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Nutrient gaps and hunger realities in marginalized coastal communities: A study from Kuzhuppilly Panchayath, Kerala

[1]Dr. Shilpa Jose, [2]Dr. Seeja Thomachan Panjikkaran, [3]Dr. Blossom KL, [4]Megha S Karthikeyan and [5]Shoji JoyEdison

[1]Associate Professor, Department of Home Science and Centre for Research, St. Teresa's College (Autonomous), Ernakulam, Kerala, India

[2]Associate Professor and Head, Department of Community Science, College of Agriculture, Vellanikkara, Kerala, India

[3]Assistant Professor, Department of Fish Processing Technology, Kerala University of Fisheries and Ocean Studies, Panangad, Kerala, India

[4]Research Assistant, Department of Home Science and Centre for Research, St. Teresa's College (Autonomous), Ernakulam, Kerala, India

[5]Subject Matter Specialist (Horticulture), ICAR-Krishi Vigyan Kendra, Ernakulam, Kerala, India

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Corresponding Author: Dr Shilpa Jose

Abstract

The present study investigates the interrelationship between socioeconomic status, food security, and dietary adequacy among Below Poverty Line (BPL) households in Kuzhuppilly Panchayath, a coastal village in Kerala. A total of 200 households were surveyed to assess their socioeconomic status using the updated Kuppuswamy scale (2023) and food security status using the USDA Household Food Security Survey Module. Findings revealed that 71% of households belonged to the Upper Lower class, 22% to the Lower Middle class, and 5.5% to the Lower class, indicating a significant concentration in economically disadvantaged categories. No families were classified in the Upper class. Food security data showed that while 63.5% of families were food secure, 36.5% experienced food insecurity, including 27% with food insecurity without hunger, 7.5% with moderate hunger, and 4.5% with severe hunger. Severe food insecurity was notably higher among households without children (5.1%) compared to those with children (0.97%), possibly reflecting disparities in welfare coverage. To evaluate nutritional adequacy, dietary intake data of 40 women were analyzed against ICMR (2020) RDA for sedentary women using one-sample t-tests. The results revealed that while protein (104.2%), total fat (129.8%), folate (78.05%), vitamin B12 (181.5%), and selenium (100.4%) intake were adequate or above RDA levels, significant deficits were found in energy (72.7%), iron (59.6%), calcium (14.3%), dietary fibre (67.3%), and zinc (49.5%) ($p<0.01$), highlighting prevalent micronutrient inadequacy. Despite residing in an agriculturally rich region, a substantial proportion of the population continues to experience both caloric and nutrient deficits, indicating that food availability does not translate to nutritional adequacy. These findings highlight a strong correlation between low socioeconomic status and poor nutritional outcomes, underscoring the need for integrated public health interventions. Policy efforts should focus on improving livelihood opportunities, expanding food-based welfare schemes, and enhancing community-level nutritional education to address the dual burden of under nutrition and hidden hunger in vulnerable coastal populations.

Keywords: Socioeconomic status, food security, nutrient intake, coastal households, Kuppuswamy scale, Micronutrient deficiency, Below Poverty Line (BPL)

Introduction

Food security is a vital pillar of public health and sustainable development, intricately connected to nutrition, economic resilience, and overall well-being. According to the Food and Agriculture Organization (FAO, 1996) [4], food security exists when all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs for an active and healthy life. Despite notable strides at global and national levels, food insecurity remains a pressing concern, especially in developing nations. In 2022, nearly 2.4 billion people approximately 29.6% of the global population faced moderate to severe food insecurity, with around 900 million enduring severe food deprivation (FAO, 2023) [6].

In India, food insecurity is particularly pronounced among socioeconomically disadvantaged groups such as those residing in rural and coastal areas. These regions often face compounded challenges including dependence on informal livelihoods, environmental risks, and poor access to health and nutrition services. Coastal communities, for instance, grapple with declining natural resources, seasonal unemployment, and increased vulnerability to climate change (FAO, 2006) [5]. Although Kerala is often lauded for its favorable health and development indicators, marginalized sections like Below Poverty Line (BPL) households continue to experience significant food and nutrition insecurity.

