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Burden of Anaemia among Non Pregnant Non Lactating (NPNL) Married Women of Reproductive Age in Urban Slums of Lucknow, Uttar Pradesh- A Community Based Cross- Sectional Study

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Abstract

Background: Nutritional anaemia is a major public health problem worldwide particularly in developing countries among women of reproductive age group.

Objectives: To find out the prevalence of anaemia among non pregnant non lactating women of reproductive age living in urban slums of Lucknow city and to study the factors influencing the anaemia status of women of urban slums.

Methods: Descriptive cross sectional study was conducted among 410 ever married, non- pregnant and non- lactating women of reproductive age group (15-45 years) residing in urban slums of Lucknow city. Women were selected using cluster sampling method. Hemoglobin estimation was done by using hemocue method. Structured questionnaire was used for interview and anthropometric measurement and nutritional assessment of all the women was also performed.

Results: The overall prevalence of anaemia was sixty nine percent among non-pregnant, non-lactating women of reproductive age in urban slums. Prevalence of mild, moderate, and severe anaemia was 48.3%, 18.5% and 2.2% respectively. On logistic regression analysis, intake of iron, body mass index of the women, access to media and use of the contraceptives by the woman were the only independent predictors found to be significantly associated with prevalence of anaemia.

Conclusions: Burden of anaemia is high among non pregnant non lactating women of reproductive age group urban slum women. National Nutrition Programs should target this vulnerable women group also. It is important to improve not only the awareness but also the accessibility and affordability of the food for this vulnerable section of society to increase the nutrient intake.

Keywords: Anaemia, Non Pregnant, Non Lactating, Reproductive Age Women, Urban Slums, Community Based

1. Introduction

Globally, anaemia affects 1.62 billion people (95% CI: 1.50–1.74 billion), which corresponds to 24.8% of the population (95% CI: 22.9–26.7%). However, the population group with the greatest number of individuals affected is non-pregnant women (468.4 million, 95% CI: 446.2–490.6). Prevalence of anaemia in South Asian countries is the highest among the world¹. Even among the South Asian countries, India has the highest prevalence of anaemia². Analysis of nation-wide dataset showed that over the 7-year period anaemia prevalence increased significantly from 51.3% (95% CI 50.6% to 52%) to 56.1% (95% CI 55.4% to 56.8%) among Indian women³. In 2012, the World Health Assembly⁴ Resolution 65.6 endorsed comprehensive implementation plan on maternal, infant and young child nutrition, which specified six global nutrition targets for 2025. The second target is a 50% reduction of anaemia in women of reproductive age⁵.

In India, most researches and efforts to reduce anaemia among women of reproductive age have been focused primarily on pregnant/ lactating women and adolescents girls. However, another closely linked group within this population, also at risk for anaemia is non- pregnant and non-lactating woman which is often sidelined. It is well known that high nutrition costs of pregnancy and lactation contribute significantly to woman poor nutritional status. But nutritional status before and in early pregnancy is not only a very important determinant for

health of the women herself but also for the pregnancy outcome. To meet iron needs during gestation; a woman requires an iron reserve of at least 300-500 grams prior to conception so as not to become iron deficient after the first trimester^{6,7}. It is estimated that fifty percent of women do not have adequate iron stores for pregnancy. Besides this, they are also physiologically more vulnerable due to recurrent menstrual blood loss. Therefore, to address the nutritional and health needs of all women of reproductive age, it is important to understand the patterns and determinants of nutritional status particularly of this vulnerable section of non-pregnant and non-lactating (NPNL) women of reproductive age.

Like most developing countries, the nutritional status of women of poor socio economic section living in either rural areas or urban slums of India is very serious. Therefore, the present study was undertaken to investigate the prevalence and determinants of anaemia among non-pregnant and non-lactating women of reproductive age group residing in urban slums, socioeconomically a most disadvantaged group. This study could also help to explain many of the interrelated factors, which can influence the efforts made for improvement of anaemia status of the urban slum women.

Methods and Material:

Study setting: Present descriptive cross sectional study was conducted among ever married (non-lactating and non-pregnant) women of reproductive age group (15-45 yrs) residing in urban slums of Lucknow city.

