European Economic Letters
ISSN 2323-5233
Vol 13, Issue 5 (2023)
http://eelet.org.uk

Exploring the Depths: Understanding the Association between Mental Health and Food Insecurity among Nicobar Islands' Tribal Community

[1]S. Naveen, [2]Jayanta Kumar Parida, [3]Itishree Panda, [4]M. Sampath Nagi
[1]Research Scholar (Sociology), School of Social, Financial and Human Sciences,
KIIT Deemed to be University, Bhubaneswar-751024, Odisha, India.
Email: snaveenkiit@gmail.com
[2]Director, School of Social, Financial and Human Sciences,
KIIT Deemed to be University, Bhubaneswar-751024, Odisha, India.
Email: jayantakp123@gmail.com
[3]Research Scholar (Sociology), School of Social, Financial and Human Sciences,
KIIT Deemed to be University, Bhubaneswar-751024, Odisha, India.
Email: itishreepanda033@gmail.com
[4]Assistant Professor, Department of Management,
Pondicherry University, Port Blair Campus, A&N Islands-744103, India.
Email: sampathnagi@gmail.com

Abstract
Organizations and governments aim to support communities by investigating the possible like between health and Insufficient food availability. In our recent study, conducted in the Nicobar Islands, we focused on the association between mental health (MH) and food insecurity (FI) among tribal populations in this specific region of India. Primary data were collected in collaboration with the Health Services Department on the island of Nicobar from 150 respondents aged 20 years and above, who were diagnosed with cardiovascular diseases. The data analysis included a measure of FI and measures to understand MH factors (mood disorders, psychological anxiety, and psychotic disorders). The results indicated that 74.1% of the total sample studied experienced FI. The study of their demographic characteristics showed a correlation between FI and age, where the phenomenon was more prevalent among younger age groups in the study. FI was also found to be associated with mood disorders and psychological anxiety. One key conclusion among many obtained is that individuals experiencing FI need to be identified and treated for their MH, especially among the younger age groups in the population. In addition, a set of specific interventions to support food security should be implemented as a means to address and improve MH.

Keywords: Food insecurity, Health, Mental, Tribal, Nicobar.

1. Introduction

It could be argued that the global food crisis may well be the crisis of the 21st century. While humanity has suffered from pandemics in past centuries that have led to the deaths of millions of people, food shortages may be the hallmark of this century Approximately 800 million individuals worldwide are believed to be suffering from hunger, meaning that approximately one out of ten people does not have enough food to enjoy good health and a decent life (Action Against Hunger, 2020). Among the main causes of hunger are natural disasters, conflicts, poverty, and environmental degradation. In recent times, the confluence of financial and economic crises has resulted in more individuals falling into the trap of hunger.

Millions of people around the world are living in harsh conditions of poverty, hunger, and disease, making poverty the most devastating epidemic in the world today. It is not surprising, therefore, that the United Nations has made the eradication of poverty and hunger a pivotal target of its Millennium Development Goals (MDGs).

Food shortage is, in fact, the primary threat to human health worldwide, surpassing the combined dangers of AIDS, malaria, and tuberculosis. The impact of hunger is not limited to individuals, but also imposes a substantial economic burden on developing nations. Therefore, every child suffering from physical and mental growth impairment may be due to hunger and malnutrition.

As per the Food and Agriculture Organization of the United Nations (FAO) definition, FI refers to the insufficient physical and social means to access adequate food that meets an individual's dietary requirements and preferences (Cafiero et al., 2018; Jaron & Galal, 2009) This issue arises from a range of factors, including a poor education infrastructure, lack of communication with other communities, and limited economic development, which collectively contribute to an individual's FI. Communities that are marginalized or geographically separated and possess distinct traditions and cultures

from the dominant society are more prone to FI compared to the majority population (Power, 2008; Restrepo-Arango et al., 2018). This may be due to their limited access to resources or restricted access resulting from their social identity, which differs from the mainstream of society (Gracey & King, 2009; Skinner et al., 2016; Walch et al., 2018).
This study contributes significant information to the literature on a tribal community, specifically regarding their food security and MH. These findings fill a gap in research that serves as a foundational cornerstone for future investigations on this topic. Dealing with members of this community can pose a significant obstacle for any research in this region. Despite this challenge, the researcher was able to collect data due to their affiliation with the island and the various approvals obtained from official authorities in the area, in addition to the significant cooperation received from the study participants.