Food security is not solely a function of food availability or

access, but also hinges critically on dietary quality and nutrient adequacy. A growing body of literature has emphasized the concept of dietary diversity as a proxy for micronutrient adequacy in the diet. Arimond *et al*. (2011) [1] highlighted that increased consumption of diverse food groups enhances the likelihood of meeting essential nutrient requirements and contributes to improved nutritional outcomes. Inadequate dietary diversity is often correlated with insufficient intake of energy, protein, iron, calcium, and vitamins, resulting in both overt and hidden forms of malnutrition, particularly among economically vulnerable populations.

Given this context, the present study was carried out in Kuzhuppilly Panchayath, a coastal area in Ernakulam district of Kerala, with the objective of assessing the socioeconomic status, food security conditions, and dietary adequacy of BPL families. Standardized tools such as the Modified Kuppuswamy Scale (2023), the USDA Household Food Security Survey Module, the MSSRF Food Security Index, and a 24-hour dietary recall method were employed to provide a comprehensive understanding of the multidimensional nature of food insecurity. The study aims to inform targeted interventions that can enhance food access, improve dietary diversity, and ultimately support better health outcomes in coastal communities living in poverty.

Methodology

The present study was conducted between February and June 2025 among 200 Below Poverty Line (BPL) households in Kuzhuppilly Panchayath, located in Ernakulam district, Kerala. The study employed a multistage stratified random sampling technique to ensure representative selection of the study population. In the first stage, two coastal blocks were randomly selected from the district. From each selected block, one panchayat was chosen through random sampling. Subsequently, two wards were randomly selected from each panchayat, resulting in a total of four wards per district. Within these wards, 200 families belonging to the BPL category were identified using official records maintained by the respective Taluk Rationing Officer, ensuring the sample consisted of economically disadvantaged households. The socioeconomic status (SES) of these families was assessed using the modified Kuppuswamy scale (2023), which incorporates parameters such as education, occupation, and income to classify households into different socioeconomic categories, thus providing a standardized measure of economic standing.

Food security status was evaluated through a comprehensive approach addressing three key dimensions: access, availability, and absorption of food resources, as outlined by the M.S. Swaminathan Research Foundation (MSSRF). To achieve this, two validated and widely accepted instruments were utilized: a modified version of the United States Department of Agriculture (USDA) Household Food Security Survey Module (2000) and the Food Security Index developed by MSSRF (2008). These tools provided a reliable assessment of the prevalence and severity of food insecurity at the household level. In addition, dietary intake assessment was carried out using the 24-hour dietary recall method. A subsample of 40 women in the age group of 21-35 years was randomly selected from the BPL households, and their actual intake of energy and key nutrients was assessed. Data collection was conducted through structured interviews with heads of households or primary caregivers, ensuring consistency and accuracy in responses. This robust methodology allowed for an in-depth understanding of the socioeconomic and dietary factors influencing food security among marginalized coastal families in Kerala.

Statistical analysis

The collected data were analysed using descriptive statistics, including frequencies and percentages, to summarize the socioeconomic status of families based on the modified Kuppuswamy scale and their food security status using the USDA Household Food Security Survey Module. In addition, a one-sample t-test was used to compare the actual intake of nutrients among the subsample of women with the recommended dietary allowances, thereby identifying any significant differences in nutrient intake. All data were analysed using Microsoft Excel 2019.

Results

Based on the findings using the updated Kuppuswamy Socioeconomic Status (SES) scale (2023), the majority of the 200 surveyed families belonged to the lower socioeconomic categories. Specifically, 71% of households were classified in the Upper Lower class, indicating limited access to consistent income, education, and skilled employment. The Lower Middle class accounted for 22%, while only 1.5% of families fell within the Upper Middle class. No households were classified under the Upper class, and 5.5% were in the Lower class (score <5), reflecting acute economic vulnerability. This distribution underscores widespread deprivation, which may constrain access to essential services such as healthcare, housing, and especially adequate nutrition.