Sample size calculation

Sample size was calculated by using formula $n = (Z_{1-\alpha})^2 (1-P) / P/d^2$. Prevalence (P) of anaemia was taken as 56% in non-pregnant and non-lactating women as per NFHS-3 UP (2005-2006)⁸. Design effect of 1.5 was applied to calculate final sample size as cluster sampling method was used to select the study subjects. Total 410 women of reproductive age group were included in the study.

Selection of Subjects

List of all slums situated in the Lucknow city with their total population was obtained from the office of District Urban Development Agency, Lucknow district. Based on probability proportion to population size, thirty slums were included in the study. In the second stage, from each selected slum, 14 non-pregnant non-lactating women of reproductive age group were randomly selected. In case of presence of two or more study subjects in one household, only one respondent was randomly chosen. If all the eligible women could not be found in the selected cluster, survey was continued in the contiguous cluster till all the 14 Women of Reproductive Age were interviewed. Total 410 women were interviewed and examined after obtaining the written consent. Married women aged between 15-45 years and willing to participate in the study were included, whereas currently pregnant, lactating mother who had delivered a live baby in last one year, post-menopausal, suffering from any chronic illness and non-volunteers were excluded from the study.

Data Collection tools

Using the predesigned and pre tested structured questionnaire all relevant information on particulars of the household and the women were collected.

Socio-demographic –Current age, Age at marriage, literacy status and occupation of woman and her husband, type of toilet, house, ventilation, lighting and access to media. Socioeconomic status was estimated by using the modified Kuppuswamy scale.

Reproductive history: Total number of pregnancies, live births, fetal loss, current use of contraception and reproductive morbidities was assessed.

Nutritional Assessment: Dietary habits and dietary intake of each woman was recorded. Dietary intake by woman was assessed by 24 hour recall oral questionnaire. Standardized utensils were used to calculate the intake of food items. Nutrition estimate was done by using nutritive value of Indian foods for proximate principles and vitamin content per hundred grams of food items. Nutrient intake was compared with ICMR standards for RDA⁹. Food frequency questionnaire was used to interpret food consumption pattern of the woman.

Anthropometric measurement: Measurement of weight was done by using digital weighing scale. Locally made height board was used to measure the height of the woman. Information on smoking/ tobacco chewing and consumption of alcohol was also collected. The data for intestinal parasites or malaria in the subjects could not be obtained as collection of stool samples was very difficult. During the survey, women were asked only about recent history of passing worms in the stools. No subject had clinical features of malaria at the time of blood collection. Information on exposure to nutrition and health education in last six months and enrolment of the woman in the AWC was also asked during the survey,

Haemoglobin estimation:

HemoCue was used to estimate the haemoglobin concentration in capillary blood by using disposable microcuvettes and lancets. A single drop of blood was taken by finger prick after removing the first two drops of blood to ensure that the sample was based on fresh capillary blood. Separate lancet and microcuvettes was used to take blood from each person. HemoCue was checked every day before the start of the work for accuracy, using a standard microcuvette supplied by the manufacturer with each machine. The finger prick tests were carried out in the homes of the respondents, and blood samples were tested immediately using a portable hand-held HemoCue testing system.

Outcome of interest

Primary outcome variable of interest was prevalence of anaemia and it was created from haemoglobin measurements. For interpretation of “any” anaemia, a cut off points for haemoglobin level taken was at <12g/dl. We classified the women as mildly, moderately or severely anaemic based on their haemoglobin measurements and following international reference Three levels of anaemia for non pregnant women were distinguished based on the level of haemoglobin: mild anaemia (10.0-11.9g/dl); moderate anaemia (7.0-9.9g/dl) and severe anaemia (<7.0g/dl)¹⁰.

Data Analysis: For the purposes of analysis we combined severe and moderate anaemia into severe/moderate anaemia to avoid problems with zero cell counts. Descriptive and summary statistics were carried out using percentages and

mean \pm SD. Unpaired “t” test and ANOVA were used to test significance of difference between the groups. Post hoc Scheffe test was used to test the difference within the groups. Chi square test was applied to study the association with the anaemia and categorical independent variables. Multiple logistic regressions (Backward conditional) analysis was used to get more insight about the factors influencing the anaemia status.

