

Original Research Article

PREVALENCE, DETERMINANTS AND OUTCOMES OF HOUSEHOLD FOOD INSECURITY IN AN URBAN SLUM: A CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Household food insecurity is common in urban slum communities and may adversely affect the nutritional status of women and under-five children. However, evidence regarding its prevalence and determinants in Mumbai's urban slums remains limited. The objective is to assess the prevalence, determinants and selected outcomes related to food insecurity among households residing in an urban slum of Mumbai.

Materials and Methods: This study employed a cross-sectional investigation at the community level among 140 households within the service area of Cheeta Camp Urban Health Centre, Mumbai. Eligible households included females aged 18–50 years responsible for food preparation and distribution, with at least one under-five child. Systematic random sampling was employed to select the participating households. Household food access status was evaluated with the Household Food Insecurity Access Scale. MUAC was measured among under-five children and haemoglobin was estimated among eligible females. Data were analysed using Microsoft Excel and IBM SPSS version 23.

Results: Among 140 households, 102 (73%) were food insecure. Mild, moderate and severe food inadequacy were observed in 33%, 27%, and 13% of households, respectively. Food insecurity was significantly associated with female education, family type, family size, ration card availability, source of ration and per capita income. MUAC <12 cm and anaemia were more frequent in food-insecure households.

Conclusion: Household food inadequacy was highly prevalent in the studied urban slum population and was significantly connected to socioeconomic vulnerability. Food-insecure households showed higher proportions of adverse nutritional indicators among women and under-five children.

Keywords: Food insecurity, HFIAS, Urban slum, Anaemia, Under-five children.

INTRODUCTION

Food insecurity refers to a multidimensional public health challenge and is not limited to the absence of food. It occurs when individuals or households have limited or uncertain ability to obtain wholesome and nourishing food that fulfils dietary requirements & supports a healthy lifestyle. Within households, it may manifest as concern regarding food availability,

poor dietary quality, decreased meal quantity or frequency and episodes of hunger.^[1] The Household Food Insecurity Access Scale (HFIAS) is a nine-item instrument used to assess the access-related dimension of household food inadequacy and captures three major domains: worry and doubt regarding household food availability, poor quality of food consumed and inadequate intake leading to physical effects.^[2]

Limited access to sufficient food continues to represent an important worldwide community health issue. According to the State of Food Security and Nutrition in the World 2023 report, nearly 691–783 million individuals were affected by hunger in 2022, and around 2.4 billion people lived with moderate-to-severe food access insecurity.^[3] The Global Hunger Index 2023 placed India 111th among 125 nations under the “serious” hunger category, indicating persistent susceptibility to hunger and undernutrition.^[4] India continues to experience a threefold burden of malnutrition, which includes undernutrition, excess nutrition and micronutrient inadequacy. Findings from the National Family Health Survey-5 show that stunting, wasting & underweight among under-five children continue to be major public health challenges in India.^[5]

In India, food security is influenced not only by food availability, but also by affordability, household income, education, employment stability, family size, access to social protection schemes and availability of subsidised food through the public distribution system.^[6] These factors are particularly important in urban slum communities, where many households depend on informal employment, daily wages and unstable livelihoods. Overcrowded housing, poor living conditions, limited savings, vulnerability to illness, sudden loss of income and fluctuations in food prices may further compromise household food access.^[7]

Food insecurity has important nutritional and health consequences. Limited access to diverse and nutrient-rich foods may affect dietary diversity, micronutrient intake, child growth and nutritional status. In households with young children, inadequate food access may compromise feeding practices and contribute to undernutrition. Among women, poor access to nutrient-rich foods may increase the risk of anaemia, fatigue, reduced work capacity and poor overall health. Food-insecure households may also experience increased healthcare needs and financial burden further worsening their socioeconomic vulnerability.^[8,9]

Although household food insecurity has significant public health implications, local evidence from urban slum communities in Mumbai remains limited. Community-level data are essential for identifying vulnerable households and planning context-specific interventions. Therefore, the current investigation was conducted to assess the prevalence, determinants & selected outcomes of household-level food inadequacy in an urban slum with particular focus on anaemia among women and nutritional status among under-five children.

