

Original Research Article

Household food security in rural Tamil Nadu: a survey from Kaniyambadi block, Vellore district

Abirami Kailasam, Bharathi Kannan, Eashwar Barath Lochan, Sathya Narayanan K., Sirshendu Chaudhuri*, Venkata Raghava Mohan

Department of Community Health, Christian Medical College, Vellore, Tamil Nadu, India

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***Correspondence:**

Dr. Sirshendu Chaudhuri,

E-mail: sirshendusisu@gmail.com

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ABSTRACT

Background: Adequate and safe food is a basic requirement for every individual. Inadequate food leads to food insecurity. Household-level food insecurity may directly influence the health of an individual. We aimed to assess the prevalence of household-level food insecurity in the rural areas of Kaniyambadi block and to assess the household level determinants of food insecurity.

Methods: A cross-sectional study was conducted in villages of Kaniyambadi block, a rural development block of Vellore district in Tamil Nadu. Households were the unit of study. The interview was conducted with a pre-tested, semi-structured questionnaire in Tamil. 'U.S. Food Security Survey module', September 2012, for a reference period of 30 days was used to determine food security status.

Results: One hundred and fifty households were selected; 15 from each 10 randomly selected villages. Prevalence of food insecurity we got as 52.7% [95% CI: 44.6%, 60.8%]. Determinants like 'low (<1225 INR/ month) per capita income' [Adjusted odds ratio (AOR)- 6.7; 95% CI: 3.3,13.6]; 'presence of debt at the time of interview' [AOR- 3.5; 95% CI:1.7, 7.3] and 'presence of at least one smoker in the family' [AOR- 3.2; 95% CI:1.5, 6.8], were found to be associated significantly with food insecurity, after adjusting for the clusters by multi-level modelling.

Conclusions: Food insecurity is a hidden phenomenon in India. Poverty is the key determinant behind this. To alleviate food insecurity, it will be logical to adopt multi-dimensional approaches with thrust on implementing the existing poverty alleviating programs.

Keywords: Food security, Household, Determinants

INTRODUCTION

Healthy and nutritious food in adequate amounts is a basic requirement of every individual. With the growing number of populations around the globe, it remained a challenge for every country to meet such basic need of the population, mainly so in the low and middle-income countries.¹ When food lacks to meet up the need of the population, the condition is termed as food insecurity. In 1996, the World Food Summit defined food security as "when all people at all times have access to sufficient,

safe, nutritious food to maintain a healthy and active life". Lack of any of the above may lead to the condition of 'food insecurity.'

Food insecurity results in various consequences in public health. Some direct consequences include poor childhood growth and development; high burden of infectious diseases like diarrhoea, respiratory infections, malaria; and poor mental health.^{1,2} Such effects are more prominent among the young children and the women in a household.³ The indirect and long-term effects include

disruption of a family function, social unrest, and poor quality of life with decreased productivity.^{1,2,4} Notably, the poor productivity forces population from the economically weaker section to buy low-quality food that in turn poses them at risk of developing both communicable and non-communicable diseases.^{3,5}

The burden of food insecurity is often confusing due to lack of uniformity in assessment tool. However, Food and Agriculture Organization (FAO) recently estimated the burden through 'Food Insecurity Estimation Scale' which considers access of an individual to both quality and quantity of food.⁶ It estimates that although the condition is quite high in the low and middle-income countries; even the high-income countries (HIC) are not free from the condition. The report estimated that Food insecurity varies between 10.8% in the HICs to 56.5% in the low-income countries (LICs). Roughly one out of three individual suffers from any form of food insecurity in the lower and middle-income countries (LMICs). Additionally, the proxy measures like nutrient deficiencies, and malnutrition among under-five children exist in high burden in different parts of LICs and the LMICs.^{7,8} Food insecurity exists in different parts of India as well.⁹ The burden could be alarmingly high among the vulnerable sections like poor and tribal population.¹⁰⁻¹³

The sustainable development goal envisages ending hunger and achieving food security by the end of 2030.¹⁴ However, due to various reasons like socio-political change and climatic change, this challenge has remained a huge task to overcome.¹⁵ Despite putting various multi-dimensional effort by the country like improvement in the agriculture sector, nutritional supplementation schemes for the children and pregnant women, and delivery of food grains through the public distribution system (PDS); we are yet to see a sizeable change.¹⁶ Therefore, it is crucial to identify the gaps in reducing food security in a big country like India with its wide geo-cultural diversity. In this background, the present study aimed to determine the prevalence of household-level food insecurity in rural areas of Kaniyambadi block and to assess the household level determinants of food insecurity.

METHODS

Study design

Cross sectional study.

