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Title: Life style behavior affecting prevalence of anemia among women in EAG states, India

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Abstract

In India, prevalence of anemia among women of age group 15 to 49 years is much higher. Poor eating habits and iron deficiency are established as major causes of anemia, particularly in eight under developed states (known as Empowered Action Group or EAG states) the situation is worst. The present study is based on National Family Health Survey (NFHS-3, 2005-06) data. Major insight of the study is that anemia level of women largely differs with the changes in lifestyle variables irrespective of other background characteristics. Thus, the present study has tried to focus on those issues which are responsible for determining the level of anemia among women aged 15 to 49 years and has also tried to provide scientific explanations of statistical analysis of how lifestyle behavior along with the other socio economic background characteristics of women affect the prevalence of anemia in EAG states.

Key words: women, anemia, EAG, socioeconomic, lifestyle, states, hemoglobin

Introduction

Anemia is ignored in most of the developing countries even though it's one of the most prevalent public health problems and has serious consequences for national development. According to WHO (1992), there are two billion people, who are anemic because of iron deficiency. Prevalence of anemia in South Asian developing countries is among highest in the world, mirroring over all high rates of malnutrition (Bentley M.E, *et al* 2003). In 2001, the world health organization estimated that prevalence of anemia among women was 10% in developed countries and 42% in developing countries (WHO, 2001).

Anemia is a deficiency of red blood cells or hemoglobin in the blood and the dietary intake or absorption of iron is inadequate. The job of hemoglobin is to carry oxygen because hemoglobin (found inside RBCs) normally carries oxygen from the lungs to the tissues, anemia leads to hypoxia (lack of oxygen) in organs. Because all human cells depend on oxygen for survival, varying degrees of anemia can have a wide range of clinical consequences.

In 2002, Iron Deficiency Anemia (IDA) was considered to be among the most important contributing factors to the global burden of disease (WHO, 2002). Iron deficiency is the most common single cause of anemia worldwide, accounting for about half of all anemia cases. It is more common in women than in men. Iron deficiency anemia is the most common form of anemia. Three stages of iron deficiency are (a) First stage characterized by decreased storage of iron without any other detectable abnormalities. (b) An intermediate stage of “latent iron deficiency”, that is, iron stores are exhausted, but anemia has not occurred yet. Its recognition depends upon measurement of serum ferritin levels. The percentage saturation of transferrin falls from a normal value of 30% to less than 15%. This stage is the most widely prevalent stage in India, and (c) The third stage is that of overt iron deficiency when there is a decrease in the concentration of circulating hemoglobin due to impaired hemoglobin synthesis (Park K. 2007).

Most of anemia's are caused due to inadequate supply of nutrients like iron, folic acid and vitamins B₁₂, amino acids, proteins, vitamin A, C and other vitamin B complex group i.e. niacin and pantothenic acid are also involved in the hemoglobin level (Lee G.R, *et al* 1998); and (Agarwal K.N *et al.* 2006). Poor eating habits play a major role in the development of iron deficiency anemia that is an important indicator of poor health status. Children and adolescent are at increased risk of developing iron deficiency anemia because of their increased demand for iron during growth and puberty (Ghada Z.A. *et al*, 2007). In most cases, they are undiagnosed because of irregular, far visiting of health clinics, doctors, and hospitals (World Bank, 1996). It is evident that anemia reduces to do physical and mental ability to do work reduces to fight infection and causes increased mortality and morbidity. The National Nutrition Survey in Japan revealed that anemia prevalence among young Japanese women is increasing (Kusumi Eiji *et al* 2006).

In India, anemia affects an estimated 50% of the population (NFHS-3, 2005-06). Hospital and community based studies conducted by Indian Council of Medical Research (ICMR) and other research agencies have shown that prevalence of anemia is highest among pregnant women – estimated prevalence range between 50-90 % (Agarwal K.N, *et al*, 2005). The high prevalence of anemia among women in India is a serious health hazards for them, for their families, and for the economic development and productivity of the country (Bentley, *et al*, 2003; Upadhyay, *et al* 2011).

According to National Family Health Survey (NFHS-3), fifty percent women whose hemoglobin level was tested were found to be anemic. 39% of women are mildly anemic, sixteen percent are moderately anemic and two percent are severely anemic in India. Prevalence of anemia for ever-married women has increased from fifty two percent in NFHS-2 to fifty six percent in NFHS-3. In 2001, The Ministry of Health and family Welfare has prepared a list of eight states which are less developed and are also backward in socio demographic indices as compared to others states of India. The Government of India has called them an Empowered Action Group. Empowered Action Groups (EAG) includes Bihar, Jharkhand, Uttar Pradesh, Rajasthan, Odisha, Madhya Pradesh and Chhattisgarh.

Bentley M.E. *et al.* (2003) observed in their study 'The burden of Anemia among women in India'. They found statistical significant differences in the prevalence of anemia between communities based upon socio economic status and location of residence. They also found that health and nutritional variables such as drinking alcohol and eating pulses daily were statistically significantly less likely to be any anemic than those who reported eating pulses less than daily.

