	38015 (52.5)	1240 (15.5)	9280 (12.8)
<b>Marital status</b>						
Currently married	80144	670407	42349 (55.9)	344771 (53.0)	12403 (17.1)	86792 (13.3)
Formerly married	5259	29279	2889 (58.9)	15919 (56.0)	895 (19.5)	4566 (16.1)
<b>Parity</b>						
0	8372	213078	4289 (54.4)	106229 (51.7)	1406 (18.2)	26289 (12.8)
1	13627	99101	7172 (56.3)	50227 (52.3)	2104 (17.8)	12691 (13.2)
2	22459	175433	11445 (54.1)	90416 (53.1)	3239 (16.2)	23009 (13.5)
3	17135	106624	9057 (55.6)	56930 (54.6)	2647 (17.2)	14796 (14.2)
4	10546	53637	5793 (57.8)	28857 (54.9)	1700 (17.3)	7413 (14.1)
5+	13264	51814	7482 (59.20)	28032 (55.0)	2202 (17.6)	7160 (14.1)
<b>Religion</b>						
Hindu	64873	563739	35235 (56.6)	294184 (53.7)	10415 (17.3)	75431 (13.8)
Muslim	10976	96461	5774 (55.7)	46983 (50.6)	1686 (17.1)	11202 (12.1)
Christian	4992	16620	2168 (51.2)	7631 (47.5)	613 (18.6)	2080 (13.0)
Sikh	1969	11618	789 (39.3)	5958 (52.0)	231 (12.1)	1262 (11.0)
Buddhist	1174	6469	603 (51.4)	3256 (51.6)	172 (15.8)	765 (12.1)
Other/missing	1419	4779	669 (61.7)	2677 (57.5)	181 (19.1)	619 (13.3)
<b>Caste</b>						
SC	14720	142619	8261 (58.5)	77735 (55.9)	2623 (19.0)	20933 (15.0)
ST	9716	64144	5698 (69.2)	37569 (55.9)	1853 (24.5)	10187 (16.2)
OBC	28195	303837	15112 (55.3)	154791 (52.2)	4487 (16.7)	39397 (13.3)
General	29009	157774	14294 (51.9)	75279 (49.7)	3800 (14.7)	17119 (11.3)
Other/missing	3763	31312	1873 (56.3)	15316 (51.1)	535 (17.7)	3724 (12.4)

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<b>Employment</b>						
Not working	49555	84428	25863 (54.8)	42921 (53.0)	7495 (16.3)	11439 (14.1)
Non manual	9039	9921	4365 (51.4)	4965 (52.6)	1145 (14.6)	1350 (14.3)
Agricultural	18928	17717	10734 (59.5)	9981 (57.5)	3381 (19.5)	3059 (17.6)
Manual	7881	7592	4276 (57.7)	3860 (52.3)	1277 (18.1)	1073 (14.5)
<b>Residence</b>						
Rural	49357	457461	27389 (58.1)	243546 (54.2)	8363 (18.0)	62565 (13.9)
Urban	36046	242225	17849 (51.4)	117145 (50.8)	4935 (15.4)	28794 (12.5)
<b>Wealth</b>						
1 Poorest	19669	124054	12278 (63.0)	71502 (58.7)	4006 (20.3)	18759 (15.4)
2	17998	136900	10156 (58.6)	74124 (55.1)	3163 (18.5)	19127 (14.2)
3	16493	143814	8502 (53.0)	74852 (53.3)	2486 (16.3)	19940 (14.2)
4	15684	147978	7601 (49.6)	72965 (51.0)	2043 (14.0)	18553 (13.0)
5 Richest	15559	146939	6701 (44.0)	67247 (48.2)	1600 (11.2)	14979 (10.7)
<b>Education (years)</b>						
None	34204	193078	19743 (60.1)	106386 (56.4)	6221 (19.3)	29266 (15.5)
1–5	13416	86290	7272 (56.4)	46144 (54.6)	2199 (17.6)	12018 (14.2)
6–10	25443	246906	12841 (53.1)	126478 (52.7)	3697 (16.0)	31513 (13.1)
11–12	5410	84131	2432 (46.3)	41319 (50.7)	557 (11.3)	9652 (11.8)
≥13	6930	89281	2950 (43.0)	40363 (47.6)	624 (9.3)	8910 (10.5)
<b>BMI</b>						
Underweight	22800	154031	13939 (62.7)	89732 (58.6)	4467 (20.3)	24932 (16.3)
Normal	47017	389501	24729 (55.4)	205456 (53.1)	7373 (17.3)	51606 (13.3)
Overweight	11902	105038	5018 (43.8)	48870 (46.9)	1135 (10.0)	11047 (10.6)
Obese	3684	51116	1552 (43.9)	16633 (47.0)	323 (9.7)	3774 (10.7)
<b>Contraceptive use</b>						
Not using	36693	414397	20452 (59.6)	212187 (52.9)	6787 (20.3)	55502 (13.8)
CP	3208	20820	1359 (43.5)	10174 (49.9)	265 (9.0)	1900 (9.3)
IUD	1794	7899	919 (52.0)	4457 (57.9)	229 (14.4)	1121 (14.6)
Female sterilization	30641	194826	15722 (53.8)	101430 (53.3)	4308 (15.3)	25317 (13.3)
Other	13067	61744	6786 (54.3)	32442 (54.1)	1709 (14.6)	7519 (12.5)
<b>Vegetarian</b>						
No	60049	516224	32525 (58.2)	268277 (53.6)	9520 (17.6)	67918 (13.6)
Yes	25354	183462	12713 (51.6)	92413 (51.5)	3778 (15.7)	23441 (13.1)
<b>Alcohol</b>						
No	82587	691048	43503 (55.8)	356162 (53.1)	12761 (17.1)	90163 (13.4)
Yes	2816	8638	1735 (66.5)	4528 (54.1)	537 (21.9)	1195 (14.3)

