Prevalence of Food Insecurity at Household Level and Its Associated Factors in Rural Puducherry: A Cross-Sectional Study

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Abstract

Background: Malnutrition is a consequence of food insecurity. Food insecurity in India became a public health problem due to explosive population growth and widening gap between rich and poor. It also has a detrimental effect on factors related to health and social well-being of the family. **Objectives:** The study was conducted to determine the prevalence of food insecurity at household level in rural population and factors associated with it. **Subjects and Methods:** A community-based cross-sectional study was conducted among the households of rural Puducherry. The adult females in the households were interviewed with a pretested semi-structured questionnaire in which, along with sociodemographic factors, food insecurity was assessed using the Household Food Insecurity Access Scale. Univariate and multivariate logistic regression analysis was done to identify the factors associated with food insecurity. **Results:** Out of 299 households that were assessed for food insecurity, 31.7% (95% confidence interval [CI]: 26.6–37.4) had food insecurity. Out of 95 households with food insecurity, 51 (17%), 37 (13%), and 7 (2%) had severe, moderate, and mild food insecurity, respectively. In univariate analysis, the presence of children in the family, using below poverty line ration card, and socioeconomic status were significantly associated with food insecurity. In multivariate analysis, socioeconomic status was significantly associated with food insecurity (rate ratio: 3.59; *P* < 0.001 [95% CI: 1.68–7.67]). **Conclusions:** One in three families experienced the food insecurity, and it was more among households with children. It has to be addressed to prevent nutrition-related disorders in community, particularly in children.

Keywords: Determinants, food insecurity, Household Food Insecurity Access Scale, prevalence, rural India

INTRODUCTION

Food security is defined as physical and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life, to all people, at all times. Food insecurity in India became a public health problem due to explosive population growth and widening gap between rich and poor. The Global Hunger Index (GHI) 2017 ranks India at 103 out of 119 countries. India stands in the serious hunger category in GHI 2017.[1] India had made progress in improving the hunger index but far behind from our neighboring countries such as Bangladesh and Sri Lanka.[1] The State of Food Security and Nutrition estimated that around 15% of the Indian population are undernourished, which can be considered as a proxy indicator for food insecurity.[2] GHI 2017 also estimates the increase in the

prevalence of wasting in under-five children in recent years.[1] The disparity in these indicators may be due to variation in subnational level. Variation of stunting from 19% to 48% among the states confirms the subnational level difference in undernutrition and food insecurity.[1]

In adult population, malnutrition affects the productivity and subsequent malnutrition in their dependents.[3] Malnutrition in children affects intelligence, school performance,

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sick absenteeism, and school dropouts.[4-6] In women, malnutrition causes low birth weight and malnutrition of her children.[7] Household-level food insecurity affects the whole family because it has to spend most of its income on obtaining the food. It also causes psychosocial dysfunction in children, sociofamilial problems, and overall poor health status.[8] Finally, it will lead to the vicious cycle of malnutrition, infection, and poverty. It is estimated that around 22% of the population in India are below the poverty line and prone to the vicious cycle.[9] India has reduced the population below the poverty line from 45% to 22% between 1994 and 2012.[10] The prevalence of food insecurity and factors affecting it varies widely in various parts of the country.[11]

The Sustainable Development Goals set the target of 2030 to achieve zero hunger and food security.[12] However, there is a paucity of literature on food insecurity in the general population from India, which can lead us to know the status of the country to achieve this target. There is a need for more studies to understand the national and regional level problem of food insecurity and to formulate the appropriate measures to achieve food security. With this background, the present study was aimed to determine the prevalence of food insecurity at household level in rural population and factors associated with it.

Subjects and Methods

Study design and setting
A community-based cross-sectional study was conducted during the month of September 2017 in the rural field practice area of a medical college in Puducherry.

All residents permanently residing in the four villages were eligible to participate in the study. Adult females who were the decision-makers or cooked the food in the house for more than 5 days a week and belonging to that family for more than 1 month were included as the study participants.

Sample size and sampling method
Considering the expected prevalence of food insecurity as 77%, with a 95% confidence interval, 5% of absolute precision, and 10% of nonresponse rate, the sample size was calculated to be 300.[8]

Totally 2588 households were listed, and all listed households had at least an eligible female respondent. Using systematic random sampling, with sampling interval of 8 and random start number of 5, every eighth household was selected. If the respondent in selected household was not available on the day of visit, they were visited on the next day.