Study settings

The study was conducted in villages of Kaniyambadi block, a rural development block of Vellore district in the northern part of Tamil Nadu. The total population of the block is 1,16,241 according to census 2011, mostly residing in rural areas. Majority of the population in this block are working in the unorganized sectors like agriculture and manual labor. The Community Medicine

Department of Christian Medical College (CMC), Vellore serves the area through its' various preventive, promotive and curative health care services.

Ethical consideration

The study was approved by the Institutional Ethical Committee of CMC Vellore. Additionally, we obtained written informed consent from all respondents.

Study period

The survey was conducted during January and February 2015.

Sample size and sampling method

The sample size was calculated by the formula given for proportion $n = \frac{4pq}{d^2}$ where 'p' is the prevalence in similar settings; 'q' is (1-p) and 'd' is the proportion. As there was no study available in this area, we assumed p=0.5, so q=1-p=0.5. With a 20% relative precision and assumed design effect as 1.5, the final sample size was calculated to be 150 households. A two-stage sampling was done. Initially, we selected 10 out of 82 villages by simple random sampling from Kaniyambadi block. All the permanent households in these villages were eligible for the study. Fifteen households were selected from each of the 10 villages by systematic random sampling. The list of households was taken from the updated database of the Community Medicine department. All the households were eligible for the study. Consent refusal was the only exclusion criteria.

Tools and data collection

An interviewer-administered questionnaire in Tamil was applied either to the head of the household or to an adult member of the household and responsible for cooking. Informed consent was obtained from each of the respondents. The questionnaire consists of two components. First, the socio-economic and demographic information, second food security questionnaire which was Tamil translation of 'U.S. Food Security Survey module', September 2012, for a reference period of 30 days.¹⁷

Outcome variable

Food security

From the questionnaire based on U.S. Food Security Survey module, a raw score was generated for food security. The range of raw-score varies between 0 and 18 when at least one child (<18 years) is present; 0 and 10 when no child is present. A lower score indicates higher food security. The score was classified into 'high', 'marginal', 'low', and 'very low' food security based on different cut-offs given for a raw score of households

with and without a child. A raw score of zero indicates high food security; a score of 1-2 indicates marginal food security in both groups. Low food security is indicated by a raw score of 3-7 when a child is present and 3-5 when no child is present. A household with very low food security is indicated by a raw score of 8-18 when a child is present and 6-10 in absence of a child in the household. In this paper, 'food insecurity' has been termed for the lower two categories of food security combinedly.

Statistical analysis

Double data entry was done in 'Epidata version 3.1' (The EpiData Association, Odense, Denmark) and statistical analysis was done in 'SPSS version 20' for Windows (IBM Corp., Armonk, New York, 2010). Prevalence of food insecurity was expressed as a proportion with 95% confidence interval (CI). Kruskal-Wallis test was applied to detect the difference between the clusters. Chi-square test was done to detect differences between proportions.

A multivariate logistic regression model was done to assess the predictor variables. Variables having a p-value <0.2 in univariate analysis were considered for the final regression model. Multi-level modeling (MLM) was done to adjust for the clustering effect by 'Generalised estimating equation' (GEE). A p-value of <0.05 was considered statistically significant in the final regression model.

RESULTS

All the selected households took part in the study. There was no refusal. Table 1 summarizes the household characteristics. Most of the households belong to poor socio-economic status.

Figure 1 illustrates the distribution of food security score in the study villages. Median distribution of the score varies widely among the study villages. The variation is statistically significant ($p < 0.05$) with Kruskal Wallis test.

Table 1: Distribution of the households according to different household characteristics (n=150).

Household characteristics	No. of households N (%)
Type of family	
Nuclear	97 (64.7)
Extended	53 (35.3)
Average number of family members (SD)	4.4 (2.1)
Type of house	
Kuchha	47 (31.3)
Pukka	101 (67.4)
Mixed	2 (1.3)
Religion	
Hindu	131 (87.4)
Muslim	17 (11.3)
Christian	2 (1.3)
Socio-economic status (Modified BG Prasad, 2014) based on per-capita income in INR	
Upper class (≥ 5357)	6 (4.0)
Upper and middle class (2652-5356)	15 (10.0)
Middle class (1570-2651)	32 (21.3)
Lower-middle class (812-1569)	52 (34.7)
Lower class (< 811)	45 (30.0)
No. of households using PDS	128 (85)
Presence of at least one person drinking alcohol* (%)	49 (32.5)
Presence of at least one smoker* (%)	43 (28.5)
No. of households having own land (%)	26 (17)
No. of households having debts (%)	103 (69)

When classified, we found 54 (36%) households in 'high food security' group, 17 (11.3%) households in 'marginal food security' group, 36 (24%) households in 'low food security' group and 43 (28.7%) households in 'very low food security' group. (Figure 2) For the convenience of the analysis, we clubbed 'high' and 'marginal' food security as 'food security' (n=71) while 'low' and 'very low' food security as 'food insecurity' (n=79). Overall

prevalence of food insecurity was 52.7% (95% CI: 44.6%-60.8%).

