



Munich Personal RePEc Archive

## **Double burden of nutritional disorder among Indian women: an assessment of differentials and determinants**

Deepti Singh and Srinivas Goli and Sekher T.V.

International Institute for Population Sciences (IIPS), Gird Institute  
of Development Studies (GIDS), International Institute for  
Population Sciences (IIPS)

5. June 2011

Online at <http://mpa.ub.uni-muenchen.de/53447/>

MPRA Paper No. 53447, posted 9. February 2014 14:45 UTC

# **Double Burden of Nutritional Disorder among Indian Women: An Assessment of Differentials and Determinants**

## **INTRODUCTION**

The nutritional status of women is important both for the quality of their own lives and the survival and healthy development of their children <sup>(1)</sup>. Better nutrition means stronger immune systems, fewer incidences of illness and better health <sup>(2)</sup>. However, recent evidence from developing countries indicates that malnourished women with a body mass index (BMI) below 18.5 show a progressive increase in mortality rates as well as an increased risk of illness <sup>(3)</sup>. In India, increased prenatal and neonatal mortality, a higher risk of low birth weight babies, stillbirths, and miscarriage are some of the consequences of malnutrition among women. <sup>(4, 5)</sup>

In the larger context, the individual nutritional status is seen to depend on (a) household food entitlements, deriving from both production and exchange, (b) the distribution of food within the family, and (c) the ability of individuals to convert food into nutritional achievements. Therefore, nutritional status is prejudiced by the complex social, biological, environmental, and cultural factors which do not operate through standard economic variables such as income, expenditure, or consumption that are highly interrelated and influence men and women differently. The nutritional status of a woman, for instance, depends not only on (say) household income and its utilization, but also on the quality of the environment, the number of siblings, her vulnerability to gender discrimination, her educational level, her activity status and exposure to social stimulation, the decision making power at the household and so on <sup>(6, 7, 8, 9)</sup>.

The social environment influences a woman's lifestyle and her diet, which in many cases is inadequate <sup>(10, 11, 12, 13)</sup>. With increasing socioeconomic complexity, the issue of malnutrition is becoming responsive to multifaceted factors. These factors operate at two levels: micro and macro. At the micro level, the availability of enough food and knowledge of a balanced diet are assumed to be important determinants of nutritional balance. Propensity of the place of residence and region for production and exchange of food are critical determinants at the macro-level.

However, both in the context of excess and scarcity of food, women are more vulnerable to nutritional deficiency than men. In crisis situations where food is in short supply, women are more likely to reduce their food intake as a coping strategy in favour of other household members. Familial bonds and duties affect the social, political, economic and religious aspects of a woman's life, yet there is little empirical evidence to support this <sup>(14)</sup>. Traditions in India demonstrate that women eat last and least throughout their lives. Because of social traditions, men are favoured and fed better than women. This can contribute to under-nutrition among women, particularly in poor families. However, in the functional context, micro level factors vary according to macro level factors. Women from deprived households are more vulnerable to under nutrition. On the other hand, women belonging to better socioeconomic groups are prone to obesity. At the macro-level, in patriarchal societies, women may face constraints in accessing knowledge about balanced nutrition as a result of insecurity, cultural discrimination and limited mobility <sup>(15, 16, 17, 18)</sup>.

Based on an extensive analysis of food and nutrition in India, Deaton and Dreze (2009) concluded that "the nutrition situation in India is full of puzzles," highlighting the need for more studies and surveys <sup>(19)</sup>. A systematic appraisal of available literature on nutrition points

out those earlier studies hardly focused on the critical mechanisms that determine and understand the pathways of women's malnutrition in India. During the last decade, the average health status of the people of India has improved tremendously<sup>(20)</sup>. However, more than half of the world's undernourished population still lives in India and among them; women form the most vulnerable group<sup>(21)</sup>. Over the years, the progress in women's nutritional status has been less than satisfactory and continues to remain a major challenge for health policy making. Therefore, it is necessary to focus on the versatility of emerging determinants and to understand the new dynamics of socioeconomic differentials of malnourishment among Indian women. Consequently, the study on the dynamics of double nutritional burden among women is important because malnutrition has repercussions not only for women but also for their families.

The present study focuses on individual life styles, household and community factors that are responsible for women's discrimination, malnutrition and consequences of within group deviations and between group differentials of nutritional status among Indian women.

## MATERIALS AND METHODS

**DATA:** The National Family Health Survey (2005-06) data has been used in this study. The National Family Health Survey is the Indian equivalent to the worldwide Demographic Health Survey (DHS). The NFHS-3 survey is coordinated by the International Institute for Population Sciences (IIPS) and Macro International under the aegis of the Ministry of Health and Family Welfare, India. NFHS-3 collected information on key family and health indicators from a nationally representative sample of 109,041 households, 124,385 women aged 15-49, and 74,369 men age 15-54. The NFHS-3 sample covers 99 percent of India's population living in 29 states. In this study, women who are pregnant at the time of survey and women who gave birth during the two months preceding the survey are excluded from the analysis. The overall analysis is restricted to ever-married women (15-49 years).