'Causes of Anemia among women in the Eastern states of India: A study of West Bengal' gives the causes of anemia among women in West Bengal in follow-up of some selected villages of National Family Health Survey-2 (1998-1999). Causes of anemia have been studied from the perspective of workload, nutritional status, food intake, type of childbirth, breastfeeding and menstrual characteristics. They investigated that higher proportion of working women was found to be severely or moderately anemic. Those women who consumed foods such as fruits, vitamin C, pulses were quite low, which can be one of the predicted causes of anemia among women. Unisa S. *et al.* (2010).

Bentley P, *et.al.* (1998) In their paper 'Perceptions of anemia and health seeking behavior among women in four Indian states' have summarized four qualitative studies on women's knowledge, perceptions, and health-seeking behavior related to anemia. The research was conducted to gain a better understanding of how to improve iron status among women in a country where it is the norm to experience anemia. Iron supplementation programmes for a variety of reasons; have not been successful in reducing prevalence of anemia. Kusumi E, *et al.* (2006) in their study titled 'Prevalence of anemia among healthy women in 2 metropolitan areas of Japan' revealed that among women younger than 50 years, anemia was identified in 22.3 %,

and 25.2 % of them had severe anemia. Most of the existing studies conclude that anemia among women causes increased low birth weight, inadequate iron stores for the newborn child, higher risk of maternal morbidity as well as decline in mental concentration and physical activities. (Gillips and Johnston, 1998; Toteja et al., 2006; Manider k. and Kochar G.K.)

Rationale behind the study:

In developing countries, women are less privileged, particularly in respect to having proper food and health care facilities. The present study has focused on the estimation of the level of anemia among women of age group 15-49 years in the eight states of India. The present study has tried to evaluate the prevalence and determinants of anemia among women in EAG states of India. A collective term is used for these states is, the 'Empowered Action Group' or EAG states. In 2001, Government of India has formed this group because these states have almost 45% of India's population and they are very far lagging behind in socio demographic, economic & health dimensions with comparison to other states of India. To improve the condition of women in these states we need to focus on the level of anemia of them. Therefore, the study is planned to estimate the prevalence of anemia among women in this group and to see the association of anemia with the socio economic, demographic and life style variables.

Therefore the whole study will try to focus on the following objectives:

- i) To examine the prevalence of anemia among women of age group 15-49 years by different socioeconomic back ground characteristics in EAG states
- ii) To examine the determinants of anemia among women 15-49 years by socio economic back ground characteristics in EAG states.
- iii) To study the effect of lifestyle variables on anemia level of women of age group 15-49 years of EAG states.

Conceptual Framework:

In the present study, a conceptual framework is developed that will definitely provide a focus into the inquiry. In India, the anemia level of women of age group 15-49 years widely varies from state to state, region to region. But the situation is most awful in the EAG states. Presently, the prevalence of anemia among women, belong to the EAG states is discussed here. Along with their demographic and socioeconomic background characteristics, other life style variables are

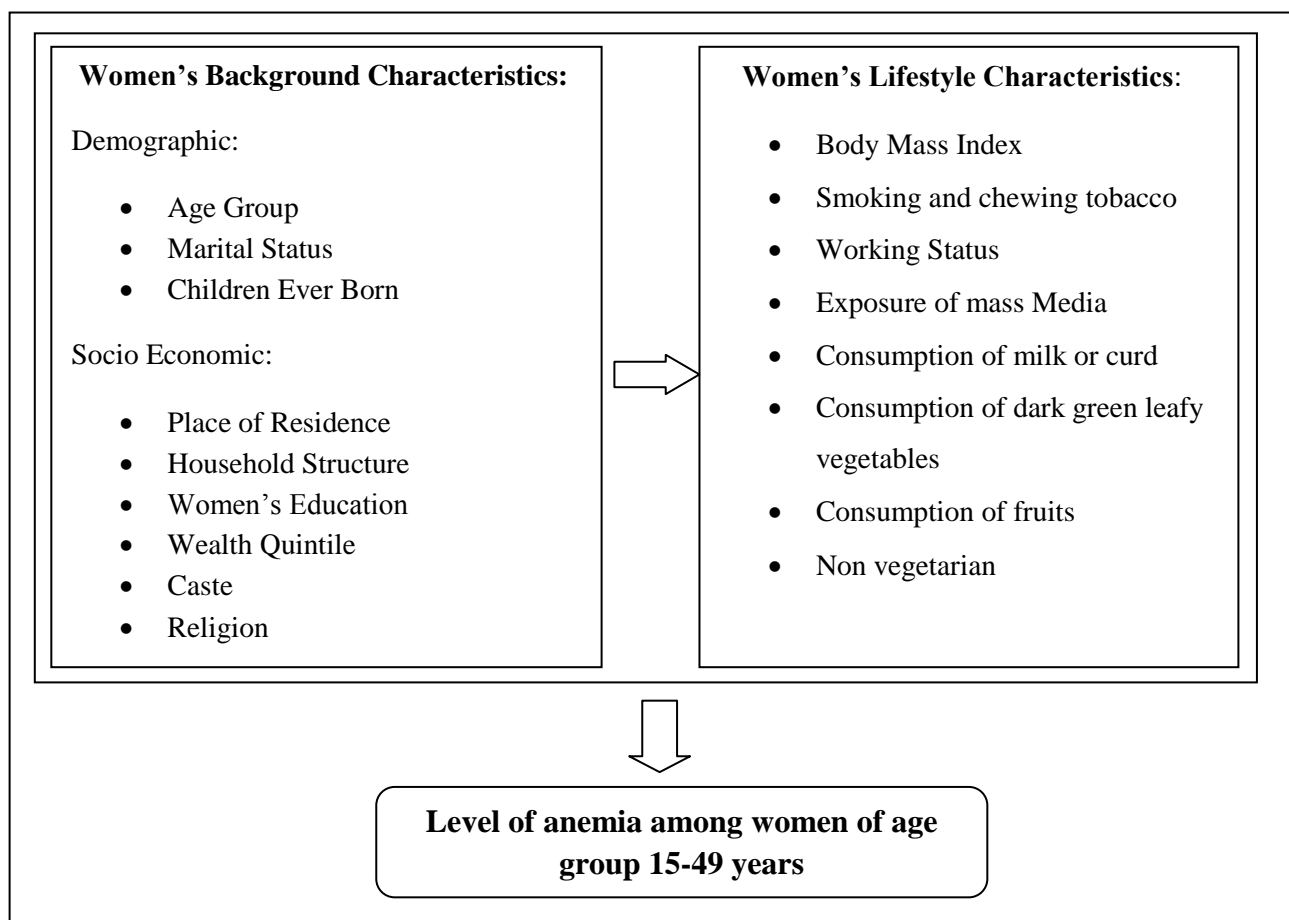
also taken into consideration as determining factors of prevalence of anemia among women aged 15 to 49 years.

