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DETERMINANTS OF HOUSEHOLD FOOD SECURITY AND THEIR IMPACTS ON  
THE NUTRITIONAL STATUS OF WOMEN IN SLUMS OF GHAZIABAD CITY,  
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**Objective:** The determinants of household food security are studied in relation to the nutritional status of women in slums of Ghaziabad City. The contribution of income, livelihood and expenditure is also explored. **Design:** Exploratory Cross-sectional study, Household survey was conducted to elicit information on Socioeconomic, demographic profile and food consumption pattern. A 24 dietary recall of three consecutive days in two seasons and anthropometric assessments were also carried out on one woman head per household. **Setting:** Household (n 114) belonging to two slums; Deendayal puri in the city and Bhuapur slum is located on the outskirts of Ghaziabad. **Subjects:** women aged 18-59 years. **Results:** Out of the total 114 households 20.1 % were highly insecure (food insecure with hunger), whereas 37.7% were low food insecure (Food insecure without hunger) and only 42.1% were food secured. The obesity was more prevalent in the food insecure household as compared to underweight. It is also seen that with the increase in the total monthly per capita expenditure the shared percentage of expenditure on food decreases.

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**Keywords:** Nutritional status, Dietary intake, Household food security, Income, Food expenditure, Non-food expenditure

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**INTRODUCTION**

The Concept of food security has undergone many changes during last fifty years or so not only in India, but also in regional and International discourse. It is useful to define food security at National, household and individual level. The study is focused on the urban poor environment, it is important to know the circumstances in which they are living. The urban poor who are living in slums are mostly vulnerable due to the exclusionary attitude of the state towards poor; it's not only the brutal physical and socio-economic environment but also the lack of social networks and monetization of basic needs. These factors undermine the capacities of vulnerable in a different way to impact their wellbeing. Poor access to safe water and basic sanitation has considerable adverse effects on the physical

and cognitive development of children, results in the range of gastrointestinal disorders in adults and makes it difficult for girls and women to maintain person and menstrual hygiene. Especially women who are living under such circumstances are particularly at risk. The lack of basic amenities is not only due to their inability to access but also due to the location of their settlements. The location of settlement provides a framework to capture the combination of human beings and socioeconomic factors in explaining variation in health status within given population. In general terms, what people do is nearly always influenced by the social settings in which they find themselves. Studies have also shown a positive association between perceived health status and access to health services and amenities in the neighborhood. So, it is important to understand the

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compositional, contextual and collective factors responsible for health.

Studies in general are based on mean-based estimates of consumer expenditure, cereal consumption and calorie intake and summary measures of calorie deprivation like the incidence of calorie deficiency and conclude that under-nutrition and food insecurity has increased in India. Of course, estimates by the official poverty-line-calorie norms (GoI, 1979) show that incidence of calorie deficiency is 85 percent in rural India and 65% in urban India. But, it is important to examine the disaggregated profiles of such changes and their implications. According to National Sample Survey (NSS) data, between 1983 and 2009-10, average inflation-adjusted monthly expenditure of households increased by 28% but calorie intake declined by 16% in rural India.

State wise profile on calorie intake and deprivation reveal the little impact on the nutritional Indicators. Considering calories intake or energy is irrelevant on the major determinant of physical capability and health. It is difficult to explain, on the basis of available information and knowledge, the relationship among Income/Consumption, calorie intake and nutritional outcomes. Hence, alternative options are required for analyzing the outcome or nutritional status across the different sections.

The literature reviewed identified the gaps in the availability of disaggregated data on women in respect of food insecurity and nutritional status and how this impacts on their social role or how the nutritional status is affected due to the social discrimination faced by women. As per the urban health resource Centre (2008), approximately 38.5% of poor urban women of reproductive age are suffering from acute undernutrition, i.e., body mass index less than 18.5 kg/m<sup>2</sup>. The higher levels of women's malnutrition (mainly chronic energy deficiency) suggest that norms and discriminatory practices against women are more rigid and intense in some states or alternatively, they may relate to the levels of poverty. These patterns may simply reflect the food habits of the region, and the lack of adequate nutritive components in them. Therefore it is very important to study the socio-economic dimensions of women food security and its impact on their nutritional status. The women malnutrition has increased despite the reduction in poverty. It may also indicate the poor reach of welfare programs in general and to the poor women in particular.