MATERIALS AND METHODS

Study design: A cross-sectional study was undertaken in a metropolitan slum locality of Mumbai. The study was undertaken in the service area linked to Cheeta Camp Urban Health Centre,

affiliated with the Department of Community Medicine, Topiwala National Medical College and B.Y.L. Nair Charitable Hospital, Mumbai. The study was conducted over a period of six months.

Study population: The study population comprised households residing in the selected urban slum area. The respondent from each eligible household was a female aged 18–50 years who was primarily responsible for preparation and distribution of food within the household. Only households having at least one child below five years of age were considered for inclusion.

Inclusion Criteria

Households were included if they fulfilled all the following criteria: the household had a female respondent aged 18–50 years who was mainly responsible for handling food preparation and distribution within the family, the household had at least one child below five years of age, the family had lived in the study locality for at least six months or more and the eligible respondent gave documented informed consent to participate in the investigation.

Exclusion Criteria

Households were not included if the eligible respondent was not willing to participate or did not provide consent. Children below five years of age with chronic medical conditions such as haemoglobinopathies, malignancies, congenital disorders or other chronic illnesses likely to independently affect nutritional status were excluded from the nutritional outcome assessment.

Estimation of sample size

The required sample size was calculated using the standard formula:

$$n = Z^2pq/L^2$$

where Z was considered as 1.96 for a 95% level of confidence, p was assumed to be 77.2% as reported in an earlier Indian study on the prevalence of household food access inadequacy, q was derived as 1 – p and L represented an absolute permissible error of 7%. The calculated sample size was 138.4, which was rounded off to 140 households for the study.

Sampling method

Households were chosen by systematic random sampling. According to the health post records, there were 13,975 houses in the selected study locality. The sampling interval was determined by dividing the total number of listed houses by the estimated sample size: $13,975/140 = 99.8$, which was rounded to 100. The initial household was selected by lottery from the first 100 numbered households. Subsequently, each 100th household was visited to collect the required information.

If a selected house was locked, did not fulfil the inclusion criteria or the eligible respondent refused to participate, the next consecutive house was approached. Subsequent household selection was continued according to the original sampling interval until the predetermined sample of 140 households was reached.

Data collection method

Information was gathered using a prestructured case record form and a standardized interview schedule. The aim of this investigation was clearly described to all eligible respondents and written informed consent was obtained prior to collecting the information. Information was collected regarding sociodemographic and household characteristics, including age, education and occupation of the female respondent, type of family, total number of family members, number of earning members, monthly family income, per capita income, ration card availability and source of ration. Questions related to household food-related practices and coping strategies were also included.

Evaluation of household food access status

Household-level inadequacy in food access was assessed using the Household Food Insecurity Access Scale (HFIAS). The HFIAS consists of nine occurrence-based questions, each accompanied by frequency-related responses, and measures the access component of household food inadequacy. Based on the responses obtained through the HFIAS, households were classified as food secure or as having mild, moderate, or severe food inadequacy. For the analysis of associated factors, households with mild, moderate and severe food access inadequacy were grouped together as food-inadequate households and compared with food-secure households.

Outcome assessment

The selected outcomes assessed in the study were nutritional status among children below five years of age and anaemia among eligible female respondents. Mid-upper arm circumference (MUAC) of under-five children was measured using Shakir's tape. For analysis, MUAC <12 cm was considered suggestive of wasting or acute malnutrition among under-five children.

Haemoglobin estimation was carried out among eligible female respondents using a portable digital haemoglobinometer. Anaemia was defined according to standard cut-off values for adult females; haemoglobin level <12 g/dL was considered anaemia among non-pregnant women. The severity of anaemia was classified as mild, moderate or severe according to standard haemoglobin cut-off criteria.

Data analysis

The collected data were first recorded in Microsoft Excel and subsequently processed using IBM SPSS Statistics version 23. Continuous variables were described using the mean and standard deviation, where appropriate, while categorical variables were presented as numbers and proportions. The relationship between household food insecurity and categorical factors was examined using either Pearson's Chi-square test or Fisher's exact test, depending on the suitability of the data. Statistical significance was defined as a p-value below 0.05.

Ethical approval and consent

Ethical approval was received from the Ethics Committee for Academic Research Projects of Topiwala National Medical College and B.Y.L. Nair Charitable Hospital, Mumbai, before the study was initiated. All adult participants provided documented informed consent prior to enrolment. Participation was voluntary, and confidentiality of all participant information was maintained throughout the research. Households identified as experiencing food insecurity were provided with information regarding locally available food assistance programmes.