Study tools and variables
An interview was conducted using a semi-structured questionnaire, which had two parts. The first section comprised the sociodemography, including details about the agricultural land owned, if any. The Modified BG Prasad Scale 2017 was used to classify the families into five socioeconomic statuses (SES).[13] Monthly Per Capita Expenditure (MPCE) on health and food was calculated as per the National Sample Survey Organization guidelines.[14] The second part of the questionnaire was to assess the food insecurity. It had 15 questions which are adopted from the Household Food Insecurity Access Scale for Measurement of Food Access developed by the Food and Nutrition Technical Assistance Project.[15] Details were collected regarding the benefits from the Public Distribution System (PDS) and other public food security programs (Antyodaya Anna Yojana, Annapurna Scheme, Mid-Day Meal Scheme, or Anganwadi Services). It was translated into the vernacular language (Tamil) and was cross-checked by back translating to English. It was pretested in a sample of the residents and modified.

Data collection
Data were collected using trained interns under the supervision of resident doctors of the Department of Preventive and Social Medicine. Informed verbal consent was taken from the eligible participant, and data were collected. If any house was locked or subject was busy with household work, the data collectors would revisit the house after enquiring the next available time. If anyone of household members of these households were not available to contact in the second visit, then the next house will be approached. If any house had more than one participant qualified to be a subject, then one of the houses was selected using a lottery method.

Operational definitions
- Food secure: Household encountering only worriedness, that too rarely, for not having enough food[15]
- Mildly food insecure: Worrying sometimes or often for not having sufficient food, and/or unable to eat favored kinds of meals, and/or ate rarely dull monotonous categories of food (e.g., wheat porridge) or those that were disliked[15]
- Moderately food insecure: Consumed sometimes or often dull monotonous categories of food or those that were disliked, and/or rarely or sometimes fed lesser quantity or frequency of meals[15]
- Severely food insecure: Often fed lesser quantity or frequency of meals, and/or even once if food got exhausted or slept starving or hungry throughout the whole day and night.[15]

Statistical analysis
Data were single entered in EpiData version 3.01 software, EpiData Association, Odense, Denmark and the analysis was done using Stata version 14.0, StataCorp LCC, Lakeway Drive College Station, Texas, USA.[16,17] The strength of association of food insecurity with independent categorical variables was expressed using the prevalence rate ratio with a 95% confidence interval. Multiple logistic regression model was used to identify the factors associated with food insecurity. The independent variables with $P < 0.02$ were included in the model. The adjusted odds ratio with a 95% confidence interval was calculated. $P < 0.05$ was considered as statistically significant.

Ethical considerations
Necessary ethical clearance was obtained from the Institutional Review Board. Informed consent was taken before the questionnaire was administered to the study participants.

RESULTS

Out of 309 households contacted, 299 females agreed to participate in the study, with a response rate of 97%. The ten subjects disagreed citing preoccupied commitments as reason.

The median family size was 4 (IQR 3–5). The median household income was Rs. 1500 (IQR 1000–2500) with nearly all households (99%) having an earning member in the family (M = 1, IQR 1–2). Children (<18 years) were there in 24% of households, with a median of 2 per household (IQR 1–3). Out of total households, 59% had below poverty line (BPL) ration cards. Nearly 60% of the households had agriculture land ownership, and 20% had irrigated land, with a median owned land area of 2 cents (IQR 2–3). PDS services were availed by 92%.

The mean (standard deviation) percentage share of food in MPCE was 62 (22). Almost everyone availed food items from the PDS (92%), and 64% of the households availed other food scheme benefits.

The prevalence of food insecurity was found to be 31.7% (95% CI: 26.6–37.4). Out of 95 households with food insecurity, 51 (17%), 37 (13%), and 7 (2%) had severe, moderate, and mild food insecurity, respectively. Among the 71 households which had children, in 3 (4%) households, the children had to skip a meal or eat less due to lack of food at home.

Agricultural land ownership and catastrophic health expenditures were not significantly associated while household with children, SES, ration card, and availing PDS service were found to be significantly associated with food insecurity and were assessed through regression analysis. Food insecurity was significantly associated with SES and found to be more than three times higher among the lower three quintiles [Table 1].