## MATERIALS AND METHODS

As per the available list of the District Urban Development Authority (DUDA) of Ghaziabad, there were 79 notified slums. In the first stage, two notified slums were selected to explore the interlinked factors and to see the area effects. Therefore one slum was selected on the outskirts (Bhuapur) and one was selected in the city (Deendayalpur).

### Study Period

The data collection took a total period of five months in two seasons. In January-March 2016 (winter season), a detailed household (HH) and dietary survey was conducted in Deendayal puri slum. This was supplemented with a 24 Dietary Recall (DR) on three consecutive days of one woman of reproductive age (18-59 years) per HH. The same procedure was followed in bhuapur slum in May-June (summer season). It included the interview of the individuals in the community and observation is also a major part of this study.

### Sample Size

The data collected is comprised of various quantitative tools. The total number of households was selected proportionally to the population of the two slums. The total households of the two slums were (2723 + 1400 = 4123). Therefore, the number of households from Deen Dayal puri slum =  $2723/4123 \times 100 = 66\sim 65$ , and the number of households from Bhuapur slum =  $1400/4123 \times 100 = 33.9\sim 35$ . Due to extensive nature of the instrument to be applied to the collection of field data and with limited time in order to ensure maximum coverage of the field reality, a sample size of 100 HH has been decided to be systematically chosen from the field area. Keeping these vital facts under consideration, the sample size has been considered adequate for the study. The total (n = 114) households were chosen by using circular systematic sampling method. The key informants were a female head of the household who were more than or equal to 18 years of age (Unmarried or married, without children or divorced or widowed). And who are involved in cooking and purchasing food as they are supposed to aware of household food insecurity condition. The pregnant and lactating women were excluded due to their different consumption e and dietary requirements.

### Data Collection

It has been suggested that household food insecurity is best documented in adult women as young children are generally protected from the consequences of household

food insecurity until this is severe (Townsen *et al.*, 2001; and Adams *et al.*, 2003). Hence, selecting adult females as respondents seemed apt. The following data were requested from respondents (information was cross-checked through observation, when possible):

1. Household characteristics—Following information was collected using semi structured interview schedule: i) religion, family size, respondent's literacy level, literacy level of head of household. ii) Employment and income: The respondents were carrying a different type of work i.e., casual, semi-casual and self-employed. The monthly income for each household was summed and the average monthly income of the household calculated. iii) The socio-economic status of households was assessed using modified District Level Household Survey Standard of Living Index (SLI) District Level Household Survey-2, 2002-04, International Institute for Population Sciences. The index is calculated by summing the scores, which are based upon the relative significance of ownership of the specific household assets—drinking water, types of house, source of lighting, fuel for cooking, toilet facilities and ownership of items: fan, radio/transistor, sewing machine, television, bicycle, motorcycle. iv) Household Monthly Per Capita Expenditure (MPCE): To assess the MPCE of the household, the household consumer expenditure schedule used by National Sample Survey (2005-06) (National Sample Survey Organization, 2008) was simplified and adapted to an urban context. Groups of expenditure items included—food, fuel, conveyance, medicinal, water, electricity, and rent and non-food daily items. The reference period of recall was generally the last 30 days. The total expenditure incurred by households on domestic consumption during the reference period was divided by the family size to arrive at MPCE. v) Household Food Insecurity: The HH food security was assessed using a six item measuring scale comprising a subset of 18 items (Economic Research Service, USDA, 2012). The sum of affirmative responses to the six questions in the household Food Security Scale-Short forms provided the HH's raw score on the scale. It differentiates three categories of food security. Food secure, Food insecure without hunger and Food insecure with hunger (Revised by USDA, 2012) (Economic Research Service, 2012). The questions were asked in Hindi and respondents were asked to refer to the experience of adults in the household only.

2. Food consumption pattern was calculated using the formula proposed by WFP and FAO of 2008 (Programme, 2008). The frequency of consumption of different food groups was assessed using a Food Frequency Questionnaire (FFQ). The reference period for the FFQ was 1 month.
3. A three day 24 dietary recall was taken for one woman of reproductive age per HH. For the dietary recall, the selected woman was asked to remember, in as many details as possible, her food intake during the past 24 hour. For each meal, the respondent was asked to recall and wherever possible show or describe the foods eaten (i.e., each food item consumed along with a detailed recall of ingredients used, method of preparation, etc.) based on the recipe. A food recall kit which included standard utensils, measuring cups, spoons glasses and a weighing scale was used for this purpose.
4. Anthropometric assessments to measure height and weight were carried out using standard protocols and equipment (weighing scale and anthropometric tape) on the same woman from whom dietary recall was taken. Continuous variables were summarized as mean and standard deviation while categorical variables were summarized as a number of subjects and percentages.