RESULTS

A total of 140 households from the selected urban slum area were included in the study. Among the female respondents, 57% were unemployed. Joint families constituted 60% of the study households. Ration cards were available in 67% of households, while 52% reported purchasing food items mainly from retail shops. Among under-five children, 92% were enrolled in Anganwadi services. [Table 1]

Prevalence of household food insecurity

Out of 140 households, 38 (27%) were food adequate, whereas 102 (73%) were food inadequate. Among food-inadequate households, 46 (33%) had mild food inadequacy, 38 (27%) had moderate food inadequacy, and 18 (13%) had severe food inadequacy. Thus, mild food insecurity was the most commonly observed category in the study population. [Table 2, Figure 1]

Determinants of household food insecurity

Education of the female handling food showed a statistically significant relation with household food access inadequacy ($P = 0.008$). Food insecurity was more frequently observed in households where the female respondent was illiterate or had lower educational attainment. Among illiterate females, 39 (27.9%) belonged to food-insecure households, whereas only 7 (5%) belonged to food-secure households. In contrast, among females educated up to higher secondary level and above, 13 (9.3%) belonged to food-insecure households and 14 (10%) belonged to food-secure households. [Table 3]

Type of family was also significantly related with household food inadequacy ($P = 0.002$). Food insecurity was more common among joint families, with 69 (49.3%) food-insecure households, compared with 33 (23.6%) food-insecure households among nuclear families. Total family size showed a statistically significant relation with food inadequacy ($P < 0.001$). Households with more than four members had a higher burden of food inadequacy, with 69 (49.2%) food-insecure households, compared with 33 (23.5%) food-insecure households among families with up to four members. [Table 3]

Ration card availability was significantly related with household food insecurity ($P = 0.008$). Among households with ration cards, 62 (44.2%) were food

inadequate and 32 (22.8%) were food secure. Among households without ration cards, 40 (28.5%) were food insecure and 6 (4.2%) were food secure. Source of ration also showed a statistically significant association with food inadequacy ($P < 0.001$). A higher proportion of food-inadequate households reported obtaining food items from ration shops while a relatively greater proportion of food-secure households reported purchasing from retail shops. [Table 3]

Per capita income showed a significant relation with food insecurity ($P < 0.001$). Food insecurity was highest among households belonging to the lower class, where 69 (49.2%) households had inadequate food access and only 6 (4.28%) were food secure. In contrast, food insecurity was comparatively lower among middle and upper-middle class households. [Table 3]

Outcomes related to household food insecurity

Nutritional and health outcomes varied across households with and without food insecurity. MUAC < 12 cm among under-five children was observed in 81.0% of households experiencing food insecurity, as against 47.3% among households classified as food secure. Similarly, anaemia among female respondents was more frequently observed in food-insecure households with 95% affected, compared with 78.9% among food-secure households. [Table 4, Figure 2]

Overall, the results indicated a substantial burden of household-level food inadequacy in the study population. Lower educational status of the female handling food, joint family type, larger family size, ration card status, source of ration and lower per capita income were substantially related to household food inadequacy. [Table 3]

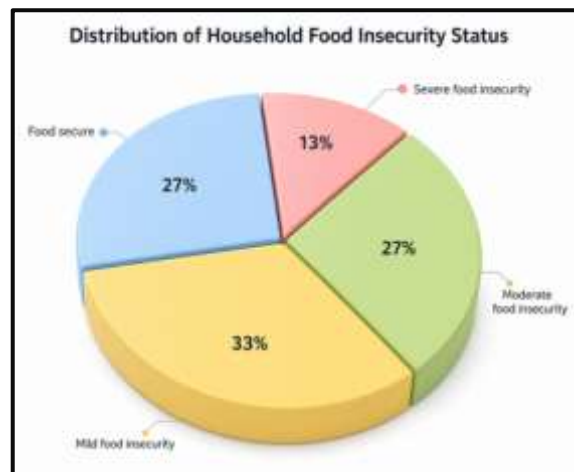


Figure 1: Distribution of household food insecurity status according to HFIAS categories