Table 2: Weighted anaemia prevalence by state, and relative risk in anaemia prevalence over time

Indian States	NFHS-3	NFHS-4	NFHS-3		NFHS-4		Relative risk	
	2005	2015	2005		2015		RR	
	N	N	Percent	95% CI	Percent	95% CI	RR	95% CI
All India	85403	360692	56.1	55.4 to 56.8	53.1	52.9 to 53.3	0.95	0.94 to 0.95
<b>North</b>								
Delhi	1819	4556	43.2	40.1 to 46.3	54.3	52.9 to 55.7	1.26	1.20 to 1.31
Haryana	2190	9610	56.5	54.0 to 59.0	62.7	61.7 to 63.7	1.11	1.06 to 1.16

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Himachal Pradesh	2260	2003	42.8	38.5 to 47.1	53.5	51.3 to 55.7	1.25	1.19 to 1.31
Jammu & Kashmir	1976	3309	53.6	50.4 to 56.8	49.5	47.8 to 51.2	0.92	0.87 to 0.98
Punjab	2633	8076	38.4	36.0 to 40.8	53.5	52.4 to 54.6	1.39	1.35 to 1.44
Rajasthan	3156	16927	53.7	50.6 to 56.8	46.8	46.0 to 47.6	0.87	0.83 to 0.91
<b>Central</b>								
Madhya Pradesh(C)	8099	22591	57.6	55.5 to 59.7	52.5	51.8 to 53.2	0.91	0.89 to 0.94
Uttar Pradesh(U)	10401	54412	50.9	49.2 to 52.7	52.4	52.0 to 52.8	1.03	1.01 to 1.05
<b>East</b>								
Bihar( J)	5242	33442	68.7	66.8 to 70.6	60.2	59.7 to 60.7	0.88	0.85 to 0.91
Orissa	3289	12481	62.7	60.2 to 65.2	51.0	50.2 to 51.9	0.81	0.78 to 0.85
West Bengal	5108	33562	63.8	61.5 to 66.1	62.5	62.0 to 63.0	0.98	0.95 to 1.01
<b>Northeast</b>								
Arunachal Pradesh	1163	253	50.3	45.0 to 55.6	43.2	37.1 to 49.3	0.86	0.72 to 0.99
Assam	2669	7715	69.4	66.5 to 72.3	46.0	44.9 to 47.1	0.66	0.62 to 0.71
Manipur	2727	321	39.4	36.9 to 41.9	26.4	21.6 to 31.2	0.67	0.55 to 0.79
Meghalaya	1192	865	48.7	43.6 to 53.7	56.2	52.9 to 59.5	1.15	1.07 to 1.24
Mizoram	1185	141	40.2	35.6 to 44.9	24.8	17.7 to 31.9	0.62	0.44 to 0.79
Sikkim	1378	111	58	53.8 to 62.2	34.9	26.0 to 43.8	0.60	0.41 to 0.80
Tripura	1414	1143	67.5	64.4 to 70.6	54.5	51.6 to 57.4	0.81	0.73 to 0.89
<b>West</b>								
Goa	2136	268	38.8	36.4 to 41.1	31.2	25.7 to 36.7	0.80	0.68 to 0.93
Gujarat	2898	17253	55.4	52.7 to 58.1	54.9	54.2 to 55.6	0.99	0.95 to 1.03
Maharashtra	5998	30913	49	47.0 to 51.0	48.0	47.4 to 48.6	0.98	0.95 to 1.01
<b>South</b>								
Andhra Pradesh	5139	16725	62.6	60.3 to 65.0	60.0	59.3 to 60.7	0.96	0.93 to 0.99
Karnataka	4201	15208	51.9	49.8 to 54.0	44.8	44.0 to 45.6	0.86	0.83 to 0.90
Kerala	2690	6506	32.7	30.0 to 35.5	34.3	33.1 to 35.5	1.05	1.00 to 1.09
Tamil Nadu	4440	28160	53.7	51.1 to 56.3	55.0	54.4 to 55.6	1.02	0.99 to 1.06