## RESULTS

### Sample Characteristics

The ratio of males to females in the study population was 0.53. The mean household size of 4.9. The mean age of the reproductive age of women was 34.8 (SD 8.9). Around 80.7% of the total population of the sample were migrants and among them 20% were inter-state whereas 60% were intra state migrants. Around 47.4% of the total sampled household did not have a ration card. Most of the female were housewives (72.8%). The female head of the household included casual work (7.9%), self-employed (7.0%) regular wages (12.3%). The women who were on regular wages were working as laborers, maids and factory workers; self-employed included tailor, shopkeepers and vendors whereas casual workers included mainly laborers and seasonal vendors. Out of 114 respondents 45.6% were illiterate. The occupations of the head of the household were mostly included rickshaw pulling, daily labor, domestic servant, carpentry, mechanic/electrician and vendor.

In Table 1 where the socio economic and demographic characteristics of both the cluster are compared, cluster 1

**Table 1: Cluster-Wise Social-Economic and Demographic Profile of the Sampled Households in the Selected Slums of Ghaziabad, India (n = 114)**

Table 1 Variable	Category	N = 73 (%) Cluster 1	N = 41 (%) Cluster 2
House Ownership	Own	78.1	31.7
	Rented	28.9	68.3
Migrants		75.3	90.2
	Inter-state	13.7	31.7
	Intrastate	61.6	58.5
Occupation of the household head female (key subjects)	Casual worker	8.2	7.3
	Housewife	71.2	75.6
	Self employed	8.2	4.9
	Regular wages	12.3	12.2
Literacy level of women (18-59 years) (key subjects)	Illiterate	50.7	36.6
	Schooling (primary, middle, high)	42.5	56.9
	Graduate	5.5	-
	Post graduate	1.4	7.3
Toilet Facility		98.6	73.2
Drinking Facility	Boring	94.5	17.1
	Govt tap/Handpump	4.1	34.1
	Boring and Handpump	1.4	26.8
	Bisleri	0	22
Household holding PDS Ration Card*		56.2	41.5

seems to be having better livelihood as compared to cluster 2. In cluster 1, majority of the families were staying in own house (78%) whereas in cluster 2 only 31% families were having house ownership. In both the slums majority of the families were migrants including 90% in cluster 2 and 75% in cluster 1. As the type of employment is concerned, more number of casual workers were in the cluster 2 (56%) as compared to cluster 1 (44%). But the income status is much better in cluster 2 as compared to 1, the families who were earning above 30000 were 9.5% in cluster 2 and 1.4% in cluster 1. The Cluster 1 had better toilet facility (98.6%) whereas 1.4% didn't have toilet facility but in cluster 2, 26.8% didn't have separate toilet for their own. The cluster 1 also had better drinking water facility, majority (94.5%) of them were using shared submer savel whereas only 17%

were using boring or underground water in cluster 2. Around 22% were also buying bisleri water bottles for drinking which can be considered as defensive expenditure. More than half (56%) of the household in cluster were having ration card whereas 58% of the household in cluster 2 didn't have ration Card.

#### Average MPCE Across Deciles and Percentage Share of Food Expenditure in Both the Selected Clusters

In the selected clusters, the share of food was 54.1% for its bottom 10% population and 19.1% of top 10% population. The average monthly per capita expenditure was 2748.8 whereas the monthly per capita expenditure on food and nonfood was 729.5 and 1384.21 respectively. It was clearly

**Table 2: Average Monthly per Capita Expenditure (MPCE) Across Deciles and Percentage Share of Food Expenditure of Cluster 1 (n = 73)**