**Statistical analysis:** All statistical analyses were performed using SPSS version 15. To study the between group differentials and within group deviations, the mean and standard deviation measures have been estimated. Further, this study used multinomial logistic regression for simultaneous examination of differentials and determinants of double nutritional disorders (thin and obesity) by their predictors. Multinomial logistic regression is the standard statistical tool often used in nutrition studies, particularly when we need more than two discrete outcomes (such as thin, normal and obese). In the first stage of this model, we have estimated beta coefficients for thin by taking obese as the reference category. At the second stage, we have used Multiple Classification Analysis (MCA) conversion model to estimate the adjusted percentages for three Body Mass Index (BMI) indicators.

The mathematical form of these two models is written as

$$Z_1 = \text{Log} \left( \frac{P_1}{P_3} \right) = a_1 + \sum b_{1j} * X_j$$

$$Z_2 = \text{Log} \left( \frac{P_2}{P_3} \right) = a_2 + \sum b_{2j} * X_j$$

$$\text{and } P_1 + P_2 + P_3 = 1$$

Where,

$a_i$   $i=1,2$  : constants

$b_{ij}$   $i=1,2; j=1,2,\dots,n$  : multinomial regression coefficient.

$P_1$ =Estimated probability of women being thin.

$P_2$ =Estimated probability of women being normal.

$P_3$  (Obesity) was reference category.

For the sake of simplicity in the interpretation of results, multinomial logistic regression coefficients were converted into adjusted percentages. The procedure consists of following steps:

Step 1: By using regression coefficient and mean values of independent variables the probability was computed as:

$$P_i = \frac{\exp(Z_i)}{\{1 + \sum \exp(Z_i)\}}, i=1, 2, 3 \text{ and } P_4 = 1 - P_1 + P_2 + P_3 \text{ where } Z \text{ was the estimated value of}$$

response variables for all categories of each variable.

Step 2: To obtain the percentage values, the probability P was multiplied by 100.

In this way, tables consisting of unadjusted and adjusted percentages were generated.

The BMI of women has been used to assess both thin and obese women<sup>(22, 23)</sup>. The body mass index is categorised into three components: thin (BMI less than 18.5), normal (BMI in between 18.5 to 24.9) and obese (BMI more than 25).

The independent variables used in the analysis are broadly classified into three groups:

a) individual factors 2) household factors and 3) community factors.

*The individual factors include*

a) Age: Categorised into four groups - 15 to 19, 20 to 29, 30 to 39 and 40 to 49 years.

b) Marital Status: Classified into two groups - Currently Married and Others (widowed, divorced, separated and not living together).

c) Educational Status: Categorised into three - No Education, Secondary, and Higher and above.

d) Children ever born: Classified into four groups - No Children, 1 to 2 Children, 3 to 5 Children and more than 6 Children.

e) Frequency of intake: Categorised into three - Never, Daily and Weekly (important food items include milk, vegetables, fruits and non-vegetarian food such as egg, fish and meat).

*The household factors comprise of*

f) Religion: Categorised into three - Hindus, Muslims and Others.

g) Caste: Includes four categories- Scheduled Castes, Scheduled Tribes, Other Backward Castes and Others.

h) Wealth index: Computed as an indicator of economic status and categorised into five groups: poorest, poorer, middle, richer and richest.

i) Occupations of the respondent and her husband/partner: Categorised into Not Working, Primary Occupation, Secondary Occupation, Tertiary Occupation and Quaternary Occupation.

*The regional factors include*

j) Place of Residence: Rural and Urban areas.

k) Regions: Divided into six geographical regions of India, namely North, Central, North-Eastern, West, East and South. The states of Delhi, Haryana, Himachal Pradesh, Jammu and Kashmir, Uttarakhand and Punjab have been included in the north region, while the central region consists of Madhya Pradesh, Chhattisgarh, Uttar Pradesh and Rajasthan. All the eight states of the northeast (Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura) have been clubbed to represent the north-eastern region, while the western region comprises of Gujarat, Maharashtra and Goa. The states of

Bihar, Jharkhand, Orissa and West Bengal comprise the eastern region. Andhra Pradesh, Karnataka, Kerala and Tamil Nadu constitute the south region.

## RESULTS

**WOMEN'S NUTRITIONAL STATUS; BETWEEN GROUP DIFFERENTIALS AND WITHIN GROUP DEVIATIONS:** In the recent past, the country has made considerable progress on social and economic fronts, as indicated by improvements in per capita income, life expectancy and literacy levels. However, there has been little improvement in the nutritional status of women and children <sup>(24)</sup>. While it is estimated that per capita cereal availability within India is adequate, national level surveys still show that 40 % of the population in India consume less than 80 % of the energy requirement and most of them are women <sup>(25)</sup>. During the last decade, the distributional dimension of nutrition has become a prominent global health policy agenda, as researchers have come to regard averages as an inadequate summary of the country's performance in nutritional balance. On the contrary, in recent population and health policies, the entire focus is on average nutritional status. This is quite insensitive to distributional concerns and it neglects variations altogether <sup>(26)</sup>. In this context, the present study assesses the extent of deviations and differentials in the nutritional status of women by their individual and household characteristics.