Conceptual framework showing effects of background characteristics of women on level of anemia:

The figure 1 shows the prevalence of anemia among women of age group 15 to 49 years which largely depends on their background characteristics. If demographic characteristics like age groups of women, marital status and children ever born vary, then women’s anemia level

Figure1:

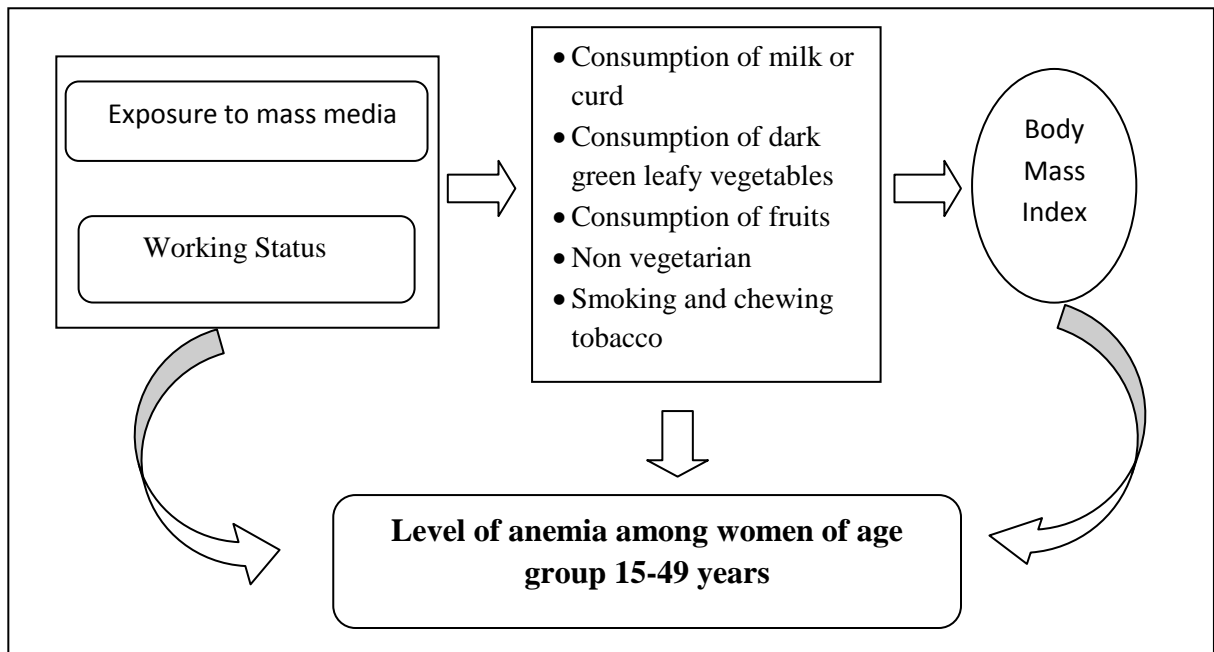
Conceptual framework showing effects of background characteristics on level of anemia



will certainly vary. Along with these, other socioeconomic characteristics are also playing crucial role in this regard. Whether a woman lives in rural or urban area, whether she belongs to higher or lower socioeconomic strata in terms of caste, religion, whether she comes from poor or rich family, whether she is educated or uneducated etc, all these together decide woman’s behavior, attitudes as well as her level of hemoglobin and ultimately health status.

Figure2:

Conceptual framework showing inter linkages among lifestyle variables and its effect on anemia



Conceptual framework showing inter linkages among lifestyle variables and its effect on anemia:

Now a day, another set of variables has been emerging in determining the women's level of anemia in India. These variables are collectively termed as life style background characteristics. Different practices and behavior, such as smoking and chewing tobacco, exposure to mass media etc; different food habits like consumption of fruits, milk or dark green leafy vegetables etc; play important role in determining level of anemia. Impacts of two more important determinants namely, women's working status and her body mass index are also discussed in the present study. Through this framework, inter linkages among the different lifestyle variables, in respect to their influence on each other, are shown. This framework also tries to explain the effect of all lifestyle variables, used in this study, on level of anemia among women of age group 15 to 49 years.