Decile Classes of MPCE (Rs)	Average MPCE (Rs)	Decile Classes of MPCE on Food (Rs)	Average MPCE on Food	% Share of Food in Consumer Ex	Decile Classes of MPCE on Nonfood (Rs)	Average MPCE on Nonfood (Rs)
<766	490.62	<335	211.64	43.1	<212	132.3
758-1210	1065.07	335-406	372.74	34.99	212-310	270.91
1210-1500	1399.47	406-475	455.65	32.5	310-403	358.86
1500-1666	1600	475-525	505.119	31.5	403-499	452.14
1666-2000	1836.73	525-600	576.36	31.3	499-594	538
2000-2373	2291.66	600-700	673.79	29.4	594-713	673.8
2373-2500	2490	700-834	765.41	30.7	713-778	757.3
2500-3333	3128	834-938	887.97	28.3	778-1022	904.44
3333-4273	3850	938-1152	1007.61	26.1	1022-1374	1195.72
>4273	6931	>1152	1577.08	22.7	>1374	1638.72
All Classes	2447.94	All classes	700.08	28.5	All Classes	692.11

seen that with the increase in the total monthly per capita expenditure the shared percentage of expenditure on food decreases.

In the cluster 1 (Table 2), the MPCE across deciles and percentage share of food expenditure is shown. The share of food was 43.1% for its bottom 10% population and 22.7% of top 10% population. With the increase in the total monthly per capita expenditure the percentage share of expenditure on food decreases except in 7<sup>th</sup> decile. Likewise, in the cluster 2, the share of food was 46.2% for its bottom 10% population and 32.8% of top 10% population. It is clearly seen that with the increase in the total monthly per capita expenditure, percentage share of expenditure on food decreases.

In Table 3, around 27.2% of women were overweight and 10.5% were obese whereas only 7.9% were underweight. Most of the women had a sedentary lifestyle (44.7%) whereas 35.1% and 20.2% were moderate and heavy workers. Almost 81% of the women were found among the borderline food consumption score and only 3% were falling in the category of poor food consumption score. The poor and the borderline food consumption score identify the calorie deficits among the households. Out of the total 114 households 20.1% were highly insecure (food insecure with hunger), whereas 37.7% were low food insecure (Food insecure without hunger) and only 42.1% were food secured.

**Table 3: Categorization on the Basis of the Body Mass Index, Physical Activity, Food Consumption Score (n = 114)**

Variable	Category	%
BMI	<18.5 (Under weight)	7.9
	18.5-24.9 (Normal weight)	51.8
	25.0-29.9 (Over weight)	27.2
	30.0-34.9 (Class I obesity)	7
	35-39.99 (Class II obesity)	3.5
	>40 (Class III)	2.6
Physical activity status	Sedentary	44.7
	Moderate	35.1
	Heavy	20.2
Food consumption pattern	Status	
0-26	Poor Food Consumption	2.7
29-42	Borderline Food Consumption	81.1
>42	Acceptable Food Consumption	16.2

**Table 4: Selected Characteristics of Food Insecure versus Secure Households**

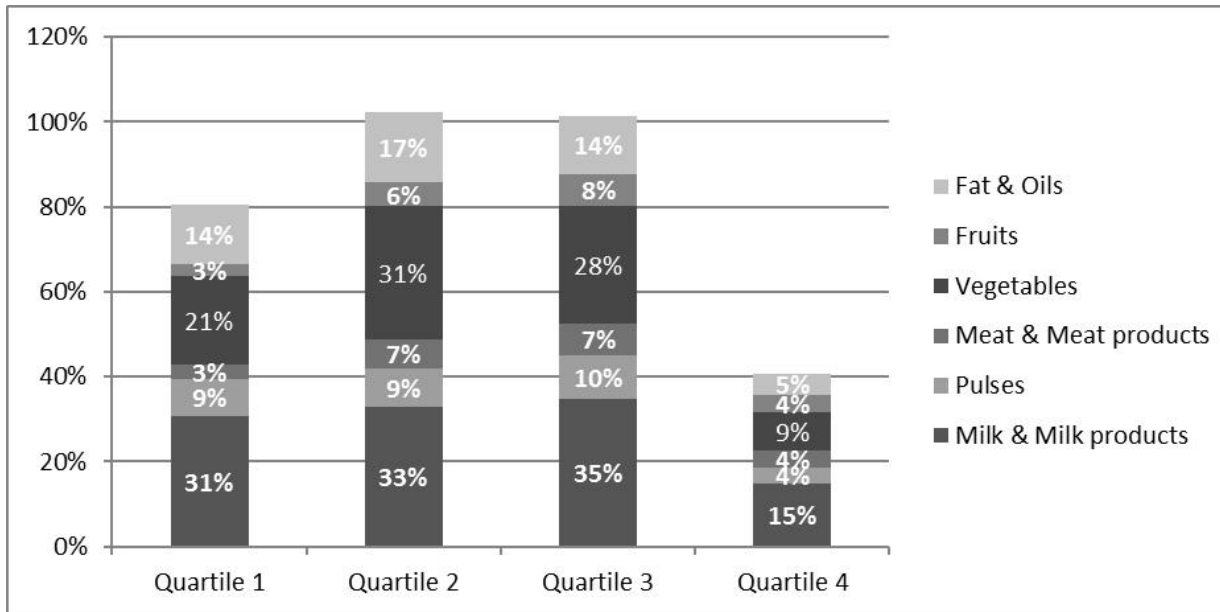
Household Food Security Status (% Within Household)	Categories	Food Insecure Households with Hunger (n = 23)	Food Insecure Household Without Hunger (n = 43)	Food Secure Households (n = 48)
Education	Post Graduate and above	-	7	2.1
	Graduate	43.5	44.2	60.4
	illiterate	56.5	48.8	37.5
Standard of living index	High	69.6	83.7	89.6
	Medium	26.1	16.3	10.4
	Low	4.3	-	-
Body Mass Index	<18.5	4.3	11.6	6.2
	18.5-24.9	47.8	44.2	60.4
	25 and above	47.8	44.2	33.3
Type of work	Self employed	13	2.3	8.3
	Regular wages	8.7	14	12.5
	Casual worker	13	4.7	8.3
	No work	65.2	79.1	70.8