Evidence from the recent National Family Health Survey shows that at the national level, one-third (33 %) of the women in the age group, 15 to 49 fall under the category of malnourished (BMI less than 18.5), showing a relatively high chronic energy deficiency. Accordingly, to assess the distributional dimension of nutrition in more detail, we have estimated the mean differential and Standard Deviation (S.D.) of nutritional status among women in India. Table I presents the mean differentials of BMI with background characteristics. Results of Mean Distribution by individual characteristics indicate that the mean BMI among women in the age group 40 to 49 is high (22.0 kg/m<sup>2</sup>) in comparison to other women. Again, highly educated women have a higher mean BMI and it decreases with the decrease in women's education. In the occupational category of women, BMI is high among those women employed in quaternary occupations. It is apparent from the analysis that mean BMI is highest among women who consume milk or curd daily followed by those who have it on a weekly basis and lowest among those who never consume of them. Women who eat vegetables, fruits and non-vegetarian food on a daily basis have higher BMI than others. By parity, it is clear from the data those women who have one or two children have a higher mean BMI (21.2 kg/m<sup>2</sup>) compared to others. The mean BMI for women who are severely or moderately anemic is less than that of women who are either mildly anemic or not anemic. At the household level, those women, whose partners have a higher education, have a greater BMI than others. Among caste groups, women belonging to other castes (mostly upper/ forward) have a higher mean BMI in comparison to women belong to Scheduled Castes, Scheduled Tribes and Other Backward Castes. Muslim women have a low mean BMI compared to women from other religious groups. Economic status is measured based on the wealth quintile proves to be a critical determinant. Women with a higher economic status have a higher mean BMI (24.0 kg/m<sup>2</sup>) in comparison to the poorest women (18.8 kg/m<sup>2</sup>). Women who reside in rural areas have a slightly low mean BMI compared to those from urban areas. The mean BMI is highest in the southern region (21.7 kg/m<sup>2</sup>) and lowest in the eastern region (19.9 kg/m<sup>2</sup>) of India.