Data and Methods:

Data:

This study utilizes the data obtained from National Family Health Survey (NFHS-3), which was conducted in 2005-06 covering twenty-nine states in India, comprises near about 99 percent of

India's population. The NFHS-3 collected information from nationally representative sample of 109,401 households, 124,385 women age 15-49 and 74,369 men age 15-54. It provides cross-sectional survey data on women's hemoglobin status, body weight, diet, social, demographic, determinants of India. The study considers only non-pregnant women of age groups 15-49 years of EAG states of India.

Methods:

Description of variables

Different variables are used in the study to understand the differential in anemia and inter-relationships among the variables that affect women's health. The variables of the study are briefly described in this section.

Dependent variables:

Anemia level: Women with any anemia (mild, moderate, severe) are considered for the study. The level of anemia among pregnant and non pregnant women varies, greatly, and for non pregnant women the cut off Hb level is less than 12 g/dl and for pregnant women it is less than 11 g/dl. For multinomial regression, anemia variable are divided into four categories:

a) Severe (< 7 g/dl), b) moderate (7.0-9.9 g/dl), c) mild (10-11.9 g/dl), d) not anemic (> 12 g/dl)

Independent Variables:

The study includes a set of independent variables to understand the extent and differentials of anemia among women and its effect on the outcomes. The study divides variables into two categories, namely as socio economic & demographic and life style characteristics/variables. The variables are described as follows:

a) Socio economic & demographic characteristics:

The Socio economic characteristics of women include: Age groups (15-19, 20-29, 30-39, 40-49 years), Place of residence (rural, urban), Religion (Hindu, Muslim and others), Ethnic Groups (scheduled caste/ tribes, other backward caste, others), Women education level (no education, up to primary level education, up to secondary level education and high school and above), Wealth quintile (poorest, poorer, middle, richer and richest), Marital Status (married and others), Children ever born (No children, 1-2 children,, 3-4 children, and 5 or above children), Household structure (nuclear family, joint family and not de jure resident).

b) Life style Characteristics:

The life style characteristics consist of those variables which are totally dependent upon individual living and dietary pattern such as smoking and chewing tobacco (yes, no), Body mass index (underweight below 18.5 kg/m^2 , normal weight $18.5\text{-}24.9 \text{ kg/m}^2$ and overweight above 25.0 kg/m^2), Working status (no working, working in past years, currently working and have job but in leave more than 7 days), Exposure of mass media (yes, no), Consumption of milk (ever, daily, weekly, and sometimes), Consumption of dark green vegetables (often and rarely), Consumption of fruits (never, at least once in a week, sometimes), Non-vegetarian (never, at least in a week).

Statistical Analysis:

The study uses bivariate and multivariate techniques to understand the level of anemia among non-pregnant women of age groups 15-49 belong to EAG states of India. Multivariate techniques like multinomial logit regression analysis are applied to examine the effect of socio economic and life style variables on anemic women.

Multinomial Regression Analysis:

Multinomial regression is the most appropriate technique in a situation where the dependent variables are categorical and have more than two outcomes. The model permits the study of the effect of a unit change in the independent variables on the dependent variable considering the simultaneous effects of several variables.

The multinomial regression model is generalization form of logistic regression model. The multinomial regression model is used to analyze the effect of some selected life style factors on anemia among the women in EAG states of India. The level of anemia is categories as: Severe ($< 7 \text{ g/dl}$), Moderate ($7.0\text{-}9.9 \text{ g/dl}$), Mild ($10\text{-}11.9 \text{ g/dl}$) and not anemic ($> 12 \text{ g/dl}$).

Suppose the response variable as anemic:

p_1 : estimated probability of severely anemic women aged 15-49 years.

p_2 : estimated probability of moderately anemic women aged 15-49 years.

p_3 : estimated probability of mildly anemic women aged 15-49 years.

p_4 : estimated probability of not anemic women aged 15-49 years.

Let the reference category is not anemic.

The multinomial logit model then consists of three equations plus a constraint

$$\text{Log} (p_1/p_4) = a_1 + \sum b_{1j} * X_j$$

$$\text{Log} (p_2/p_4) = a_2 + \sum b_{2j} * X_j$$

$$\text{Log} (p_3/p_4) = a_3 + \sum b_{3j} * X_j$$

$$p_1+p_2+p_3+p_4=1$$

where,

$$a_i \quad i=1,2,3$$

$$b_{ij} \quad i=1,2,3; j=1,2,\dots,n$$

The multinomial logit coefficient has been estimated using 17th version of SPSS (Statistical Packages for Social Sciences). Due to the sign of a multinomial logit regression coefficient may not reflect the predictor variables. In this study the adjusted percentage for the multinomial logit model is estimated by using excel sheet.

Most convenient way to represent the effects of the predictor variable on p₁, p₂, p₃ and p₄ is in the form of a MCA table. To measure the goodness of fit pseudo R square is used in multinomial logit regression.