From the Table 4, which is based on the characteristics of the food secure versus insecure households, it can be stated that 60% of the food secure household were belonging to literate (graduate) whereas 37.5% were illiterate. Around 89.6% food secure households were from the High standard of living index although 69.6% were from food insecure household with hunger; the majority of the households were falling in the category of High SLI because of the added weight to basic resources. The standard of living index lack a direct measure of living standards and has its limitation (Wagstaff *et al.*, 2008). The type of work of the female household also influences the household food security status. Most of the women were not working as they mostly comprise of housewives. Around 13% of the insecure household with hunger was belonging to the self-employed and casual workers each whereas only 8.7% were including regular wages. Among the food secure households only 8.3% were self-employers and casual workers each and 12.5% were regular wage earners. As per the Figure 1, the percentage contribution of all the food groups is seen among the four quartile of monthly per capita expenditure on food. The first (lowest) which spends on an average 458 rupees contributes 81% expenditure on food whereas the

fourth quartile (highest) which spends an average of 2300 rupees contributes only 41% on food expenditure. However the data may varies as the expenditure on cereal is not considered because pattern of buying cereal varies, as in most of the cases people tends to store the cereals for a year and also take it from fair price shop.

For understanding the factors affecting Food insecurity, the bivariate analysis (Tables 5 and 6) is done for different variables were identified such as Household Food Security Score, per capita income, Body Mass Index, total food expenditure and a number of family members. The results of Pearson correlation among these factor reflected there was a negative correlation between household food insecurity and food consumption score ( $r = -0.207, -0.306$ ). The correlation value ( $0.07, 0.052 > p = 0.05$ ) indicates that there is no statistical significance between the food consumption Score and household food insecurity score for both the clusters. There was a positive correlation between the total family member and household food insecurity ( $r = 0.063, 0.505$ ). And this is statistically significant in the case of Slum 2 but not in the case of cluster 1 ( $0.59 > p = 0.05, 0.001 < .05$ ). The Body Mass Index of the women was positively correlated ( $r = 0.11, -0.24$ ) to Household Food

**Figure 1: Average Monthly per Capita Expenditure on Various Food Groups on the Basis of MPCE on Food Quartiles**



**Table 5: Relationship Between Household Food Insecurity, Nutritional Status and Food Consumption Score Among Cluster 1**