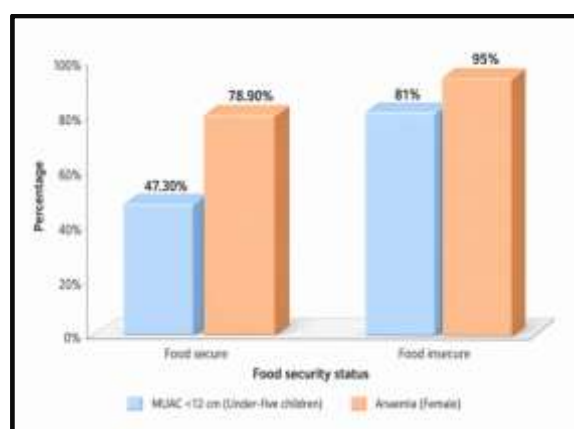


Figure 2: Comparison of MUAC < 12 cm among under-five children and anaemia among females according to household food security status

Table 1: Descriptive Characteristics of Study Households

Characteristic	Frequency/Percentage
Total households studied	140
Female respondents unemployed	57%
Joint family households	60%
Households with ration card	67%
Households purchasing ration mainly from retail shops	52%
Under-five children enrolled in Anganwadi	92%

Table 2: Distribution of Household Food Insecurity Status

Food Insecurity Status	Frequency	Percentage (%)
Food secure	38	27
Mild food insecurity	46	33
Moderate food insecurity	38	27
Severe food insecurity	18	13
Total	140	100

Table 3: Association of Selected Determinants with Household Food Insecurity

Variable	Category	Food Secure n (%)	Food Insecure n (%)	P value
Education of female handling food	Illiterate	7 (5.0)	39 (27.9)	0.008
	Primary education	8 (5.7)	22 (15.7)	
	Secondary education	9 (6.4)	28 (20.0)	
	Higher secondary and above	14 (10.0)	13 (9.3)	
Type of family	Nuclear family	23 (16.4)	33 (23.6)	0.002
	Joint family	15 (10.7)	69 (49.3)	
Total number of members in family	Up to four members	26 (18.5)	33 (23.5)	< 0.001
	More than four members	12 (8.5)	69 (49.2)	
Families with ration card	Yes	32 (22.8)	62 (44.2)	0.008

	No	6 (4.2)	40 (28.5)	
Source of ration	Ration shops	9 (6.5)	58 (41.4)	<0.001
	Retail shops	29 (20.7)	44 (31.4)	
Per capita income	Lower class	6 (4.28)	69 (49.2)	<0.001
	Lower middle class	6 (4.28)	26 (18.5)	
	Middle class	18 (12.8)	4 (2.8)	
	Upper middle class	8 (5.71)	3 (2.1)	

Percentages are calculated using the total sample size (n = 140).

Table 4: Distribution of Household Food Insecurity with Selected Outcomes

Outcome	Food Secure (%)	Food Insecure (%)
MUAC <12 cm among under-five children	47.3	81.0
Anaemia among females	78.9	95.0

DISCUSSION

The present community-based cross-sectional investigation evaluated food insecurity at the household level, its determinants and selected outcomes among households residing in an urban slum of Mumbai. The study found that 72.9% of households were food insecure while 27% were food secure. Among the food-insecure households, mild, moderate and severe food inadequacy were observed in 33%, 27% and 13% of households, respectively. These findings indicated that nearly three-fourths of the study households had some degree of compromised food access.

The prevalence observed in this investigation corroborated the findings of Chinnakali et al. (2014), who reported household-level food insecurity among 77.2% of households among residents of a North Indian urban resettlement community.^[10] This similarity may be attributed to the urban low-income background of both study populations and the use of the Household Food Insecurity Access Scale for assessment. In contrast, Joshi et al. (2019) reported a lower burden of food insecurity, 43%, within households residing in un-notified slums in India.^[11] The difference may be due to variations in study population, sampling method, slum characteristics, access to social support services and operational definitions used for food insecurity.

In this investigation, education of the female handling food showed a statistically significant relationship with household food insecurity. Food access inadequacy was more common among households where the female respondent was illiterate or had lower educational attainment. Chinnakali et al. (2014) also observed that higher education among women showed a relationship with reduced likelihood of household food insecurity.^[10] Education may influence household food budgeting, nutrition awareness, utilisation of welfare schemes and decision-making related to food purchase and distribution. In resource-limited urban slum households, the educational status of the woman responsible for food management may therefore play an important protective role.