<b>Others*</b>								
Andaman and Nicobar Islands	NA	151	NA	NA	65.7	58.1 to 73.3	NA	NA
Chandigarh	NA	383	NA	NA	76.0	71.7 to 80.3	NA	NA
Chhattisgarh	NA	7676	NA	NA	47.0	45.9 to 48.1	NA	NA
Dadra & Nagar Haveli	NA	141	NA	NA	79.7	73.1 to 86.3	NA	NA
Daman and Diu	NA	49	NA	NA	59.0	45.2 to 72.8	NA	NA
Jharkhand	NA	11230	NA	NA	65.2	64.3 to 66.1	NA	NA
Lakshadweep	NA	20	NA	NA	46.5	24.6 to 68.4	NA	NA
Nagaland	NA	214	NA	NA	27.9	21.9 to 33.9	NA	NA
Puducherry	NA	414	NA	NA	52.3	47.5 to 57.1	NA	NA
Uttarakhand	NA	2615	NA	NA	45.1	43.2 to 47.0	NA	NA
Telangana	NA	11248	NA	NA	56.6	55.7 to 57.5	NA	NA

NA = information not available.

**Table 3: Adjusted socioeconomic correlates of anaemia among ever-married women aged 15–49 years in 2005/2006 and 2015/2016**

	2005/2006		2015/2016	
	N (85403)		N (699686)	
Covariates	Adjusted (OR)	95% CI	Adjusted (OR)	95% CI
<b>Wealth index</b>				
Richest	1		1	
Richer	1.05**	(1.02 to 1.08)	1.32*	(1.29 to 1.34)
Middle	1.06**	(1.03 to 1.09)	1.18*	(1.17 to 1.20)
Poorer	1.09**	(1.06 to 1.13)	1.13*	(1.12 to 1.15)
Poorest	1.14**	(1.10 to 1.18)	1.07*	(1.05 to 1.08)
<b>Education</b>				
≥13	1		1	
11–12	1.01	(0.97 to 1.05)	1.19*	(1.17 to 1.21)
6–10	1.06**	(1.02 to 1.10)	1.61*	(1.14 to 1.19)
1–5	1.06**	(1.03 to 1.11)	1.12*	(1.10 to 1.14)
None	1.06**	(1.03 to 1.11)	1.09*	(1.06 to 1.10)
<b>Caste</b>				
General	1		1	
SC	1.03*	(1.00 to 1.05)	1.17*	(1.16 to 1.19)
ST	1.13**	(1.10 to 1.17)	1.32*	(1.29 to 1.35)
OBC	1	(0.98 to 1.02)	1.05*	(1.04 to 1.06)
Other/missing	0.98	(0.94 to 1.02)	0.99	(0.97 to 1.02)
* $<0.05$ and ** $<0.01$				

**Conclusion**

In this study, the prevalence of anaemia among women of reproductive age has slightly decreased significantly during a recent 10-year period in India. Majority of regional variations were identified. Maximum prevalence of anaemic inflation was seeming across socio-economic groups and states in comparison to third round of national family health survey. There was geographical variation in anaemia trends. Education, wealth index and castes were identified measure causal factors of anaemia among reproductive age group of women.

**Conflict of Interest:** Nil

**Source of Funding:** Nil

**Ethical Clearance:** The unit level data from NFHS-3 and NFHS-4 is available in the public domain.

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