Ethical consideration: A full explanation of the purpose of the study and the investigations to be carried out was given to all the study participants. Written consent was obtained from each case. Whenever pathology was detected, appropriate treatment was given and/or referral advised.

Observations:

Eighty percent of women were Hindu and two third belonged to SC/ST category (**Table 1**). About half of the women had no education and only one fifth of women were working outside the home for cash. Most (14.2%) of them were engaged in unskilled work. Majority (82.4%) of women belonged to socioeconomic class IV. (%) of surveyed women were living in the joint families. Seventy percent of the houses were kuttcha or semi-pucca with inadequate ventilation or lightning in the house. LPG was the main cooking fuel, whereas one fifth of the houses were using wood or coal as cooking fuel. About half of the women were using contraceptive at the time of survey (Tubectomy 31.5%, Condom 31.3%, IUD 26.3%, Oral pills 3% and injectables 3.8%).

Table 1: General Characteristics of Married Women of Reproductive Age Group (NPNL) in the study (N= 410)

Characteristics	Mean \pm SD	Percentage (%)
Current mean age (years)	29.7 \pm 6.5	
Mean age at marriage (years)	16.9 \pm 2.8	
Mean age at 1 st conception (years)	17.6 \pm 4.7	
Mean number of pregnancy	3.22 \pm 1.9	
% of women with birth order >3	-	62.2
Mean family size	5.2 \pm 2.1	
Mean monthly family income (Rs)	5845 \pm 4093	
% of households with education of husband >10 th std	-	34.0
% of households with education of women >10 th std	-	20.2
% of households using sanitary latrines	-	77.0
% of households using piped water		57.1
% of households having BPL card		20.0
% of women had access to TV/ Radio in their houses	-	71.8
Mean BMI (Kg/m ²)	21.3 \pm 3.9	
Mean Height (cm)	151 \pm 5.5	
Mean Weight (Kg)	48 \pm 9.9	

In the present study, sixty nine percent non-pregnant, non-lactating women of reproductive age were found to be

anaemic (**Table II**). Prevalence of mild, moderate, and severe anaemia was 48.3%, 18.5% and 2.2% respectively.

Table 2: Distribution of Women by their Haemoglobin Level in the Study (N= 410)

Haemoglobin level (g/dl)	N	%
Normal (>12)	127	(31.0)
Mild (10-11.9)	198	(48.3)
Moderate (7-9.9)	76	(18.5)
Severe (<7)	09	(2.2)
Any Anaemia (<12)	283	(69.0)
Mean \pm SD	11.0 \pm 1.7	

The mean intake of calories, proteins, Iron, Calcium, Folic acid, Vitamin A and Vitamin C among the women was 1927 kcal, 46.6gm, 16.2mg, 507.0 mg, 271.8 μ g, 309 μ g and 72.1 μ g respectively (**Table III**). Women in the study area were taking diet deficient in protein (83% of RDA), Iron (77.0% of

RDA) and Vitamin A (51.5% of RDA). Mean intake of calorie, protein, iron, folic acid was significantly lower among the women who had any anaemia in comparison to non- anaemic women.

Table 3: Distribution of Mean Intake of Calories and Nutrients by Anaemia Status of Women in Study (N=410)

	No Anaemia	Mild Anaemia	Moderate to severe Anaemia	Any Anaemia
Calories (kcal/day)	1990 \pm 158.7 ^a	1910.1 \pm 200.5 ^b	1873.4 \pm 173.7 ^b	1899.1 \pm 193.3 ^{**}
Proteins (gm)	49.1 \pm 11.1 ^a	45.5 \pm 7.8 ^b	45.5 \pm 7.5 ^b	45.5 \pm 7.7 ^{**}
Iron (mg)	19.3 \pm 4.9 ^a	15.3 \pm 4.0 ^b	13.6 \pm 3.9 ^c	14.8 \pm 4.1 ^{**}
Calcium (mg)	541.2 \pm 267	492 \pm 245	491 \pm 270	492 \pm 252
Folic Acid (μ g)	282 \pm 58.0	267 \pm 51.1	264 \pm 58.9	267 \pm 53.5 ^{**}
Vitamin A (μ g)	451 \pm 291 ^a	269 \pm 264.8 ^b	193.1 \pm 236 ^b	246.2 \pm 258 ^{**}
Vitamin C	74.2 \pm 34.9	70.1 \pm 22.9	73.7 \pm 38.0	71.2 \pm 28
Thiamine	1.95 \pm 0.46	1.85 \pm 0.46	1.83 \pm 0.50	1.84 \pm 0.47
Riboflavin	1.76 \pm 0.44 ^a	1.61 \pm 0.44 ^b	1.56 \pm 0.51 ^b	1.60 \pm 0.46 ^{**}
Niacin	16.1 \pm 3.4	15.2 \pm 2.7	15.5 \pm 3.5	15.3 \pm 3.01