To identify the various determinants for food insecurity, we performed bivariate analysis followed by multivariate analysis (Table 2) after adjusting for the village level clustering effect by GEE.

Table 2: Univariate and multi-variate analysis for food insecurity.

Variables	Frequency in 'food insecure' group (n=79)	Frequency in 'food secure' group (n=71)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	P value for AOR
	N (%)	N (%)			
Education					
Up to 8 th standard	44 (60.3)	29 (39.7)	1.8 (1.0- 3.5)	1.4 (0.6-3.5)	0.4
>8 th standard	35 (45.5)	42 (54.5)			
Per capita income					
<1225 INR	56 (74.7)	19 (25.3)	6.7 (3.3-13.6)	9.1 (3.3-24.6)	<0.001
≥1225 INR	23 (30.7)	52 (69.3)			
Presence of debt at the time of interview					
Yes	64 (62.1)	39 (37.9)	3.5 (1.7-7.3)	2.9 (1.1- 7.7)	0.03
No	15 (31.9)	32 (68.1)			
At least one smoker in the household					
Yes	31 (72.1)	12 (27.9)	3.2 (1.5- 6.8)	4.5 (1.6-13.1)	0.006
No	48 (44.9)	59 (45.1)			
Nuclear family					
Yes	56 (57.7)	41 (42.3)	1.8 (0.9- 3.5)	2.5 (1.0- 6.7)	0.06
No	23 (43.4)	30 (56.6)			
High average monthly health expenditure-income ratio (HEI)					
Yes (>10%)	48 (70.6)	20 (29.6)	4 (2.0- 7.8)	1.8 (0.7-4.8)	0.2
No (≤10%)	31 (37.8)	51 (62.2)			
Possession of any land					
Yes	9 (34.6)	17 (65.4)	0.4 (0.2-1.0)	0.3 (0.1-1.1)	0.07
No	70 (56.5)	54 (43.5)			

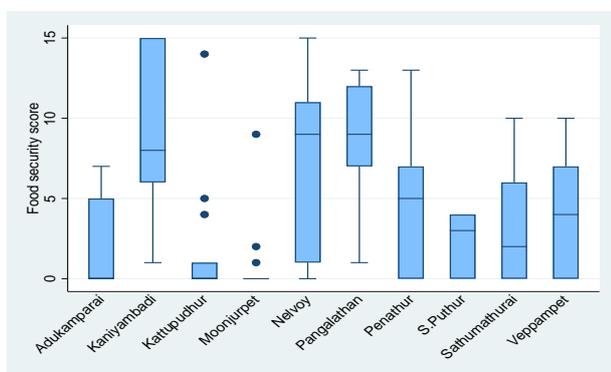


Figure 1: Distribution of food security score in different clusters.

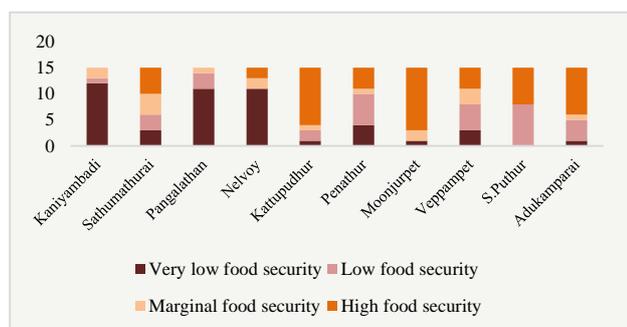


Figure 2: Category-wise distribution of food security in different clusters.

We found, economic status in the form of per-capita income as a strong factor behind food insecurity. Food insecurity (high score) decreases with increase in income. Per-capita income explains 30% of the variability of the food security score (Figure 3). The following variables didn't show any significance in univariate analysis. Presence of at least one alcoholic in the family (OR-1.7; 95% CI-0.8, 3.4); presence of a child (<14 years) in the family (OR-1.3; 95% CI-0.6, 2.8), and using ration (PDS) (OR- 1.4; 95% CI- 0.5, 4.0).