Findings:

Present situation of prevalence of anemia among women in EAG states:

High percentage of women observed from table 1 suffering from severe anemia, is in Rajasthan (2.5%) where as it is lowest in Bihar and Madhya Pradesh each having (0.9 %). Prevalence of Moderate anemia is found highest in the state of Jharkhand and lowest in Uttar Pradesh. Prevalence of mild anemic cases is the highest in Bihar and lowest in Rajasthan. It means severe anemic women are more in Rajasthan in respect to other EAG states. Prevalence of anemic women is two times higher in the states of Jharkhand as compared to the not anemic women. In Uttar Pradesh almost fifty percent women are anemic and rest of the fifty percent is not anemic. The lowest level of anemic cases is found in Rajasthan. Most of the states like Jharkhand (69.4 %), Bihar (68.2 %) and Odisha (60.9 %) are having the highest percentage of anemic women among EAG states.

Differential in anemia level of women by socio economic characteristics:

The adolescent girls of EAG states are more severely anemic in compared to other age groups of women. The women aged 40-49 years are mildly anemic (43.0 %). The rural women are less mildly anemic (37.3 %) where as the women in urban area (42.9 %) are anemic. In India, a great diversity is found in prevalence of anemia among various caste and class. A difference of approximate seven percent in between scheduled caste/ tribes and others (except other backward caste) in mildly and moderately anemic can be seen in which the high women suffering anemia belongs to scheduled caste/ tribes.

Education leads to awareness and the effect of education is reflected in the statistics of women suffering from anemia. According to the statistics, the women who have high school and above education are two times less severely anemic than the women who un-educated. The higher percentage of women lies in mild anemic where poorest women are (46.1 %), poor (43.2 %), middle (40.0 %), richer (39.0 %) and richest (36.0 %). Similarly the more severely anemic women are found among poorest. Therefore, it can be seen that as the economic status escalates the degree of anemic severity reduces.

Those women who are currently married are more severely anemic as compared to others (divorced, widowed, separated, not living together). Similarly high variation can be seen in the moderate and mild anemic women. The women who have more than five children are mildly anemic (43.3 %) & it is reducing by decreasing number of children. The same pattern is followed among the non-anemic women (Table 2).

Differential in anemia level of women by life style characteristics:

Table 3 presents the anemia status among women (15-49 years) by life style background characteristics in EAG states. It can be seen that high percentage of women suffering from severe anemia are under weight where as the normal weight women and overweight are less severely anemic. The similar trend can be seen in the moderate & mild anemic women. Those women who smoke & chew tobacco contribute a high percentage in mild anemic (40.1 %) than those who are non-smokers and do not chew tobacco. The difference between who smoke as well as chew tobacco and those who do not chew tobacco is almost (7.8 %). Those women, who are currently employed, are more mildly anemic (42.5 %) than the women who are not employed (40.2 %). The difference between not anemic women who are not working and who used to work

in past years is almost 8 percent. It denotes that not working women are less anemic in compared to those who were working in past years. The women who have exposure of mass media are less anemic than those who are not exposed to the mass media.

The women who never consumed milk or cured are more anemic (34.3%) in compared with those who have consumed daily (49.3 %), weekly (44.0 %), sometimes (41.4 %). Those women who use to consume green or leafy vegetables are less severely anemic as compared to women who rarely consumes. The women who never consumed fruits are more prone to be anemic (64.0 %) as compared to women who consumed fruits at least once in a week or sometimes (52.1 & 58.0 %). The women who sometimes consume non-vegetarian food are less anemic than other categories of women like never and take at least in week.

Effect of socio-economic variables on anemia level of women:

The adjusted percentage of anemia level of women estimated by using multinomial logistic regression analysis and MCA conversion model by her socio-economic background characteristics is shown in Table 4. The findings reveal that young women aged 15-19 years are less not anemic (41.6%) as compared to the women belong to 40-49 years age (46.7%). Women who are uneducated, are more severely anemic (1.7%) and slightly is decreasing as education level increases. Those women who have high school and above education, severely anemia among them decreases half of the uneducated women (0.8%). Similar results found in moderately and mildly anemic level. This indicates that if education level of women increases, it results in decrease in some percentage of anemia level. Women have low economic status are more vulnerable to be anemic, it is also proved by findings of the study, such as severely (1.2%), moderately (9.9%), mildly (42.2%) anemic. Findings reveal that, those women who have no children are more not anemic (47.8%), which slightly decreases as the number of children increases.

Impact of lifestyle variables on anemia level irrespective of socio-economic variables:

The adjusted percentage of anemia level of women by her socio-economic and lifestyle variables is presented together in Table 5. It can be seen that high percentage of women suffering from severe anemia are under weight (1.7%) where as the normal weight women (1.3%) and overweight women are less severely anemic (0.5%). Those women who smoke & chew tobacco

contribute a high percentage as not anemic (47.5%) than those who are non-smokers and do not chew tobacco (40.4%). As seen in the table, women who do not have exposure of mass media are severely anemic (2.0%) than those who have exposure of mass media (1.7%). The table shows that women who have never consumed milk or cured are less not anemic (39.5%) as compared to those who have consumed daily (46.4%), weekly (44.4%), sometimes (44.5%). Women who never consumed fruits are anemic (57.2%) as compared to women who consumed fruits at least once in a week or sometimes (55.4 & 55.8%).