** Any anaemia Vs No anaemia (p<.05);

a,b,c- Post hoc Scheffe test

All the independent variables which were found to be significantly associated with the any anaemia status of the women were put for logistic regression analysis: Education of the women, age at marriage, age at first conception, toilet facility in the household, iron intake, intake of GLV and pulses, BMI, access to media, current use of contraceptives

etc. On logistic regression analysis (Table VII), intake of iron, body mass index of the women, access to media and use of the contraceptives by the woman were the only independent predictors found to be significantly associated with prevalence of anaemia.

Table 7: Logistic Regression analysis for prediction of anaemia among women in the study (N=410)

	B	Sig.	Exp(B)	95% C.I. for EXP(B)	
				Lower	Upper
Body mass index					
Normal			Reference		
Underweight	1.231	0.002	3.423	1.569	7.472
Overweight	0.423	0.231	1.527	0.763	3.055
GLV intake					
Daily			Reference		
Not daily	0.908	0.002	2.47	1.421	4.33
Iron Intake					
≥RDA			Reference		
10% deficient of RDA	1.829	0.000	6.228	3.047	12.732
>10 deficient	2.605	0.000	13.528	6.734	27.176
Current use of contraceptive					
Yes			Reference		
No	0.594	0.027	1.811	1.071	3.063
Access to Media					
No			Reference		
Yes	-0.773	0.020	0.462	0.241	0.886
Socioeconomic status					
Class II & III			Reference		
Class IV& V	0.701	0.037	2.016	1.008	4.031

Discussion:

In slums of Lucknow city high prevalence of anaemia (69 %) was observed among non-pregnant and non-lactating women of reproductive age group. This indicates anaemia is a severe public health problem in slums of Lucknow city. WHO¹¹ has categorised more than 40% prevalence of anaemia as serious public health problem. Similar high prevalence of anaemia was also reported in studies conducted in slums of Meerut city¹² (40%), Allahabad¹³ (71.2%) of Uttar Pradesh. NFHS- 3 in Meerut city slums reported prevalence of 28% .10.5% and 1.6% mild, moderate and severe anaemia respectively among non-pregnant women of reproductive age group. Panigarhi et al¹⁴ reported overall 60.8% prevalence of anaemia among women of reproductive age group residing in urban slums of Bhubaneswar. In Andhra Pradesh, Bentley et al¹⁵ reported high prevalence of anaemia (62%) among urban poor women.

Socio-demographic characteristics of women and anaemia status

Consistent to other studies^{13,14,16} in slums of other parts of country, in our study area also respondents were young with mean age of 29.7± 6.5 years and majority of them were illiterate and majority had gravidity of three to four. In the present study, high prevalence of anaemia was found among women of urban slums to be across all age groups, religion, and caste groups but association with these variables was not found to be statistically significant (Table IV). However, socioeconomic status of the family was found to be statistically significantly associated with the anaemia prevalence. Majority (85.8%) of the households in the study were of low socioeconomic statuses (IV, V), who are the poorer group among the poor's. Though, amongst respondents of lowest socio-economic groups (IV, V) one fifth of the women were moderate to severe anaemic; prevalence of anaemia was high across all the socioeconomic groups. This observation is consistent with the findings of the other researchers^{14,15}.