<i>Cluster 1 (n=73)</i>		HFS	FCS_	TFM	BMI_	INC_	TFE
HFS	Pearson Correlation	1	-0.207	0.063	0.11	-0.068	-.279*
	Sig. (2-tailed)		0.079	0.598	0.355	0.569	0.017
FCS	Pearson Correlation	-0.207	1	-.302**	0.07	0.137	0.071
	Sig. (2-tailed)	0.079		0.009	0.554	0.249	0.549
TFM	Pearson Correlation	0.063	-.302**	1	-0.029	-0.095	0.065
	Sig. (2-tailed)	0.598	0.009		0.809	0.425	0.585
BMI	Pearson Correlation	0.11	0.07	-0.029	1	0.151	-0.083
	Sig. (2-tailed)	0.355	0.554	0.809		0.203	0.485
INC	Pearson Correlation	-0.068	0.137	-0.095	0.151	1	.260*
	Sig. (2-tailed)	0.569	0.249	0.425	0.203		0.026
TFE	Pearson Correlation	-.279*	0.071	0.065	-0.083	.260*	1
	Sig. (2-tailed)	0.017	0.549	0.585	0.485	0.026	

Insecurity and it was not statistically significant for both the clusters (0.35, 0.11 > p = 0.05).

The household income was negatively correlated to household food insecurity (r = -0.068, -0.098) but it was not

statistically significant (0.56, 0.54 > p = 0.05). The total number of family was negatively correlated with Household Food Insecurity (r = -0.279, -0.235) and it is statistically significant for both the clusters (0.01, 0.14 < p = 0.05).



**Table 6: Relationship Between Household Food Insecurity, Nutritional Status and Food Consumption Score Among Cluster 2**

<i>Cluster 1 (n=73)</i>		<b>HFS</b>	<b>FCS_</b>	<b>TFM</b>	<b>BMI_</b>	<b>INC_</b>	<b>TFE</b>
HFS	Pearson Correlation	1	-0.207	0.063	0.11	-0.068	-.279*
	Sig. (2-tailed)		0.079	0.598	0.355	0.569	0.017
FCS	Pearson Correlation	-0.207	1	-.302**	0.07	0.137	0.071
	Sig. (2-tailed)	0.079		0.009	0.554	0.249	0.549
TFM	Pearson Correlation	0.063	-.302**	1	-0.029	-0.095	0.065
	Sig. (2-tailed)	0.598	0.009		0.809	0.425	0.585
BMI	Pearson Correlation	0.11	0.07	-0.029	1	0.151	-0.083
	Sig. (2-tailed)	0.355	0.554	0.809		0.203	0.485
INC	Pearson Correlation	-0.068	0.137	-0.095	0.151	1	.260*
	Sig. (2-tailed)	0.569	0.249	0.425	0.203		0.026
TFE	Pearson Correlation	-.279*	0.071	0.065	-0.083	.260*	1
	Sig. (2-tailed)	0.017	0.549	0.585	0.485	0.026	

**Note:** \*\* Correlation is significant at the 0.01 level (2-tailed); and \*Correlation is significant at the 0.05 level (2-tailed).

There was a negative correlation between total food expenditure and household food Insecurity ( $r = -0.279$ ,  $-0.235$ ). Hence the household becomes more food secure with increasing expenditure on food. This relationship was statistically significant in the case of cluster 1 but statistically insignificant in case of cluster 1. The total food expenditure is positively correlated ( $r = 0.260$ ,  $0.367$ ) to income and it is statistically significant in both the selected slums ( $0.026$ ,  $0.018 < p = 0.05$ ), which shows that the income generation opportunities is crucial for tackling the problem of food insecurity.

#### Cluster-Wise Categorization on the Basis of the Average Percent Adequacy of All the Nutrients

The nutrient intake data from the dietary recall method was entered into the validated software 'Diet Cal' version 3.0 (Profound Tech Solution; <http://dietcal.in/>), which is based on values from the Nutritive value of Indian foods (Gopalan and Sastrin, 2004). Nutrient intake data (as represented by mean) were then compared with the Recommended Dietary Allowances (RDA) for Indians for an adult woman as per their lifestyles (<http://icmr.nic.in/final/rda-2010.pdf>). The adequacy of nutrient intake by each participant was computed in terms of the Nutrient Adequacy Ratio (NAR)

(Malhotra and Passi, 2007). Cut-offs for NAR were considered as 'inadequate' when the ratio was less than 0.66; 'fairly adequate' when the ratio was 0.66 to  $< 1.00$ ; and 'adequate' when the ratio was  $\geq 1.00$ . NAR (Nutrient Adequacy Ratio) is calculated as participant's nutrient intake per day/RDA of the respective nutrient. The nutrient intakes in the two groups were then compared between the groups.