Here it is mention worthy that after controlling lifestyle variables, the provided results related to socio economic variables shows slightly change in adjusted percentages when lifestyle variables are not controlled. Those women who belong to age groups 15-19 years are less not anemic (33.7%) as compared to the women who belong to the higher age groups 30-39 years (39.7%). The table shows that the women belong to scheduled caste/tribes are more moderately anemic (18.4%) as compared to others (13.6%). Those women belong to Hindu religion are more severely anemic (1.6%) as compared to the other (1.4%). Married women have higher risk of getting severely anemic (2.2%) than the others (1.4%).

Conclusion:

The study found that apart from the socio economic characteristics, the life style variables also play significant role in determining level of anemia among women. According to World Bank (2000), India has shown remarkable improvement in most of health indicators in the last two decades, which include a reduction in infant mortality rate from 115 in 1980 to 70 in 1998 and a fall in the fertility rate from 5 to 3.2 during the same period, improvement in dietary status, still it has been less satisfactory. Half of the world's undernourished population lives in India (Krishnaswami, 2000; Bentley M.E. *et al.* 2003). This study shows that among EAG states, severe anemia is highest in Rajasthan where as moderate anemia is highest in Jharkhand (69.4 %), Bihar (68.2 %) and Odisha (60.9 %) are having the highest percentage of anemic women among EAG states. The reason behind the higher percentage of women being anemic may be due to their low literacy level, having less decision making power or low level of autonomy and mostly due to higher poverty situation in those states. Women in young age (15-19years) are significantly more likely to be anemic as compared to 20-29 age groups. Education (above high

school) and high economic status are playing significant role in controlling the prevalence of anemia among women in these states.

In this study, it is found that life style variables have significant role in developing anemia in women. Body mass index of those women who are underweight are more vulnerable to anemia than normal and overweight women after controlling the other life style factors. Smoking and tobacco chewing women are more anemic than women who do not smoke and chew tobacco. The reason why smoking is more vulnerable to cause anemia is that smoking consist carbon monoxide, nicotine, tar and cadmium. Carbon monoxide is odorless and color less gas which emits from smoking so when carbon monoxide attaches itself with hemoglobin then hemoglobin is not able to carry oxygen which cause anemia. Smoking can inactive over 10 percent of body hemoglobin. Those women who never consumed milk or curd are more vulnerable to be anemic.

In conclusion, high percentage of women is anemic in EAG states, which is considered as a serious health problem for them, for their families, society and for the economic development of those states as well as for the country. Iron supplementation programs have not been effective in reducing anemia prevalence (Vijayaraghaven *et al*, 1990 & Bentley M.E. *et al*. 2003). Government of India has started many intervention programmes to eradicate the problem of anemia in the country but most of the efforts are towards the supplementation of iron tablets to the women (Upadhyay S, *et al*. 2011). To address the public health problem of anemia, in 1970 India's Ministry of Health and Family Welfare initiated the National Nutritional Anemia Control Prophylaxis Programme (renamed the National Nutritional Anemia Control Programme (ACP), in 1989 (Bentley P. *et al*.1998). Several other programmes focusing on issue of anemia includes: Integrated child Development Services (ICDS), Mid-day meal programme, Kishori Swasthya Yojna, Matri Suraksha Abhiyan, Indian Medical Association Anemia free India, as a Public-Private Partnership and Anemia Chale Jao etc.(12 by 12 Initiative, GOI, WHO, UNISEF, FOGIS, 2007).To control high prevalence of anemia in EAG states, a short and effective program that targets to reduce difference existing in socio economic as well as life style factors that influence the anemia level of women and also their health, is the utmost prerequisite.

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Table 1. Prevalence of Anemia among woman in Empowered Action Group states of India, NFHS 2005 06.

<i>States</i>	Anemia level by hemoglobin status					Sample Size
	Severe (<7.0g/dl)	Moderate (7.0-9.9 g/dl)	Mild (10.0-11.9g/dl)	Anemic (<12.0g/d)	Not Anemic (>12.0g/dl)	
Uttarakhand	1.4	12.5	41.5	55.3	44.7	2693
Rajasthan	2.5	14.2	35.9	52.6	47.4	3643
Uttar Pradesh	1.6	12.1	36.0	49.7	50.3	10175
Bihar	0.9	14.4	52.9	68.2	31.8	3323
Jharkhand	1.3	16.7	51.4	69.4	30.6	2573
Odisha	1.4	14.3	45.2	60.9	39.1	4152
Chhattisgarh	1.8	12.9	40.6	57.1	42.9	3573
Madhya Pradesh	0.9	12.9	41.9	55.8	44.2	6048
Total	1.4	13.0	40.5	54.9	45.1	36180

Table2. Prevalence of anemia among women age 15-49 years by socio economic background characteristics in EAG States of India, NFHS 2005-06.