Table 4: Socio-Demographic Correlates of Anaemia among Women in the study (N=410)

Characteristics	Total N=410		Haemoglo bin Mean ±SD	No Anaemia N=127	Mild Anaemia N=198	Moderate to Severe Anaemia N=85	Any Anaemia N=283
	N	%					
Current Age							
<25 yrs	89	(21.7)	11.1±1.5	27.0	58.4	14.6	73.0
25- 35 yrs	200	(48.8)	11.1±1.7	34.0	45.5	20.5	66.0
> 35 yrs	121	(29.5)	10.8±1.7	28.9	28.9	42.2	71.1
Religion							
Hindu	334	(81.5)	11.0±1.8	30.5	48.2	21.3	69.5
Muslims	76	(18.5)	11.2±1.5	32.9	48.7	18.4	67.1
Caste							
General	40	(9.8)	11.3±1.7	40.0	40.0	20.0	60.0
OBC	100	(24.4)	11.1±1.4	33.0	47.0	20.0	67.0
SC/ST	270	(65.9)	10.9±1.8	28.9	50.0	21.1	71.1

Educational status (women)						
Illiterate	227 (55.4)	10.7±1.8	24.2	54.2	21.6	75.8*
Up to 8 th	101 (24.6)	11.2±1.6	36.6	42.6	20.8	63.4
Up to 10 th	47(11.5)	11.4±1.4	36.2	44.7	19.1	63.8
Up to 12 th or more	35(8.5)	11.4±1.8	51.4	31.4	17.1	48.6
Working for cash						
Yes	84 (20.5)	10.9±1.8	23.8	57.1	19.0	76.2
No	326 (79.5)	11.3±1.6	32.8	46.0	21.2	67.2
Socioeconomic status						
II	16 (3.9)	12.1±1.2	75.0	12.5	12.5	25.0*
III	42 (10.2)	11.6±1.7	50.0	31.0	19.0	50.0
IV	338 (82.4)	10.9±1.7	27.2	51.5	21.3	72.8
V	14 (3.4)	10.6±1.4	14.3	64.3	21.4	85.7
Family size						
≤4	176 (42.9)	11.2±1.7	36.4	50.0	13.6	63.6*
5-7	182 (44.4)	10.8±1.6	23.6	50.6	26.4	76.4
>7	52 (12.7)	11.0±2.0	38.5	36.5	25.0	61.5
Age at marriage						
≤18	323 (78.7)	10.9±1.7**	27.6	50.5	22.0	72.4*
>18	87 (21.2)	11.4±1.7	43.7	40.2	16.1	56.3
Age at 1st conception						
≤21	337 (86.9)	10.9±1.8**	27.9	49.1	23.0	72.1*
>21	51 (13.1)	11.8±1.1	48.0	46.0	6.0	52.0
Children ever born						
0	30 (7.3)	10.9±1.8	36.7	43.3	20.0	63.3
1-2	202 (49.2)	11.1±1.8	35.6	48.5	15.8	64.4
≥3	178 (43.4)	10.9±1.6	24.7	48.9	26.4	75.3
Toilet facility						
Sanitary	316 (77.0)	11.1±1.7	35.1	45.3	19.6	64.9*
Open fields	94 (22.9)	10.7±1.6	17.0	58.5	24.5	83.0
Ventilation of the house						
Adequate	24 (5.9)	11.7±1.3	58.3	25.0	16.7	41.7*
Inadequate	386 (94.1)	11.0±1.7	29.3	49.7	21.0	70.7
Lighting in the house						
Adequate	117 (28.5)	11.5±1.5**	47.0	41.0	12.0	53.0*
Inadequate	293 (71.5)	10.8±1.8	24.6	51.2	24.2	75.4
Tobacco use						
Yes	68 (16.6)	10.3±1.9**	19.1	45.6	35.3	80.9*
No	342 (83.4)	11.1±1.7	33.3	48.8	17.8	66.7
Current Use of contraceptive						
Yes	209 (51.0)	11.3±1.6	37.8	44.0	18.2	62.2*
No	201 (49.0)	10.7±1.8	23.9	52.7	23.4	76.1
Faced food Scarcity						
Yes	136 (33.1)	10.4±1.8**	19.9	47.1	33.1	80.1*
No	274 (66.8)	11.3±1.6	36.5	48.9	14.6	63.5

*Chi square test (P<.05) between any anaemia Vs normal

** t test

One third of the families in the survey reported food scarcity in a month preceding the survey, i.e., families did not have enough food for each member of their family and had to sleep hungry. Anaemia prevalence was significantly higher in those households who had faced food scarcity. High prevalence of moderate/ severe anaemia (33.0%) was also observed in women of these households. Bentley et al¹⁵ opined that extreme poverty limits the ability of the poor to purchase the adequate and quality food. Government of India is providing BPL (Below poverty line) cards to the economic disadvantaged households in the rural as well as in the urban areas to include them in government assistance and aid. BPL cards holders are entitled to buy quality food grains at subsidised rate from the shops of public distribution system. It was observed that in the study area among the households who had faced food scarcity in recent past, only 19% families had BPL card. Even in whole sampled households, only one fifth of the families had BPL card.