In Table 7, the percent adequacy of daily nutrient intake is shown. The percent adequacy was below 60% for Vit B12, Vit A and riboflavin in the case of both the cluster whereas for fat it was more than 100% (table above). This shows a shift from traditional dietary patterns toward a more Western diet consisting of energy-dense foods high in fat, sugar, and salt. This data corresponds well with the National Sample survey in which the pattern of consumption of selected food items of the urban population (kg/month/per was assessed (Vepa, 2004). The Nutrient adequacy ratio was also calculated for both the clusters. It has been found that, In Cluster 1, The NAR for Calcium; Vitamin B12 was inadequate in more than 50% of the study participants whereas 95.9% of the participants were consuming an adequate amount of fat. The consumption of more fat and absence of diversified, nutrient dense diet may consider as

**Table 7: Percent Adequacy of the Daily Nutrient Intakes of Women Subjects (18-59 Years) in the Sampled Households of Two Clusters in Ghaziabad**

Nutrient	RDA	Cluster 1	Cluster 2
		% Adequacy (Mean)*	% Adequacy (Mean)*
Energy (Kcal)			
Sedentary	1900	76.83	81.45
Moderate	2230	70.74	68.74
Heavy	2850	64.6	60.23
Fat (g)			
Sedentary	20	205.91	188.69
Moderate	25	183.34	157.91
Heavy	30	129.16	141.6
Protein (g)	55	83.41	89.58
Calcium (mg)	600	75.82	73.98
Iron (mg)	25	185.01	74.41
Folic Acid (µg)	200	78.22	85.91
Vitamin B12	1	28.66	30.26
Vitamin A (µg)	1	13.64	16.01
Thiamine (mg)	1.1	122.05	127.84
Riboflavin (mg)	1.3	56.95	63.3
Niacin (mg)	14	85.88	90.66
Vitamin C (mg)	40	189.72	73.98
Zinc (mg)	10	58.06	67.73
<b>Note:</b> * The percent adequacy is calculated by the mean nutrient intake expressed as a percentage of the RDA, i.e., mean intake of nutrient /RDA of nutrient.			

the cause of overweight and obesity but a simultaneous failure to meet micronutrient requirement (Varadharajan *et al.*, 2013).

In cluster 2, The NAR for energy, Calcium, iron, Vitamin B1, Vit A, riboflavin and zinc was inadequate in more than 50% of the study participants whereas none of the individuals was consuming inadequate fat and 97.6% of the participants were consuming more than adequate amount of fat.

## DISCUSSION

Despite the abundant literature on food security there are little empirical researches which identify the relationship between nutritional status, consumption pattern of the people and their social setting. Several important findings emerged from the study. First a large proportion of urban slum dwellers were food insecure. Second, predictors of household food insecurity are directly or indirectly related to income, type or pattern of employment, pressing non-food expenditures. Lastly, the study is bringing out the association of food and nutrition security as the household security scale is coupled with anthropometric assessments of women. However, all the food insecure households may not necessarily be nutritionally insecure. The data showed that most of the women had normal weight (51.8%), 27% were overweight, 13% were obese and only 7.9% were underweight. The percentage of obese women (13%) correlates well with the third National Family Health Survey (Arnold *et al.*, 2005) showing the nutritional status of women in India. The higher percentage of obesity can be attributed to various factors including, sedentary lifestyle, and easily available cheap unhealthy foods. Food insecurity has been the significant factor for obesity in women. The continuous cycle of temporary food abundance and food restriction results in gradual weight gain over time and it is mainly due to binge eating and food restraint may put the women at risk of being overweight and obese (Zalilah and Khor, 2004). The obesity was more prevalent in the food insecure household as compared to underweight. With the increasing level of obesity, it is necessary to investigate what other factor fueling obesity prevalence in this population. The association of severe food insecurity with abdominal obesity in adult females of households may indicate their vulnerability and the need for tailoring programs to prevent further health problems in this group (Mohammadi *et al.*, 2013). The study shows that food insecurity affects the nutritional status of women.

It is very important to look into the settings of these two clusters before further conclusions can be made. Deendayal puri slum has its origin during 1990's when the jhuggi's were demolished and the land was given to the destitute families at affordable cost. This slum has also been selected for re-development under Rajiv Avas Yojna. Though it has the opportunities structure like government school and hospitals, but it is extremely unhygienic due to poor sanitation. Inadequate sewerage and drainage system brings misery to the slum. The location of a slum is in a fast growing

locality which encourages mainstreaming the slum-dwellers into the citywide network. The slum comprises 2723 households. The main occupation includes construction labourer, Rickshaw pullers, auto driver and painter. The caste wise percentages are OBC (16.79%) SC (81.07%) and others (2.14%).