**Table I: Nutritional Status and Anemia Level among Women by Different Background Characteristics, India, 2005-06**

<b>Background Characteristics</b>	<b>BMI Mean (S.D.)</b>	<b>Anemia Mean (S.D.)</b>	<b>Background Characteristics</b>	<b>BMI Mean (S.D.)</b>	<b>Anemia Mean (S.D.)</b>
<b>Individual Factors</b>			<b>Household Factors</b>		
<b>Age Group</b>			<b>Husband's Education</b>		
15-19	19.0 (2.4)	11.1 (2.3)	No education	19.6 (4.0)	11.2 (2.6)
20-29	20.0 (3.8)	11.4 (2.8)	Secondary	20.9 (4.4)	11.5 (3.0)
30-39	21.2 (4.5)	11.6 (3.0)	Higher and above	23.0 (4.9)	11.9 (2.6)
40-49	22.0 (5.2)	11.6 (2.8)	<b>Husband's Occupation</b>		
<b>Marital Status</b>			Not Working	21.1 (4.6)	11.7 (3.6)
Currently Married	20.9 (4.5)	11.5 (2.8)	Primary	19.4 (3.0)	11.4 (3.0)
Others	20.8 (4.5)	11.4 (3.0)	Secondary	20.9 (4.5)	11.5 (2.5)
<b>Women's Education</b>			Tertiary	22.5 (4.9)	11.9 (3.7)
No education	19.8 (3.9)	11.3 (2.5)	Quaternary	23.1 (5.2)	11.8 (2.4)
Secondary	21.5 (4.6)	11.6 (3.2)	<b>Caste</b>		
Higher and above	23.0 (4.8)	12.0 (2.5)	Scheduled Caste	20.1 (4.2)	11.3 (2.1)
<b>Women's Occupation</b>			Scheduled Tribe	19.2 (3.7)	11.6 (6.9)
Not Working	21.4 (4.6)	11.5 (2.7)	Other Backward Caste	20.4 (4.4)	11.5 (2.2)
Primary	19.4 (3.0)	11.4 (3.1)	Others	21.3 (4.7)	11.6 (2.1)
Secondary	20.3 (4.1)	11.4 (2.8)	<b>Religion</b>		
Tertiary	22.4 (4.8)	11.7 (3.2)	Hindu	20.6 (4.3)	11.4 (1.9)
Quaternary	22.9 (3.9)	11.8 (2.1)	Muslim	21.1 (4.8)	11.5 (2.3)
<b>Consumption of Milk or Curd</b>			Christian	22.2 (4.9)	14.3(3.7)
Never	20.1 (4.2)	11.5 (3.5)	Others	22.6 (4.9)	11.8(1.9)
Daily	21.0 (4.5)	11.6 (2.5)	<b>Wealth Index</b>		
Weekly	20.4 (4.5)	11.5 (2.9)	Poorest	18.8 (3.0)	11.1 (2.2)
<b>Consumption of Green Vegetables</b>				19.3 (3.5)	
Never	20.8 (4.8)	11.7 (3.3)	Poorer		11.4 (2.9)
Daily	21.0 (4.5)	11.5 (2.8)	Middle	20.1 (3.6)	11.5 (3.2)
Weekly	20.4 (4.5)	11.5 (2.9)	Richer	21.5 (4.2)	11.7 (3.1)
<b>Consumption of Fruits</b>			Richest	24.0 (5.0)	11.9 (2.6)
Never	20.1 (4.1)	11.4 (2.8)	<b>Regional Factors</b>		
Daily	23.2 (4.8)	11.8 (2.6)	<b>Place of Residence</b>		
Weekly	21.4 (4.7)	11.6 (3.1)	Urban	22.7 (5.1)	11.7 (2.8)
<b>Consumption of Non-Vegetarian Foods</b>			Rural	19.9 (3.9)	11.4 (2.9)
Never	21.1 (4.5)	11.6 (1.8)	<b>Region</b>		
Daily/weekly	21.6 (4.8)	11.5 (3.3)	North	21.6 (4.5)	11.6 (1.8)
Occasionally	20.4 (4.2)	11.4 (3.2)	Central	20.1 (3.8)	11.5 (1.7)
<b>Children Ever Born</b>			North-East	20.4 (3.7)	13.2 (3.8)
No Children	20.3 (3.9)	11.4 (2.6)	West	21.4 (5.2)	11.4 (1.9)
1-2	21.2 (4.7)	11.5 (2.7)	East	19.9 (3.9)	11.2 (1.5)
3-5	20.8 (4.3)	11.5 (2.8)	South	21.7 (4.9)	11.5 (2.8)
6+	20.2 (4.4)	11.5 (3.4)			
<b>Anemia Level</b>					
Severe & Moderate	19.7 (3.8)	-			
Mild	20.2 (4.2)	-			
Not Anemic	21.0 (4.5)	-			
<b>Body Mass Index</b>					
Thin	-	11.2 (2.3)			
Normal	-	11.5 (3.2)			
Overweight/Obese	-	12.0 (2.4)			

In this study, standard deviation of body mass index is used to measure the within group deviation of women's nutritional status. By individual characteristics, evidence demonstrates that the standard deviation of BMI is comparatively higher among women in the age group, 40 to 49 than women in other age groups. Results indicate that highly educated women have a higher standard deviation than others. Women who are involved in tertiary jobs show a high deviation (4.8 kg/m<sup>2</sup>) in nutritional status. Accordingly, women taking milk and green vegetables on a daily and weekly basis, show the highest deviation (4.5 kg/m<sup>2</sup>) in BMI,

compared to women who never take milk and green vegetables regularly. Women who have non-vegetarian food on a daily/weekly basis have a higher BMI deviation than others. By number of children ever born, it is evident that women with one or two children are identified with a high deviation in BMI. Surprisingly, those women who are highly educated show a higher standard deviation. Going by the level of anaemia, the deviation is more among women who are not anemic than among those who are anemic.

At the household level, women's BMI increases with increase in partner's education, and women whose partners are involved in quaternary jobs show the highest standard deviation. Among caste groups, women belonging to upper/forward castes have a relatively high standard deviation than those from the deprived caste groups (SC/ST/OBC). Interestingly, results demonstrate that the highest BMI deviation is in the case of women from the richest wealth quintile and the lowest is among women belonging to the poorest wealth quintile households. At the macro level, the standard deviation of women residing in urban areas is higher (5.1 kg/m<sup>2</sup>) compared to those residing in rural areas (3.9 kg/m<sup>2</sup>). The western region shows the highest BMI deviation (5.2 kg/m<sup>2</sup>) followed by the southern (4.9 kg/m<sup>2</sup>) and northern regions (4.5 kg/m<sup>2</sup>).

Table I also presents the estimates of mean hemoglobin level with different background characteristics. By individual level, it is evident that the mean hemoglobin level is high among women in the age groups 30 -39 and 40 - 49 (11.6 g/dl). Among educational groups, highly educated women have a high mean hemoglobin level compared to less educated and illiterate women. Women involved in quaternary occupations have a higher mean hemoglobin level (11.8 g/dl) than women working in tertiary occupations (11.7 g/dl). It can also be seen that women who eat green leafy vegetables show a high mean hemoglobin level (11.8 g/dl). Women who do not have children have a lower mean hemoglobin level (11.4 g/dl) compared to women with more than five children (11.5 g/dl). At the household level, it is evident from Table I shows that the mean hemoglobin level is high for women whose husbands are involved in tertiary occupations (11.9 g/dl). Among caste groups, women belonging to Scheduled Tribes and people belonging to other castes have a higher mean hemoglobin level (11.6 g/dl) compared to women from Scheduled Castes and Other Backward Classes. Christian women have a comparatively high mean hemoglobin level (14.3 g/dl). Women with a higher economic status (11.9 g/dl) have a high mean hemoglobin level. The analysis also indicates that women residing in urban areas have a higher mean hemoglobin level (11.7 g/dl) than those residing in rural areas (11.4 g/dl). The mean hemoglobin level is high in the North-Eastern region (13.2 g/dl).