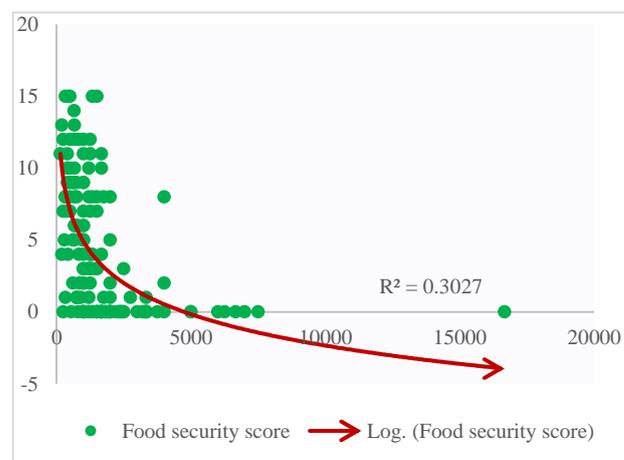


Figure 3: Relationship with household food security score with per-capita income.

DISCUSSION

The present study examined the food security in the rural areas of a better performing state in India. In our present study, we estimated that roughly half of the households suffered from food insecurity in previous one-month duration. However, the estimate varies widely across the clusters. Although, we observed similar estimates in a few studies from different parts of the country; prevalence varies in other settings across the country and found to be as low as 21% to as high as 77%.^{11-13,18,19} The variation could be due to the difference in overall socio-economic differences between the clusters. Geographical variation across the countries has been observed by a large study across 134 countries.⁶ The study identified that the geographical variation of food insecurity had a clear relation with the overall development of the countries. The same study identified that roughly one-fourth of the population are affected with food insecurity across the globe. The proportion increases to one-third for the LMICs. Additional 12.5% suffered from severe food insecurity from these countries. In addition, difference in food security assessment tool could be the other reason for such wide variation of the estimate.

Poor economic condition is the major trigger for food insecurity. We found 'per capita income' and 'presence of debt' in monetary form is the two determinants which are strongly associated with food insecurity. This evidence is supported by the findings from the other studies in India.^{11,19,20} Poor income renders people to buy low quality and inadequate food. In our study, we observed that a large proportion of the households with low income, spend almost the full income towards health issues and buying foods. Possibly this renders them to lend money leaving the family vulnerable for food insecurity further. Rammohan et al in their large study in rural India, found similar findings.¹⁹ In the present study, most of the head of the households are involved in jobs with irregular income. This factor can change the food security status from time to time. We observed that more than two-thirds of the households were burdened with debts at the time of the study. This factor, together with irregular income can worsen the food security status further. Study from urban part of Vellore also showed a similar trend.²¹

Our study indicates that smoking and alcohol consumption have a direct relationship with food security status of a household. Both can lead to a significant diversion of family income towards meeting the expense of buying these substances and thereby affecting the ability to buy adequate food. This is especially evident for the households belong to the lower socio-economic groups.²²

Although high health expenditure was not significantly associated with food insecurity, Berkowitz et al found high food insecurity among households with higher episodes of illnesses required to visit the emergency

department or with higher rates of hospitalization.²³ High out of pocket expenditure can increase the chance of development of a vicious cycle where more expenditure in illnesses increases the chance of poverty and therefore decreasing the opportunity to buy adequate and quality food which again renders the family to face a higher chance of poor health condition.

We noticed the nuclear families have a greater tendency to develop food insecurity as compared to extended families. However, community-based studies from other parts of India showed contradictory finding.¹¹ Importantly, we found to have higher food insecurity among household with lands in comparison to those who do not. This could be due to the usual dry weather in this area resulting in decreased food production. The effect of climatic change over food production in this region over the past decade has been studied extensively and showed a declining trend in rice and sorghum production.²⁴ The present study looked for household food security for a period of one month. Therefore, we couldn't capture the trend of food insecurity over different climatic conditions. Although climatic change can determine food security status, it also depends on the overall socio-economic development in that region.²⁵ Average land size and usage for cultivation would have given a better understanding. However, the present study didn't capture that information. PDS is safety net for poor people to combat against food insecurity. In our study, though we didn't get a significant association between non-usage of PDS and food insecurity, yet it seems to be an important determinant as found in another study from the urban areas of the same district.²⁶

CONCLUSION

Food insecurity in India is a hidden issue and demands an urgent attempt to address it from a multidimensional angle. A household should have either ability to produce own food or purchasing ability from the market or should get from the government's food transfer system. Poverty is the most important determinant factor behind it. Provision and implementation of sustainable employment opportunities like 'The Mahatma Gandhi National Rural Employment Guarantee Act' (MGNREGA) can ensure economic stability. Regularising and monitoring PDS; mid-day meal schemes in schools and Integrated Child Development Schemes (ICDS) can lead to partial fulfillment of the daily food requirement. Other safety nets like the proper implementation of National Rural Health Mission (NRHM) can reduce the out of pocket expenditure and improved health status. Therefore, adequate food security governance with multi-sectoral participatory decision making, better accountability and efficient resource allocation can lead us to become a food secured country.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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