On the other hand, Bhuapur slum was founded ten years ago and it is still growing. It is located on the outskirts of Ghaziabad where a large number of rag picker families reside, collecting and segregating urban waste from surrounding households. An estimated 1400 households (5,000 people approx.) resides in the slum. The community is made up of mainly migrating populations from Bihar and west Bengal. Basic amenities such as housing, electricity, water supply, health and sanitation are non-existent for this community. The family prime focus on the basic survival issues where it survives on a hand to mouth basis of income generation. The families live a hazardous existence amongst all the rubbish, the smell, the dirt and often the dangers that lurk within the garbage. The community also lacks the opportunities structures including schools, banks and PHC's. Families are living in poverty, suffering exploitation on several fronts, yet providing a crucial service to the society.

Both the clusters which have been selected come under the category of notified slums as per the Ghaziabad development authority List. Apart from the poverty, there are many factors which hinder the basic survival needs in these slums; they live in congested conditions which promote the spread of infectious diseases with poor sanitation and drinking water facilities. The socio-demographic characteristics of both clusters suggest that the slum which is located in the city has a better livelihood conditions as compare to the other which is located on the outskirts. The house ownership is higher in cluster 1 (78%) as compared to the another (31%). The migrant population is higher in cluster 2 (90%) as compared to 1 (75%). The illiteracy rate is higher in cluster 1 (50.2%) as compared to cluster 2 (36%). Though the income in cluster 2 is higher but the percentage share of food expenditure is lesser as compared to cluster 1. As far as the employment opportunities are concerned, none of the head of the family was unemployed but they lack the potential self and casual employment opportunities as they are mostly migrants who lack the financial support from the neighborhood or the community as a whole. The cluster 1 not only had better availability of adequate safe drinking water but also had

better toilet facilities whereas in the Bhuapur unauthorized settlement, households were spending money to get drinking water and they were using shared toilets. Due to the unavailability of the id proofs among the migrant population they were excluded from availing the subsidized foods items from fair price shops.

It is seen that, with the increase in the total monthly per capita expenditure the shared percentage of expenditure on food decreases. The share of expenditure spent on food is lower in urban areas compared to rural areas. If the lower share of expenditure is not giving enough calories to the urban poor, the inability to increase expenditure on food and consume more calories may be due to other pressing expenses in the urban set-up, though it is difficult to capture all of them (Vepa *et al.*, 2001). Apart from all these issues, this segment of the population also spent a larger proportion of their money on repayment of loans borrowed at high interest, paying rent and alcohol. According to the key Indicators of Household Consumer Expenditure NSSO survey (2009-10), in Uttar Pradesh the average mpce and mpce on food in urban areas was 1574 Rs and 728 Rs whereas 46.3% was the shared expenditure on food. The monthly expenditure on food in the selected two urban slums is corresponding well with the NSSO data.

As per the food consumption score, the poor and the borderline food consumption score identify the calorie deficits among the households. As the food frequency data was collected in two different seasons to capture seasonal variations. There is increased intake of green leafy vegetables in winter season because of the availability and decreased prices. The cluster 1 shows lesser number of micronutrient deficiencies as compared to 2. The majority of the women diet was rich in fat and was lacking in the various micronutrients. Therefore, they are likely to suffer from micronutrient deficiencies.

Among the food secure households only 8.3% were self-employed and casual workers each and 12.5% were regular wage earners. It can be stated that regular wage earners were in better condition as household food security is concerned and seasonal and self-employment often tends to increase the risk of transitory food insecurity. This is the major problem with the unemployed is to get assured job for 365 days of the year. Urban women are the major sufferers who usually seek jobs in the unorganized sector. To conclude, a significant association of income with food insecurity highlights the need to link urban poor women

with employment generation avenues, schemes, skill upgrading, training and linkages with potential employers.

## CONCLUSION

The determinants of household food security affect the Nutritional status of women i.e., food and non-food expenditure ratio, seasonality and type of employment. The sufficient attention should be given to the challenges of generating efficient and stable income for women as prerequisite for ensuring food security in urban slums. Public provisioning of education, transportation and housing would also reduce the pressing non-food expenditures and improve the nutritional status of the vast majority of the urban poor.

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