<i>Socio Economic Characteristics</i>	Anemia Status by hemoglobin level				Sample size
	Severe (<7.0g/dl)	Moderate (7.0-9.9 g/dl)	Mild (10.0-11.9 g/dl)	Not Anemia (> 12.0 g/dl)	
Age					
15-19	1.6	13.0	41.5	44.0	7863
20-29	1.3	14.3	41.5	42.9	11659
30-39	1.5	13.1	40.7	44.6	9922
40-49	1.5	13.5	43.0	42.0	6736
Place of Residence					
Rural	1.4	12.0	37.3	49.2	21948
Urban	1.5	14.0	42.9	41.6	14232
Caste					
Scheduled caste/ Tribes	1.8	17.2	45.5	35.5	10304
Other Backward Classes	1.3	12.5	40.7	45.6	15184
Others	1.4	11.1	38.4	49.2	10690
Woman Education					
No Education	1.6	15.2	43.8	39.4	16513
Upto Primary Level Education	1.6	13.5	41.9	43.0	7002
Upto Secondary Level Education	1.6	12.3	39.0	47.0	4748
High School and Above	0.8	9.5	36.3	53.5	7917
Religion					
Hindu	1.4	14.4	40.7	43.7	30875
Muslim	1.7	15.5	38.7	44.2	4170
Others	1.4	16.6	43.2	38.8	1135
Wealth Quintile					
Poorest	1.6	16.3	46.1	36.0	8013
Poorer	1.5	13.7	43.2	41.5	6662
Middle	1.7	13.6	40.0	44.8	5932
Richer	1.5	11.7	39.0	47.8	6620
Richest	1.0	10.4	36.0	52.6	8949
Household Structure					
Nuclear Family	1.5	14.8	40.8	42.8	17155
Joint Family	1.4	14.5	40.3	43.8	16987
Not de jure resident	1.3	13.4	42.7	42.7	2038
Marital Status					
Currently Married	2.2	30.9	40.5	45.1	28797
Others	1.4	13.0	26.3	40.7	9663
Children ever born					
No children	1.5	11.9	40.0	46.7	10641
1-2	1.5	14.3	41.4	42.8	9075
3-4	1.4	14.0	42.0	42.7	9503
5+	1.6	14.4	43.3	40.8	6931
Total	1.4	13.0	40.5	45.1	36180

Table 3. Prevalence of anemia among women (15-49) by different Life style background characteristics in EAG States of India, NFHS, 2005-06.

Life Style Characteristics	Anemia Status by hemoglobin level				Sample size
	Severe (<7.0g/dl)	Moderate (7.0-9.9 g/dl)	Mild (10.0-1.9g/dl)	Not Anemia (> 12.0 g/dl)	
Body Mass Index					
Under weight(Below 18.5 kg/m ²)	1.8	15.3	43.7	39.3	13164
Normal Weight(18.5-24.9kg/m ²)	1.4	13.1	40.9	44.6	19062
Over Weight(Above 25.0 kg/m ²)	0.5	7.9	35.9	56.1	3869
Smoking and Chewing tobacco					
Yes					
No	1.7	15.5	44.8	38.1	2258
	1.4	12.7	40.1	45.9	33908
Working status					
No working	1.5	12.6	40.2	45.8	20584
Working in past years	1.8	15.2	45.1	37.9	3278
Currently working	1.4	14.5	42.5	41.7	12145
Have job but in leave more than seven days	1.2(3)	16.4	45.6	36.8	171
Exposure of Mass Media					
Yes	1.4	12.7	40.1	45.9	26678
No	1.7	15.5	44.8	38.1	9487
Consumption of Milk or Curd					
Never	1.7	16.6	47.5	34.3	3885
Daily	1.3	11.9	37.5	49.3	11765
Weekly	1.5	13.5	41.0	44.0	6080
Sometimes	1.6	13.9	43.1	41.4	14443
Consumption of Dark green, Leafy vegetables					
Often	1.4	13.4	41.6	43.6	33542
Rarely	1.9	14.7	41.6	41.8	2555
Consumption of Fruits					
Never	2.2	14.0	47.9	36.0	1119
At least once in a week	1.2	11.6	39.2	47.9	12089
Sometimes	1.5	14.3	42.2	42.0	22935
Non Vegetarian					
Never	1.5	12.6	38.5	47.5	15780
At least in a week	1.2	12.6	41.8	44.3	3996
Sometimes	1.5	14.6	44.3	39.6	16391
Total	1.4	13.0	40.1	45.1	36180

() cases less than 25

Table 4: Adjusted Prevalence of anemia among women 15-49 years by different socio-economic background characteristics in EAG states of India, NFHS, 2005-06.

Socio-economic Characteristics	Anemia Status by hemoglobin level				Sample Size
	Severe (< 7.0 g/dl)	Moderate (7.0-9.9 g/dl)	Mild (10.0-11.9 g/dl)	Not Anemic (> 12.0 g/dl)	
Age					
15-19	1.4	13.7***	43.3**	41.6	7863
20-29	1.4	13.3***	40.3	44.9	11659
30-39	1.4	10.4	43.2**	45.0	9922
40-49®	1.5	10.5	41.3	46.7	6736
Place of residence					
Urban	1.6	12.6	39.2	46.6	14232
Rural®	1.3	11.8	42.6	44.2	21948
Caste					
Scheduled caste/Tribes	1.0**	14.7	43.6***	40.7	10304
Other Backward classes	1.2	10.7	41.7	46.4	15184
Others®	1.4	10.1	42.3	46.2	10690
Women Education					
No education	2.0***	13.3***	42.1	42.9	16513
Upto primary level education	1.8***	12.3***	41.9	44.3	7002
Upto secondary level education	1.9***	11.6***	41.4	45.5	4748
High school and above®	0.9	9.5	41.9	47.7	7917
Religion					
Hindu	1.6	12.0	41.2	45.4	30875
Muslim	1.8	11.9	45.2	41.4	4170
Others®	1.4	14.4	42.5	41.9	1135
Wealth quintile					
Poorest	1.5*	13.8***	45.8***	39.0	8013
Poorer	1.7*	12.1***	43.2***	43.1	6662
Middle	1.8**	12.5***	40.8**	45.1	5932
Richer	1.6	10.6**	44.1**	44.0	6620
Richest®	1.6	9.9	42.2	46.8	8949
Marital status					
Married	1.5**	11.9	43.2	43.6	28797
Others®	2.0	11.0	43.4	43.8	9663
Children ever born					
No children	1.6	10.2***	40.7***	47.8	10641
1-2	1.3	12.8	43.5	42.1	9075
3-4	1.4	11.9	45.0	41.9	9503
5+®	1.5	11.9	44.7	41.9	6931
Household Structure					
Nuclear family	1.7	13.8	40.7	44.6	17155
Joint family	1.6	12.1	42.7	45.3	16987
Not de jure resident®	1.5	12.5	42.4	42.8	2038