Food security assessment, using the USDA Household Food Security Survey Module (2000), revealed that 63.5% of families were food secure, whereas 36.5% experienced varying degrees of food insecurity. Among them, 27% were food insecure without hunger, indicating concerns over food quality or availability. Moderate hunger was reported by 6.5%, and 3% of families experienced severe hunger characterized by disrupted eating patterns and potential health risks. Despite residing in an agriculturally rich coastal region, the persistence of food insecurity in over one-third of households points to underlying access and utilization barriers.Further analysis revealed a higher prevalence of severe hunger among households without children (5.1%) compared to those with children (0.97%), possibly due to government programs prioritizing child-bearing households. These findings highlight a strong association between low socioeconomic status and vulnerability to food insecurity, underscoring the need for targeted interventions such as income support, food supplementation, and community-based outreach.

In addition to household-level assessments, nutrient intake was evaluated among a subsample of 40 women aged 21-35 years using the 24-hour dietary recall method. Nutrient intakes were compared with the Recommended Dietary Allowances (RDA) for sedentary women (ICMR, 2020) using one-sample t-tests.The results revealed significant

inadequacies in the intake of several micronutrients. Intakes of energy (72.7%), calcium (14.3%), iron (59.6%), dietary fibre (67.3%), zinc (49.5%), and folate (78.05%) were significantly lower than the respective RDAs. Calcium deficiency was particularly marked, with mean intake meeting only 14.3% of the recommended amount ($p < 0.001$). Conversely, intakes of protein, fat, and vitamin B12 exceeded the RDA, with protein intake being significantly higher ($p < 0.001$). Intakes of carbohydrates, vitamin A, vitamin D, and selenium did not differ significantly from the RDA.

These findings indicate an imbalanced dietary pattern, characterized by excess intake of some nutrients and deficits in others, particularly critical micronutrients. This nutritional inadequacy among women of reproductive age in socioeconomically disadvantaged coastal households highlights the need for comprehensive nutrition interventions, including dietary diversification, supplementation, and behavior change communication.

Table 1: Socio economic status of the families (N=200)

Socioeconomic class (Score)	Families
Lower (<5)	11 (5.5)
Upper Lower (5-10)	142 (71)
Lower Middle (11-15)	44 (22)
Upper Middle (16-25)	3 (1.5)
Upper (26-29)	0 (0)
Total	200 (100)

(Figures in parenthesis are percentage)
(Kuppuswamy's updated SES scale,2023)

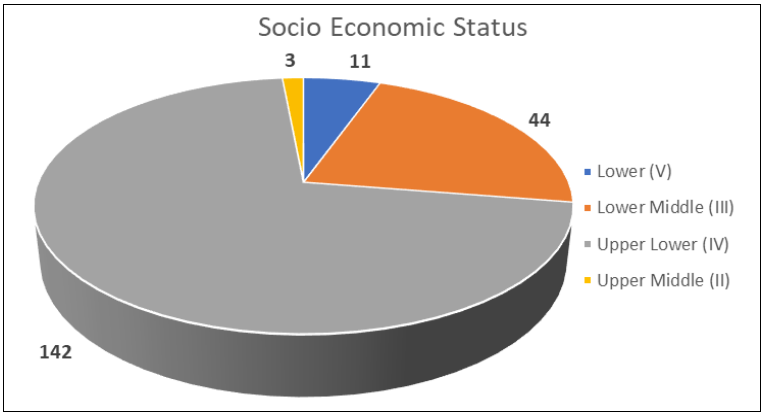

Fig 1: Socio economic status of the families (N=200)

Table 2: Distribution of families according to food security status (N = 200)

Food security status	Code value	Number of families		Total
		With Children	Without Children	
Food secure	0	67 (65.04)	60 (61.8)	127 (63.5)
Food insecure without hunger	1	28(27.1)	26 (26.8)	54 (27)
Food insecure with moderate hunger	2	7 (6.7)	6 (6.1)	13(6.5)
Food insecure with severe hunger	3	1(0.97)	5 (5.1)	6(3)
Total		103 (100)	97 (100)	200 (100)