Poverty directly results in poor housing conditions and lack of basic amenities. In the study slums, 5.9% households had adequate ventilation, 28.5 % had adequate lighting in the living room and 77% households had toilet facility. Prevalence of anaemia was found to be significantly high in women living in houses with inadequate ventilation and lighting. Type of toilet facility used by the woman was also found to be significantly associated with prevalence of anaemia. Women who were going for defecation in the open fields were significantly more prone to anaemia. About eighty percent of the women in the study who live in households with no facility of toilet were anaemic in comparison to women (64.9%) who live in households with any type of toilet facility. Wonda T et al¹⁷ in Ethiopia was reported similar high prevalence of anaemia ((35%) among women who live in households with no facility of toilets. Wilunda et al¹⁸ also observed that women without a toilet were at an increased risk of anaemia. In present study a high

prevalence of anaemia was observed even in those women who had sanitary toilet in their house. These findings support the views of Wonda T et al¹⁷ that mere possession of toilet does not necessary translates into its appropriate utilisation but availability of the toilets in the households can give an insight in to the disposal mechanism of human waste in the community that could play a important role in transmission of soil transmitted helminths. Studies^{18,19} have showed that people living in households without toilets are at increased risk of infection by hook worm and other parasites. This may cause anaemia in the infected person. In the present study stool of the woman was not examined but about five percent women have given the history of passing the worms in the stool. Facility of sanitary toilets with improvement in sanitary practices and regular preventive chemotherapy are needed in urban slums.

Delay in age of marriage and age of first conception by the women was found to be significantly related with anaemia prevalence in the present study. Women in the study who had got married at early age (≤ 18 years) or conceived first child before 21 years of age had significantly lower level of haemoglobin (10.9 \pm 1.8 gm/dl). Past fertility of the woman was not found to be significantly associated with the prevalence of anaemia but family size was found to be significantly associated with the anaemia. This high prevalence of anaemia may be due to the competition in nutrition demands in households with many family members. use of contraception by the women was found to be

significantly associated with on logistic regression analysis (OR,95%CI:1.8(1.07-3.06))

Data about the personal habits revealed that in the present study, 16.0% of the women were taking tobacco in any form. Tobacco use by the women in any form was significantly related with anaemia prevalence. Mean haemoglobin concentration of tobacco users was significantly low (10.3 \pm 1.9 gm/dl) than non –tobacco users. Singh et al²⁰ reported high prevalence of anaemia in women using in tobacco in any form. Dey et al²¹ also reported high risk of anaemia (OR (95%CI): 1.178(1.027-1.350)) among women consuming pan/bidi/gutka/cigarette.

Education, access to media and Autonomy and anaemia status of women

It was hypothesized in the study that women's education, working outside home and her autonomy in decision making regarding health seeking and household expenditure will have some influence on the anaemia status of the women (**Table V**). Except educational status of women, no significant difference in percentage of women with anaemia was observed with other two variables. Prevalence of anaemia was significantly lower (48.5%) in women educated up to 12th and above in comparison to illiterate women (75.5%), who had lowest, haemoglobin, level (10.7 \pm 1.8gm/dl) in the group. In other studies also association between anaemia prevalence and educational status of women has been observed. Educational status of husband had no association with the prevalence of anaemia in the present study.