DISCUSSION

The prevalence of food insecurity at household level in a rural population of southern India was found to be 38% (95% CI: 32.4–44.0). Studies done in the urban Indian population by Chinnakali *et al.* and Gopichandran *et al.* showed a higher prevalence of food insecurity (75% and 77.2%), whereas another study done among tribal households in West Bengal showed 53% (19).[8,18,19] Other studies done in America and Iran households also had a higher prevalence of food insecurity (61% and 41%, respectively).[20,21] There are four pillars of food security, availability, and access to food by means of purchasing power, stability of supply to the household by means of economic factors, and food utilization by means of diet quality and diversity. These pillars are again influenced by our food system environment which comprises biophysical (land, climate, energy, water, and biodiversity), socioeconomic (income, markets, and technology), political (government, institutions, and policies) and demographic (age, gender, physical status, activity, lifestyle, and genetic characteristics) environment. All these factors markedly vary between the geographical regions of India and of the world, which explains the reasons behind the wide variation in the prevalence of food insecurity. Furthermore, intervention focusing on food insecurity needs to be region specific and tailored accordingly. Most of the households in our study setting (60%) owned agricultural lands and 92% availed PDS benefits which might be the reason for the lesser prevalence of food insecurity found in the current study. They could cultivate vegetables in their own agricultural lands. Other reasons might be the middle socioeconomic status and the average family size of 4.

The present study found that low-socioeconomic status is a significant determinant of food insecurity even after adjusting for other variables in the multivariate logistic regression model which is similar to other studies.[8,20,21] Lower SES is the main factor that affects all the four pillars of food insecurity.

The present study also found that food insecurity was high among the BPL card holders which are similar to another study done in West Bengal.[19] BPL cards are given by the Government of Puducherry to the households living in poverty based on the 13 indicators of poverty.[22] Hence, the presence of BPL card in the household can be taken as a proxy indicator for low SES. It is also found that food insecurity is three times more among the households which availed PDS services. Although the Puducherry Government is giving 20 kg of boiled rice free of cost to the BPL families, and other low-price essential commodities, the households are at higher risk of having food insecurity.[23] This might be due to the depth and severity of poverty among households. Hence, poverty remains the major issue which needs an immediate focus to improve the health of the Indian community. In the present study, the prevalence of food insecurity was more 1.35 times more among the households with children when compared to the households without children. However, after adjustment, none of these variables came out to be statistically significant except the SES which clearly points out that the lower SES is the main factor affecting food insecurity.

There are few strengths to this study. First, a validated and pretested questionnaire was used. Second, data collectors were well trained, and supervision of the data collection and its validation was done. Third, since this study was done in a rural area, owning agricultural land by the study population and its association with food insecurity is also done. Fourth, probability sampling was done, so the results can be generalized to the reference population.

There are few limitations for this study. First is ecological fallacy, a household which is food insecure does not imply that all its members are food insecure. Hence, the results should be interpreted with caution. Second, information bias because of the social desirability might be there which is minimized by explaining clearly that the data collected were purely for research purpose. Third, the depth of poverty in the household could not be assessed which might affect the food security status.

CONCLUSIONS

One in three families experienced the food insecurity, and it was more among households with children. It has to be

Table 1: Association of sociodemographic factors with food insecurity (*n*=299) on multivariable analysis

Variable	Total	FI present, *n* (%)	Adjusted PR	95% CI	*P*
Children					
Present	71	29 (41)	1.35	0.98-1.87	0.060
Absent	228	66 (29)	1		
SES					
Middle	90	35 (39)	3.59	1.82-7.06	0.001
Lower middle	88	36 (41)	3.16	1.57-6.37	0.001
Lower	29	15 (52)	3.59	1.68-7.67	0.001
Upper and upper middle	92	9 (10)	Ref		
Ration card					
APL	104	19 (18)	Ref		
BPL	175	73 (42)	1.38	0.89-2.14	0.145
None	20	3 (15)	0.57	0.19-1.68	0.312
PDS services availing					
Yes	274	93 (34)	3.15	0.86-11.58	0.083
No	25	2 (8)	Ref		

PR: Prevalence ratio, CI: Confidence interval, PDS: Public Distribution System, APL: Above poverty line, BPL: Below poverty line, SES: Socioeconomic status, FI: Food Insecurity

addressed to prevent nutrition-related disorders in community, particularly in children. There is a need for effective PDS and Food Benefit Schemes concentrating on lower socioeconomic status to address food insecurity. In the long term to achieve sustainable food security, job opportunities should be enhanced for increasing the overall income strata of the rural population.

Conflicts of interest

There are no conflicts of interest.

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