Figures in parenthesis are percentage

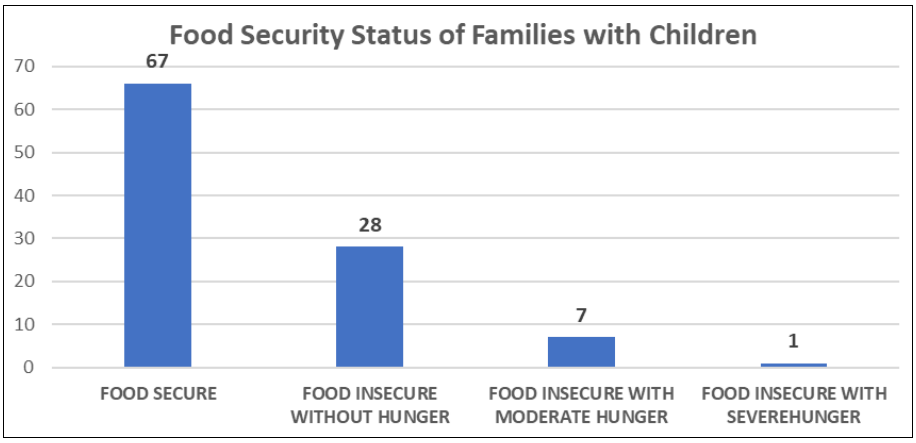

Fig 2: Food security status of familes with children (N-103)

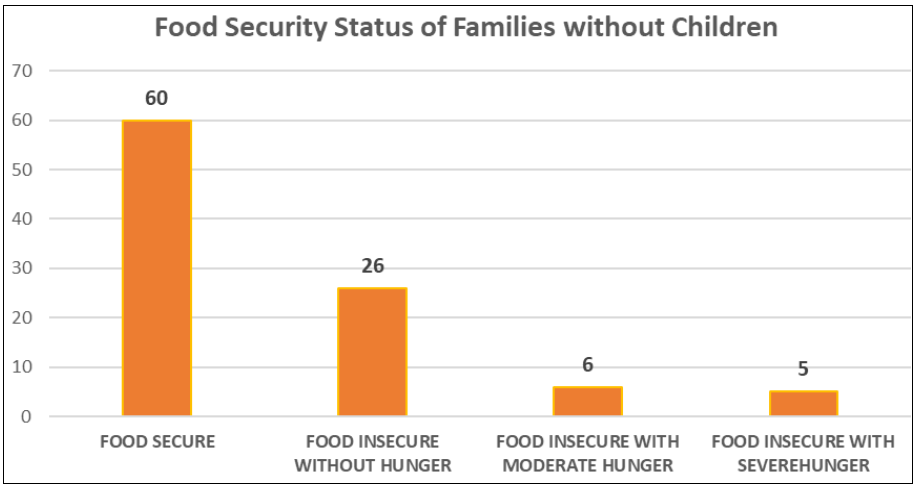

Fig 3: Food security status of familes without children (n-97)

Table 4: Actual nutrient intake of women (21-35 years) (n=40)

Nutrients	RDA	Mean nutrient intake	SE	t value	%of RDA met from diet
Energy (Kcal)	1660	1208.04	51.81	-8.723***	72.7
Protein (g)	36	37.5	0.25	5.93***	104.2
Carbohydrate (g)	267	270.19	51.50	0.062 NS	101.1
Total Fat (g)	20	25.97	2.33	2.564*	129.8
Iron (mg)	15	8.94	2.62	-2.308*	59.6
Calcium (mg)	800	143.51	12.32	-69.48***	14.3
Total Dietary Fibre (g)	30	20.20	1.13	-8.655***	67.3
Zinc (mg)	11	5.45	0.61	-9.548***	49.5
Selenium (mcg)	40	40.17	3.10	1.12 NS	100.4
Total Folates (mcg)	180	140.5	6.33	-5.85***	78.05
Vitamin B12 (µg)	2	3.63	2.68	0.61 NS	181.5
Vitamin D(IU)	400	366.47	321.44	-0.845 NS	91.6
Vitamin A (mcg))	390	376.50	91.20	0.949 NS	96.5