Note: ® & Not anemic are reference category, ***p<0.01,**p<0.05,

Table 5: Adjusted Prevalence of anemia among women 15-49 years by different socio-economic and lifestyle background characteristics in EAG states of India, NFHS, 2005-06.

Socio-economic & lifestyle Characteristics	Anemia Status by hemoglobin level				Sample Size
	Severe (< 7.0 g/dl)	Moderate (7.0-9.9 g/dl)	Mild (10.0-11.9 g/dl)	Not Anemic (> 12.0 g/dl)	
Age					
15-19	1.4	17.4***	47.5	33.7	7863
20-29	1.6	17.2***	44.4	36.99	11659
30-39	1.8	14.2	44.3**	39.7	9922
40-49®	1.9	14.3	46.6	37.2	6736
Place of residence					
Urban	1.8	16.1	44.9**	37.1	14232
Rural®	1.5	15.5	46.3	36.6	21948
Caste					
Scheduled caste/Tribes	1.2**	18.4**	47.5	33.0	10304
Other Backward classes	1.4	14.3	46.1***	38.2	15184
Others®	1.6	13.6	46.8	38.1	10690
Women Education					
No education	2.0***	17.3***	44.9	33.0	16513
Upto primary level education	1.8***	16.4***	45.2	36.7	7002
Upto secondary level education	1.9***	15.4***	45.3	37.4	4748
High school and above®	0.9	13.0	47.0	39.1	7917
Religion					
Hindu	1.6	15.6**	45.8	36.9	30875
Muslim	1.8	17.0**	42.5**	38.7	4170
Others®	1.4	18.4	46.3	34.0	1135
Wealth quintile					
Poorest	1.5	17.1***	47.2***	35.9	8013
Poorer	1.7	15.6	46.1	36.7	6662
Middle	1.8	16.2	44.4	37.6	5932
Richer	1.6	14.7	46.6	37.1	6620
Richest®	1.6	14.6	45.4	38.4	8949
Marital status					
Married	1.5	15.6**	47.3	35.6	28797
Others®	2.0	14.3	46.9	36.8	9663
Children ever born					
No children	1.6	13.5***	45.0***	39.9	10641
1-2	1.3	16.7	47.1	34.4	9075
3-4	1.4	15.6	48.8	34.2	9503
5+®	1.5	15.6	48.5	34.3	6931
Household Structure					
Nuclear family	1.7	15.7	45.0	37.6	17155
Joint family	1.6	15.8	45.8	36.8	16987
Not de jure resident®	1.5	15.9	46.9	35.7	2038

Body mass index					
Underweight	1.7***	14.3***	42.0***	42.0	13164
Normal weight	1.3***	13.8***	39.4***	45.5	19062
Overweight®	0.7	9.6	36.5	53.1	3869
Smoking and chewing tobacco					
No	1.4	9.7	43.6***	47.5	33908
Yes®	1.5	14.5	41.8	40.4	2258
Working Status					
No working	1.5	13.9	38.9	43.8	20584
Working in past years	1.7	16.1	38.9	43.8	3278
Currently working	2.0	23.2	38.9	44.6	12145
Have job but in leave more than seven days®	2.0	23.1	42.4	39.2	171
Exposure of mass media					
No	1.7	22.5	40.3**	43.6	9487
Yes®	2.0	25.3	41.0	42.8	26678
Consumption of milk or curd					
Never	2.1	26.1	42.8***	39.5	3885
Daily	2.0	20.6	37.4***	46.4	11765
Weekly	2.0	21.2	39.4	44.4	6080
Sometimes®	2.0	20.6	39.9	44.5	14443
Consumption of dark green or leafy vegetables					
Often	1.6	29.3	36.5	41.1	33542
Rarely®	2.0	22.5	36	45.2	2555
Consumption of fruits					
Never	2.5	21.4	41.5	42.8	1119
At least once in week	1.9	21.8	39.1	44.6	12089
Sometimes®	1.8	22.5	39.0	44.2	22935
Non vegetarian					
Never	1.9	21.9	36.9***	46.3	15780
At least once in a week	1.8	22.7	41.0	42.6	3996
Sometimes®	1.9	23.4	40.7	42.3	16391

Note: ® & Not anemic are reference category, ***p<0.01,**p<0.05