Standard deviation of anemia level has been used to measure within group deviations of the level of anemia among women. By individual level, it is apparent that the standard deviation of the anemia level is comparatively higher in women aged 30 to 39. Results show that women educated up to the secondary level show a high deviation (3.2 g/dl). Table I illustrates that woman who never drank milk show a higher deviation than others. The same pattern can be seen in the case of women who never ate green vegetables. By children ever born, women with six children and above show a high deviation (3.4 g/dl). At the household level, Scheduled Tribe women (6.9 g/dl) and Christian women (3.7 g/dl) show a higher deviation than women belonging to other groups. The north eastern region shows the highest deviation (3.8 g/dl) in women's anemia level followed by the southern region (2.8 g/dl).

**SIMULTANEOUS ASSESSMENT OF DIFFERENTIALS AND DETERMINANTS OF DOUBLE BURDEN OF WOMEN'S NUTRITIONAL STATUS:** Multinomial logistic regression and MCA conversion model have been used for simultaneous assessment of differentials and determinants of double disorder in the nutritional status of Indian women.

Table II (a) presents the results from the multinomial logistic regression analysis in terms of adjusted percentages of women's body mass index. From the results, it is evident that women belonging to the age group 15 to 19 are more likely to be thin (23 %) in comparison to the women belonging to other age groups. Education plays an important role in determining the nutritional status of women. Accordingly, from this study, it is evident that uneducated women are more undernourished (19 %) compared to educated women. Women, who have never taken milk, fruits and vegetables, are thinner than those who consume these items. In contrast to the mean BMI results in Table I, the multinomial logistic regression results in Table II show that women who have larger number of children are more likely to be undernourished (33 %). Women who are highly educated have less incidence of undernourishment compared to others. However, the trend is similar with regard to their partner's education.

Table II (a) also presents the differentials and determinants of obese (over weight), which are opposite to that of the determinants of thin. While anemic women are concentrated in the deprived categories, the obese are concentrated among the well-off. By individual level characteristics, results demonstrate that obesity increases with increasing age. Among education categories, the educated women are more obese than women with no education. Those women who are working in tertiary and quaternary occupations are more obese compared to others. At the household level, upper caste women are more obese than lower caste women. Among the religious categories, Christians are more obese than other religious groups. By economic status, results indicate that women belonging to the rich category are more prone to obesity than other economic groups. At the macro level, surprisingly, there is obesity among women is more in rural areas than in urban areas. Socioeconomically advanced regions of the country such as the south and the west have more obese women than the other parts of India.

Table II (b) presents the results of adjusted percentages of women by nutritional status by household and regional level background characteristics. At the household level, women belonging to Scheduled Tribes are more undernourished than women belonging to Scheduled Castes, Other Backward Classes and general castes. Among religious groups, there is evidence that Hindu women are more undernourished (19 %) than women belonging to other religions. By economic status, the poorest women (44 %) are more undernourished compared to women with a high economic status (18 %). At the macro level, there is evidence that women living in rural areas are thinner (13 %) than those residing in urban areas (17 %). By region, results indicate that a large proportion of women are undernourished in the western region (40 %) followed by the northern region (33 %) and eastern region (33 %). However, the lowest proportion of undernourished are found in the north-eastern region (27 %) followed by the southern region (29 %).



**Table II (a): Adjusted percentages of nutritional status and anemia level of women by individual background characteristics, India, 2005-06**