Table 5: Autonomy, Access to Media, Exposure to Nutrition and Health Education Message and Anaemia Status of the Women in the study (N=410)

Characteristics	Total N=410	Mean Hb \pm SD	No Anaemia	Mild Anaemia	Moderate to Severe Anaemia	Any Anaemia
Autonomy over household decisions						
Full	70 (17.0)	10.5 \pm 1.7	21.4	48.6	30.0	78.6
Partial	210 (51.2)	11.2 \pm 1.7	33.8	47.1	19.0	66.2
None	130 (31.7)	11.0 \pm 1.7	31.5	50.0	18.5	68.5
Access to media						
Yes	294 (71.7)	11.2 \pm 1.6**	36.7	46.3	17.0	63.3*
No	116 (28.2)	10.4 \pm 1.8	16.4	53.4	30.2	83.6
Enrolled in AWC						
Yes	105 (25.6)	10.8 \pm 1.8	24.8	53.3	21.9	75.2
No	305 (74.4)	11.2 \pm 1.6	20.3	46.6	33.1	66.9
Received NHE in last 6 mths						
Yes	48 (11.7)	11.4 \pm 1.5	43.8	37.5	18.8	56.2*
No	362 (88.2)	10.9 \pm 1.7	29.3	49.7	21.0	70.7

Other factors found to be significantly associated with the prevalence of anaemia were access to media (television/radio) and exposure to nutritional health messages to the women. Out of the 48 women, who received any information on nutrition and health, half of the women got it from the television or radio. In the study sample, about seventy percent of the women had access to the television or radio. Local television network and radio channels will be an opportunity to spread the nutrition and health education messages among slum women. Combined concerted efforts are needed on the part of the all stakeholders; health officials, ICDS, media houses and non- government organizations to reach the slum community. To increase nutrition and health awareness, besides educating woman, her exposure to health and nutrition messages is necessary, which may also increase

the utilisation of available nutrition and health services by the women of urban slum. This will definitely help in decreasing the prevalence of the anaemia among them.

In the study area, about one fourth of the women were enrolled with the AWC and out of these, only 32.4% of them had visited the AWC in last six months. Among the women who visited the AWC, 20.6% women were found to be moderate to severe anaemic but none of them was aware of their anaemic status or was on any iron supplementation at the time of survey. Therefore, facilities for screening of anaemia and treatment of anaemic women need to be implemented more efficiently in the urban slums. Regular organization of awareness and screening outreach camps by the health workers in congruence with the ICDS workers and community groups can be helpful in identifying women at

risk and in making provision of the IFA supplementation to them.

Nutrition correlates of anaemia status of women

Intake of calories, protein, Iron, and folic acid was found to be statistically associated with anaemia prevalence (Table

VI). Food habit and order of serving of food in the family was not found to be significantly associated with the prevalence of anaemia. About two third of the women were non-vegetarian.

Table 6: Nutritional Correlates of Anaemia among Women in the study (N=410)

Characteristics			Haemoglobin	No Anaemia	Mild Anaemia	Moderate to Severe Anaemia	Any Anaemia
	N	%	Mean \pm SD	N=127	N=198	N=85	N=283
BMI status							
<18.5	101 (24.6)		10.4 \pm 1.5	8.9	60.4	30.7	91.1*
18.5-24.9	242 (59.0)		11.1 \pm 1.8	38.0	43.8	18.2	62.0
\geq 25.0	67 (16.3)		11.4 \pm 1.5	38.8	46.6	14.9	61.2
Calories							
\geq RDA	253 (61.7)		11.2 \pm 1.7	38.3	46.2	15.4	61.7*
10% deficient of RDA	108 (26.3)		10.7 \pm 1.7	23.1	48.1	28.7	76.9
>10-20 % deficient	36 (8.8)		10.9 \pm 1.5	11.1	50.0	38.4	88.9
> 20 % deficient	13 (3.2)		11.2 \pm 0.9	7.7	84.6	7.7	92.3
Proteins							
\geq RDA	71 (17.3)		11.5 \pm 1.5	46.5	39.4	14.1	53.5*
10% deficient of RDA	71 (17.3)		11.1 \pm 1.8	38.0	40.8	21.1	62.0
>10-20 % deficient	113 (27.6)		10.9 \pm 1.7	23.9	55.8	20.4	76.1
> 20 % deficient	155 (37.8)		10.8 \pm 1.7 ^a	25.8	50.3	23.4	74.2
Iron							
\geq RDA	72 (17.6)		12.4 \pm 1.1	76.4	22.2	1.4	23.6*
10% deficient of RDA	61 (14.9)		11.4 \pm 1.1 ^{a,b}	31.1	60.7	8.2	68.9
>10-20 % deficient	54 (13.2)		11.0 \pm 1.6 ^a	27.8	53.7	18.5	72.2
> 20 % deficient	223 (54.4)		10.4 \pm 1.8 ^a	17.0	52.0	30.9	83.0
Folic acid							
\geq RDA	362 (88.3)		11.0 \pm 1.7	31.5	49.4	19.1	68.5
10% deficient of RDA	32 (7.8)		11.0 \pm 1.6	31.2	40.6	28.1	68.8
>10-20 % deficient	16(3.9)		10.0 \pm 1.9	18.8	37.5	43.8	81.2