** significant at 1%,NS-Non significant, ICMR 2020 for sedentary women, SE-Standard error

Discussion

The present study sheds light on the ongoing problem of food insecurity among Below Poverty Line (BPL) households in coastal Kerala. Despite 63.5% of the surveyed households being food secure, 36.5% faced varying degrees of food insecurity 27% experienced food insecurity without hunger, 6.5% with moderate hunger, and 3% with severe hunger. This indicates that a substantial share of the coastal poor continue to face challenges in accessing adequate and nutritious food on a regular basis.

The findings are consistent with similar studies conducted in coastal regions of other countries. Utami and Mamilianti (2021) [12] reported that 43.3% of households in Indonesian fishing communities faced food shortages, driven by factors such as income instability and lack of nutritional awareness both of which are evident in our study population. Yin *et al*. (2022) [13] highlighted that nutrient inadequacy persists even when calorie intake appears sufficient. This supports our observation that food insecurity without hunger may still reflect diets lacking in quality and diversity. Dietary diversity plays a critical role in ensuring adequate intake of essential nutrients. Arimond *et al*. (2011) [1] emphasized that a more varied diet is closely linked with improved micronutrient status. In our study, many food-insecure households were found to have poor variety of food groups especially fruits and vegetables, further confirming that food security must be measured not only in terms of quantity but also quality.

Interestingly, households without children were more likely to experience severe hunger. This could be due to the structure of government welfare programs. Also, families without children often consist only of elderly members and lack active earning members, which leads to food insecurity, which often prioritize families with children for food-based support. Although previous studies (e.g., Croome *et al*., 2007) [2] have shown that families with young children are often at greater risk, our findings suggest that in Kerala, child-inclusive households may be better supported through existing schemes such as ICDS, school meals, and ration benefits.

Our results also resonate with earlier Indian studies. Prema (2001) [9] and Devadarshini & Chhotaray (2013) [3] noted high levels of food insecurity among informal workers and landless laborers in coastal areas. In our study, most households fell into the Upper Lower and Lower Middle classes per the modified Kuppuswamy scale, reflecting limited economic mobility. Retheesh *et al* (2021) [11] also observed that lower-income groups in Kerala consume diets dominated by cereals, with low dietary diversity, a pattern reflected here as well.

In conclusion, food insecurity in coastal Kerala remains a multidimensional issue, influenced by income, employment patterns, household structure, and nutritional awareness. While welfare schemes have improved access for some groups, gaps remain, particularly among households without earing adult population. Addressing these issues requires an

integrated approach that includes income-generation programs, community-based nutrition education, and expansion of inclusive food assistance programs targeting all vulnerable households.

Conclusion

The present study underscores the intricate relationship between socioeconomic status and food security among Below Poverty Line (BPL) households in Kuzhuppilly Panchayath, a coastal region of Kerala. The findings reveal a stark concentration of households in the lower socioeconomic strata, with 71% categorized under the Upper Lower class, reflecting widespread economic hardship. While a majority (63.5%) of households were food secure, over one-third experienced varying degrees of food insecurity, including moderate and severe hunger. Severe food insecurity was more prevalent among childless households, suggesting possible gaps in access to targeted welfare programs. Moreover, dietary assessments among women aged 21-35 years exposed significant deficiencies in critical nutrients such as calcium, iron, zinc, dietary fibre, and energy. Despite adequate or excessive intake of macronutrients like protein and fat, the insufficient intake of essential micronutrients highlights a concerning nutritional imbalance that may have long-term health implications.

These findings call for comprehensive, multi-sectoral interventions that address both economic and nutritional vulnerabilities. Enhancing livelihood opportunities, expanding the reach of nutrition-sensitive social protection schemes, and promoting dietary diversification through community-based nutrition education are essential strategies. Tailored policies that prioritize vulnerable coastal populations particularly women of reproductive age are vital to improving food security and overall well-being in such marginalized communities.

Conflict of Interest

The author declares there are no conflicts of interest.

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