Background Characteristics	Body Mass Index			Anemia Level		
	Thin	Normal	Obesity <sup>®</sup>	Severe/ Moderate	Mild	Not Anemic <sup>®</sup>
<b>Individual Factors</b>						
<b>Age Group</b>						
15-19 <sup>®</sup>	23.30	72.58	4.07	17.60	54.60	27.72
20-29	23.0***	66.3***	10.58	15.7***	52.0***	32.16
30-39	16.7***	59.8***	23.35	14.1***	50.6***	35.20
40-49	13.4***	55.1***	31.42	14.3***	51.5***	34.07
<b>Marital Status</b>						
Currently Married <sup>®</sup>	32.39	63.03	4.58	19.00	56.60	24.28
Others	31.70***	63.40	4.89	17.3***	56.54	26.06
<b>Women's Education</b>						
No education <sup>®</sup>	19.3	65.6	15.1	15.70	51.80	32.42
Secondary	18.4***	62.0***	19.6	14.7***	51.5**	33.62
Higher and above	18.0***	62.9***	19.0	11.7***	52.3***	35.94
<b>Women's Occupation</b>						
Not Working <sup>®</sup>	32.3	62.7	5.0	18.40	55.90	25.59
Primary	30.7***	64.7***	4.5	17.2***	56.41	26.34
Secondary	34.1**	61.3**	4.5	16.20	57.80	25.90
Tertiary	29.3	65.8*	4.9	14.39	59.5**	26.08
Quaternary	22.2***	73.0	4.7	17.55	56.47	25.98
<b>Consumption of Milk or Curd</b>						
Never <sup>®</sup>	33.6	61.6	4.8	17.30	56.90	25.69
Daily	29.3***	65.7***	4.9	17.70	55.9***	26.30
Weekly	32.7	62.5	4.9	17.10	56.90	25.87
<b>Consumption of Green Vegetables</b>						
Never <sup>®</sup>	30.6	64.2	5.3	16.50	54.40	29.04
Daily	32.0	63.0	5.0	17.7***	56.4***	25.82
Weekly	31.5	64.0***	4.5	17.1***	57.3***	25.41
<b>Consumption of Fruits</b>						
Never <sup>®</sup>	32.2	63.2	4.6	18.00	56.40	25.57
Daily	28.3***	65.7***	5.9	16.5***	55.9***	27.45
Weekly	32.1	62.7	5.1	16.6***	57.1*	26.27
<b>Consumption of Non-Vegetarian Food</b>						
Never <sup>®</sup>	31.0	64.2	4.7	17.30	56.80	25.82
Daily/weekly	31.7	62.8***	5.4	17.60	56.90	25.39
Occasionally	32.2	63.0***	4.8	17.50	56.20	26.20
<b>Children Ever Born</b>						
No Children <sup>®</sup>	27.6	67.0	5.4	17.70	52.40	29.76
1-2	32.0***	63.1	4.8	17.60	56.2***	26.09
3-5	31.7***	63.4	4.8	17.30	57.0***	25.20
6+	33.4***	61.8	4.7	17.00	58.4***	24.52

Significance levels \*\*\* p < 0.01, \*\*p < 0.05, \*p < 0.10

Note: 1. R)-reference category of different background characteristics

2. Obesity) - reference category for Thin and Normal

3. Not anemic) - reference category of Severe/Moderate and Mild

**Table II (b): Adjusted percentages of women by nutritional status and anemia level by household and regional level background characteristics, India, 2005-06**

Background Characteristics	Body Mass Index			Anemia Level		
	Thin	Normal	Obesity <sup>®</sup>	Severe/ Moderate	Mild	Not Anemic <sup>®</sup>
<b>Household Factors</b>						
<b>Husband's Education</b>						
No education <sup>®</sup>	19.94	63.70	16.29	16.40	51.40	32.05
Secondary	18.6***	63.7**	17.54	14.8***	51.7**	33.45
Higher and above	16.9***	64.7**	18.23	12.9***	52.68	34.32
<b>Husband's Occupation</b>						
Not Working <sup>®</sup>	33.0	61.9	5.2	17.70	56.6	25.68
Primary	33.3*	62.5***	4.2	17.20	56.7*	26.05
Secondary	31.2	63.6	5.2	17.90	56	26.02
Tertiary	29.7*	65.0	5.3	16.10	58.1	25.64
Quaternary	29.1	65.1	5.7	17.60	55.7	26.66
<b>Caste</b>						
Scheduled Caste <sup>®</sup>	19.90	62.77	17.32	15.50	51.20	33.14
Scheduled Tribe	21.9***	67.7***	10.30	18.1***	56.7***	25.09
Other Backward Caste	18.4**	64.17	17.40	14.6***	51.50	33.86
Others	17.7***	62.9***	19.38	14.5***	50.8***	34.57
<b>Religion</b>						
Hindu <sup>®</sup>	19.20	63.80	16.97	14.90	51.90	33.11
Muslim	12.6***	69.87	17.44	16.0*	45.1***	38.76
Christian	19.1***	58.8***	26.88	13.5**	49.0***	37.40
Others	17.40	64.95	17.58	18.6*	53.30	28.06
<b>Wealth Index<sup>4</sup></b>						
Poorest <sup>®</sup>	43.7	54.6	1.6	19.30	57.30	23.38
Poorer	40.7***	56.4***	2.8	18.1***	57.1**	24.70
Middle	33.7***	61.7***	4.5	17.5***	56.3***	26.04
Richer	26.3***	65.9***	7.7	16.6***	56.1***	27.23
Richest	18.0***	68.5***	13.4	16.0***	55.5***	28.36
<b>Regional Factors</b>						
<b>Place of Residence</b>						
Urban <sup>®</sup>	16.70	61.67	21.57	19.00	44.10	36.77
Rural	13.4***	55.1***	31.42	14.3***	51.5***	34.07
<b>Region</b>						
North <sup>®</sup>	33.4	62.0	4.6	18.10	52.00	29.73
Central	30.5**	64.8**	4.6	15.5***	54.50	29.91
North-East	27.0**	69.0***	3.8	21.3***	58.4***	20.20
West	39.0***	56.0***	4.9	21.1***	53.1***	25.71
East	32.6**	63.5***	3.8	15.4***	64.4***	20.04
South	29.4***	63.2***	7.2	19.4***	54.7***	25.83