Prevalence of anaemia was found to be high in the entire BMI groups. Ninety percent of the underweight women were anaemic. Even among overweight women who were taking adequate calories and proteins in their diet, about sixty percent of the women were anaemic. Prevalence of moderate to severe anaemia ranged from 15% for the overweight women to 30.0% for the underweight women. Bentley et al¹⁵ also documented high prevalence of anaemia in women with normal BMI (50%) and in overweight women (41%). On cross tabulation, it was observed that even women who were taking normal or high calories and protein in their diet, 45% and 39% of the women respectively from these groups were taking >20% of RDA iron deficient diet. Balarajan et al expressed that high prevalence of anaemia even among overweight and obese women with caloric excess in their diet indicates not only the availability and supply of food but quality of food and diversity in diet of the individual is also critical²².

In the present study, mean intake of iron was 19.3 \pm 4.9mg. Only 17.6% women were consuming recommended daily allowance of iron. Even in high educated and high income, group only about one third women were taking iron equal to recommended daily allowance. Data from NNMB surveys²³ observed that very low iron intake in all the age group in the country. Humans derive iron from their every day diet, predominantly from plant foods and the rest from foods of animal origin. Heme iron is not only better absorbed than non-heme obtained from plant source food, whose absorption may range from 1-10%, but also has an enhancing effect on absorption. About two third of the women in the slums were non- vegetarian but most (75%) of them were consuming meat occasionally i.e., once in month or more. Consumption of other sources of iron like green leafy vegetables and

pulses was also low among the participants. Only half of the women were taking pulses and green leafy vegetables (GLV) daily/alternate day in their diet. ICMR²⁴ has recommended daily consumption of green leafy vegetables. Chopra et al observed in Mumbai slums only 30% and 43% of the women were daily consuming GLVs and fruits. National institute of nutrition (NIN)²⁵ survey also documented maximum deficit in GLV consumption followed by pulses, vegetables and fruit. The overall intake of GLV and pulses was less than 50% recommended daily intake in 83% and 46% of the households. Intake of GLVs by the women was found to significantly associate with the anaemia. Panigarhi et al¹⁴ also observed significant association between inadequate intake of GLVs, pulses and prevalence of anaemia in women. There is need of community sensitisation towards health benefits of consumption on variety of leafy vegetables and pulses through health and nutrition education. Dietary diversification and increase in vegetable intake is the only sustainable method of improving the iron intake of the population. One of the major factors responsible for the low consumption of pulses and vegetables is the non availability of these food items at affordable cost. Only emphasising on importance of consuming these rich sources of micronutrients through the health and nutrition education will not bring any change in the food consumption behaviour of the community unless government effectively meet the needs of the people at prices affordable by increasing the cultivation and making them available through public distribution system.

Conclusion: Burden of anaemia is high among non pregnant and non- lactating women of reproductive age group residing in urban slums. It is essential to foster the concept of improving women's nutrition and health among the women

for their own. Multifactorial and multi-sectoral efforts are needed by adopting specific interventions to address both nutritional and non nutritional problems of anaemia in women of urban slums. In addition to increasing access to adequate quantity and quality of food and improving income sources in the slums, there is need for also increasing the efforts for education of the women. Other strategies that should include tackling anaemia in urban slums are; environmental sanitation, regular deworming, provision for regular screening for anaemia in the slums itself, exposure to nutrition and health education aimed at improving the consumption of micronutrient rich food and iron folic acid supplementation and contraceptive use by the couples.

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