Rautela et al. (2020) also assessed household food insecurity in urban India and reported that food insecurity was concentrated among poorer

households and was associated with socioeconomic factors and dietary patterns.^[12] Although the prevalence reported by Rautela et al. (2020) was lower than that observed in the present study, their findings support the role of poverty, education and household-level vulnerability in determining food access in urban settings.^[12] The higher prevalence in the present study may be due to the inclusion of households from an urban slum where livelihood instability, overcrowding and dependence on purchased food may heighten the risk of household food insecurity.

Type of family and family size were also significantly showed a relationship with household food insecurity. Joint families & households with more than four members showed a higher burden of food insecurity. Larger households increase the demand for food and other essential resources and when income is limited or irregular, this may lead to resource dilution and reduced dietary adequacy. Gebremichael et al. (2022), in a systematic review and meta-analysis also reported that larger family size, low educational status, and poor financial circumstances were important factors influencing urban household food insecurity.^[13]

Per capita income showed a strong relation with household food inadequacy in the present investigation. Food insecurity was more frequent among households belonging to lower socioeconomic categories. This finding is expected in urban slum settings where food access largely depends on purchasing power and most households rely on market-purchased food. Narayanan (2015) emphasized that food security in India is closely linked to poverty, access, distribution systems, and the ability of households to obtain adequate and nutritious food.^[6]

Ration card availability and source of ration were also significantly associated with household food insecurity. Although the Public Distribution System serves as an important safety net for low-income households, the presence of a ration card alone may not ensure complete food security if entitlement, quantity, quality, portability or regular access remains inadequate.^[14] The findings highlighted the need for strengthening the linkage of vulnerable slum households with ration benefits and other food assistance programmes.

The present study also assessed selected outcomes related to under-five child nutrition and anaemia among female respondents. MUAC <12 cm among under-five children was more frequently observed in food-inadequate households than in food-adequate households. Similarly, anaemia among female respondents was higher in food-inadequate households. These findings suggested that inadequate household food access may adversely affect child nutritional status and women's health. Food insecurity can reduce dietary diversity, meal frequency and consumption of protein-rich and micronutrient-rich foods.

Das and Krishna (2018), in a investigation conducted in an urban field practice area, reported a significant relation between household food access inadequacy & under-five malnutrition, particularly wasting and undernutrition.^[15] This finding supports the observation in the present study, where MUAC <12 cm among under-five children was more frequent in food-insecure households. Together, these findings suggest that household food insecurity may adversely influence child nutritional status through reduced dietary diversity, inadequate meal frequency and limited access to nutrient-rich foods.

The findings of this investigation had crucial public health effects. Interventions in urban slum communities should not be limited to calorie provision alone, but should also focus on dietary diversity, women's education, livelihood support, ration access and child nutrition services. Households with low per capita income, larger family size, limited female education and HFIAS-based food insecurity should be prioritised for nutritional and social support interventions.

The investigation had certain limitations. Owing to the cross-sectional design of the investigation, causal relationships could not be established between household food insecurity & the factors or outcomes examined. Moreover, because the study was conducted in only one urban slum locality in Mumbai, the applicability of the findings to other urban slum communities may be limited. Food insecurity was evaluated using participant-reported information and may therefore have been subject to recall-related inaccuracies or socially desirable responses. Seasonal fluctuations in food availability and food costs were also not assessed. Despite these constraints, the study generated useful local evidence regarding the extent of household food inadequacy and its relationship with socioeconomic disadvantage & selected dietary indicators in an urban slum community.

CONCLUSION

The present study identified a substantial burden of household food insecurity in an urban slum of Mumbai, with nearly three-fourths of the participating households experiencing some degree

of food access inadequacy. Lower educational status of the female handling food, joint family type, larger family size, absence of ration card, source of ration and low per capita income were important factors associated with household food insecurity. Households with inadequate access also showed a higher proportion of MUAC <12 cm among under-five children and anaemia among female respondents, suggesting that poor household food access may adversely affect child nutritional status and women's health. These findings highlighted the need for strengthening food assistance programmes, improving access to the Public Distribution System, promoting women's education and empowerment and integrating nutrition-focused interventions within urban slum communities.

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