Significance levels \*\*\* p < 0.01, \*\*p < 0.05, \*p < 0.10

Note: 1. R)-reference category of different background characteristics

2. Obesity) - reference category for Thin and Normal

3. Not anemic) - reference category of Severe/Moderate and Mild

4. Economic status is based on mean of household economic status (wealth index), which is based on 33 assets and housing characteristics. Each household assets is assigned a weight (factor score) generated through principle component analysis, and the resulting assets scores are standardized in relation to normal distribution with mean of zero and standard deviation of one. The sample is divided into quintiles.

The results from the multinomial logistic regression analysis of the adjusted percentage of women at individual level in terms of anaemia level reveals that women in the age group 15 to 19 (17.6 %) are severely anemic. Women with no education (15.7 %) are more anemic compared to those who are educated. Women with no children are more anemic (17.7 %) in comparison to those women who have children. With regard to food intake, women who take milk daily (17.7 %) are more anemic. Women who never consume vegetables and fruits are more anemic. Comparing the body mass index with anaemia levels shows that the women who come under the category of undernourished are more anemic (Table II a). At household level factor, women residing in urban areas (19.0 %) are more anemic than those in rural areas (14.3 %). By region, a large proportion of women are severely anemic in the north-eastern region (21.3 %) followed by the western region (21.1 %) and the southern region (19.4 %) (Table II b).

Overall, the results of Table II (a) and (b) illustrate that under-nourishment and anemia is mainly the outcome of a deprived socioeconomic status of women and households belong to this category are incapable of purchasing adequate food; besides they lack the knowledge and freedom to make use of available resources efficiently. However, obesity is concentrated among women belonging to the better-off sections.

## DISCUSSION

The study found some new dynamics in relation to the nutritional status of women in India. The diverse range of issues considered in the paper does not lend itself to a simple summary. However, some of the significant empirical results that emerge from this study are as follows - The determinants of double nutritional disorders in women: An elementary but crucial observation emerging again and again from both sets of empirical investigations (differentials and deviations) is that the nutritional status of individuals is affected by a wide range of economic, social, cultural, and regional factors. Bentley and Griffiths (2003)<sup>(27)</sup> also reported a positive association between body dimensions and socioeconomic status in southern West Bengal. They also observed a significant difference in the nature of fatness between women belonging to lower and upper socioeconomic groups.

- The differentials in double nutritional disorders in women: Evidence from the study demonstrates that women's nutritional status by mean differentials is more among disadvantaged groups than among well-off groups. However, it has been observed that the deviation in nutritional status is more among prosperous groups than among disadvantaged groups. This is mainly due to the fact that higher averages lead to higher deviations in advanced groups during the progressive stages of socio economic and nutritional status. The study also reveals that women with a low economic status have the highest prevalence of under-nutrition and anemia, mainly due to lack of food security and their inability to use the limited resources efficiently. Higher prevalence of obesity among women belonging to higher socio-economic category can be largely attributable to their life styles and food habits.

Dreze (1993)<sup>(28)</sup> notes that many of these factors do not operate through standard economic variables such as income, expenditure or consumption, the problem of poor nutrition cannot be reduced to a question of 'deficient purchasing power' or even of 'inadequate food intake'. The status of women, for instance, depends not only on household income and its utilisation, but also on the educational level of the women's partner, the number of children ever born, her vulnerability to gender discrimination, her activity level and exposure to social stimulation, the quality of the food, etc.

This observation is not new, but it does emerge with particular force in this empirical study, and its implications are far-reaching. If we take the view that poor nutrition is one of the basic deprivations which economic development seeks to eradicate, it is important to see that the roots of the problem and the parameters of action are more diverse than what is usually recognized in the existing literature on 'nutrition'. On the other hand, the obesity scenario portrays a contradictory picture as most obese women are found among the economically better-off. This is why Indian women are suffering from double disorders, under nutrition and over nutrition, both of which are serious challenges.

## CONCLUSION

The present study establishes the fact that, to a large extent, this double disorder in nutritional status of women is an outcome of the increased disparity in wealth and awareness. The nutritional double burden in India arises simultaneously as women from disadvantaged groups contribute to under-nutrition and well-off groups contribute to obesity. In the larger context, the results demonstrate that the existing socioeconomic inequality is a serious threat to the nutritional balance in India. Low purchasing power, limited access to food, and individual household food insecurity are the major constraints.

The important implications that emerge from the study are that the dual burden of nutritional disorders of women in India is posing a serious challenge not only for nutritional policy making but also for socioeconomic and welfare policies. Obliteration of these anomalies is important to ensure a balanced nutritional status for women in India. Along with direct policies for promoting nutrition and food security, indirect policies like welfare programs, employment and educational programs are also important. In this process, reduction in the prevailing gap between the rich and the poor, the educated and the uneducated, and the working and non-working women is vital. Undoubtedly, there is an urgent need for establishing better nutrition monitoring arrangements in India.

## REFERENCES

1. Obaid TA. Thirty First Session of the Standing Committee on Nutrition, 2004 UNFPA, New York.
2. World Health Organization. Adolescent pregnancy: issues in adolescent health and development. Geneva: WHO; 2004. Available at: <http://whqlibdoc.who.int/publications/2004/9241591455.pdf> (accessed 30 May 2005).
3. BWI. Global Development charting a new course: 19<sup>th</sup> annual report on the state of world hunger, Bread for the World Institute. Washington DC; 2009.
4. Ramachandran P. Nutrition in Pregnancy, In: Gopalan C, and Kaur S, Editors, Women and Nutrition, Nutrition Foundation of India, 1989 Special Publication Series No. 5, 155.
5. Rotimi C, Okosun I, Johnson L, Owoaje E, Lawoyin T, Asuzu M, Kaufman J, Adeyemo A, Cooper R. The distribution and mortality impact of chronic energy deficiency among adult Nigerian men and women. *European Journal of Clinical Nutrition* 1999; 53:734-739.
6. Heaver R. Improving Family Planning, Health and Nutrition Outreach in India. World Bank Discussion Paper No. 59, World Bank, Washington, DC; 1989.
7. Harris B. The Intrafamily Distribution of Hunger in South Asia, In: Dreze J and, Sen AK, Editors, *the Political Economy of Hunger, Entitlement and Well-being*. Oxford University Press: New York, 1990.
8. Radhakrishna R. Trends in Nutrition: Emerging Challenges', and 'Nutrition: Need for Effective Intervention 1992; two articles for *The Economic Times of India*, 10- 11 February.
9. Dreze J. Review: Nutrition and Health in Rural India. *Economic and Political Weekly* 1993;28(7): 276-277.
10. Cornwall M. The social bases of religion: A study of factors influencing religious belief and commitment. *Social Forces* 1987;29:44-56.

11. Gardiner-Oey M. Gender Differences in Schooling in Indonesia. *Bulletin of Indonesian Economic Studies* 1991;27(1): 57-79.
12. Zerihun T, Larson CP & Hanley JA. Anthropometric status of Oromo women of Child bearing age in rural south-western Ethiopia. *Ethiopian Journal of Health Development* 1997;11: 1-7.
13. Kadir MM, Fikree FF, Khan A, & Sajjan F. Do mother-in-laws matter? Family dynamics and fertility decision making in urban squatter settlements of Karachi, Pakistan. *Journal of Bio Social Science* 2003;35: 545-558.
14. Avan BI, Saima A. Role of family type in idealization of a large number of children by husbands in Pakistan. *Journal of Biosocial Science* 2006;38:203-220.
15. Garn SM. Family-line and socioeconomic factors in fatness and obesity. *Nutr. Rev* 1986;44:381-386.
16. Sen Amartya K. Family and Food: Sex Bias in Poverty, In: Srinivasan, TN and Bardhan KP, Editors. *Rural Poverty in South Asia*. Columbia University Press, New York. 1988:453-472
17. Basu AM. Is discrimination in food really necessary in explaining sex differentials in childhood mortality. *Population Studies* 1989;43:193-210.
18. Inter-Agency Standing Committee (IASC). *Guidelines for Gender-based Violence Interventions in Humanitarian Settings: Focusing on Prevention of and Response to Sexual Violence in Emergency*. Action Sheet 6.1 Geneva: Implement Safe Food Security and Nutrition Programmes; 2005. <http://www.reliefweb.int/library/documents/2005/iasc-gen-30sep.pdf>
19. Deaton A. & Dreze J. Food and Nutrition in India: Facts and Interpretations. *Economic and Political Weekly* 2009;44(7):42-65.
20. International Institute for Population Sciences and Macro International National Family Health Survey. (NFHS-3) 2005-06: *India*. Mumbai, International Institute for Population Sciences; 2007.
21. (See Reference no. 3).
22. (See reference no. 15).
23. Bouchard C, Perusse L, Leblanc C, Tremblay A , Theriault G. Inheritance of the amount and distribution of human body fat. *Int. J. Obes* 1988;12:205-215.
24. (See Reference no. 20).
25. (See Reference no. 19).
26. World Health Organisation (WHO). Closing the gap in a generation: Health equity through action on the social determinants of health: Commission on Social Determinants of Health - final report. Geneva: WHO; 2008.
27. Bentley EM and Griffith LP. The burden of anemia among women in India. *European Journal of Clinical Nutrition* 2003;57:52-60.
28. (See Reference no.9).