2. Methodology

2.1. Support agencies

The study was conducted in partnership with the Department of Health Services (DHS), Tribal Council, Car Nicobar, on the island of Nicobar, where the DHS has an integrated infrastructure of primary, urban, and community health centers, in addition to a district hospital. The department plays a crucial role in providing healthcare services in the region. Its mission includes monitoring the subsidiary health centers and hospitals that serve indigenous populations in various parts of the island. As a preliminary step in the researcher's relationship with the Department of Health Services, primary data was collected with the department's approval, and this may expand to include future research. The researcher obtained initial approval for publication of the research following the collection of primary data and discussion with the community and first captain of that community. The tribal council's opinion was sought on many topics related to the research, such as the issue of FI and its determinants. The tribal council serves as a link between the local administration and the communities on the island of Nicobar.

2.2. Population and profile

The Andaman & Nicobar Islands are a homeland to several indigenous communities, including the Great Andamanese, Onge, Jarawa, Sentinelese, Shompen and Nicobarese. These communities are considered to be the first Palaeolithic colonizers of South-East Asia, according to (Thangaraj et al, 2003), these tribes are largely isolated compared to any tribal population around the world. The Census of 2011 reported that the total number of tribes on these islands is approximately 28,077 people, with the Nicobarese accounting for 97 percent of the population, so the study was conducted in the Car Nicobar (Nicobar district), as the study population is highest in this island with population of 17168 Nicobarese tribes. They have been living in the island forests for centuries, relying on hunting and gathering for sustenance, and appear to have lived in significant isolation for thousands of years. They now rely on support from the Indian government to survive and the majority have taken up some agriculture and its allied activities. Currently, some agriculture is being practiced especially coconut plantation and some domesticated animal farms for Goats & pig have been established. All study participants provided verbal consent, were qualified to participate, and were adults aged 20 years or older. No incentives were provided, and all conditions for unbiased data collection were met during the survey.

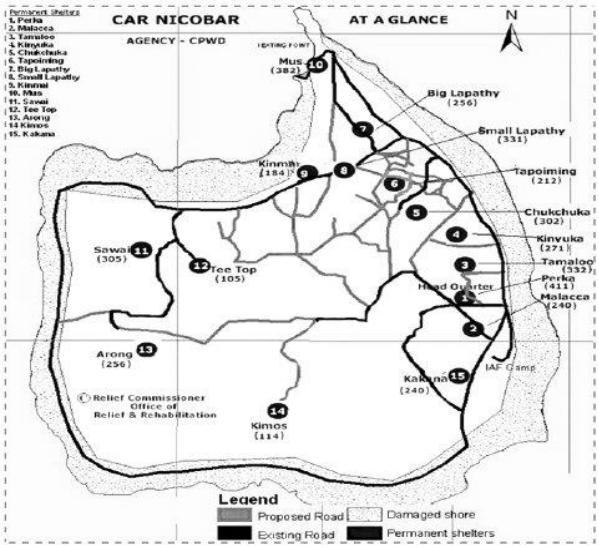

Figure 2: Study area.

2.3. Sampling

Due to the difficulty in sampling and the lack of a regular census of the study population, it was not possible to determine a sampling frame. Individuals from the community were invited to participate in this research within the local health clinic, for those who wished to do so after being provided with an explanation of the study. Following an explanation of the research's nature, community members were enrolled, and their verbal consent was secured. Data collection was organized within the centers with the assistance of members of the same community. The individuals who were recruited volunteered to work with the researcher for a full week and speak to the sample in the local language. Daily evening meetings were announced by the health centers, and individuals were invited to attend. However, a number of individuals who initially provided their consent declined to participate in the survey after arriving at the health center.

2.4. Data collection

The primary data was collected after printing paper questionnaires which were developed to include topics related to cardiovascular diseases for individuals over 20 years old. The questions were written in the local language and the answers were later translated into English. The community volunteers were trained on how to ask the questions, and the researcher checked the completion of the questionnaire and clarified some questions when necessary. After completing the registration, A secure computer database was used to input the data, which was subsequently analyzed.

2.5. Food insecurity (FI)

By conducting comprehensive research on the existence of a scale of FI, it was found that Bickel et al., (2000) has developed this scale. The food security section of the questionnaire was divided into two parts. The first part was related to household income to determine which individuals were below the poverty line, within the poverty line, or above it. The second part was related to the circumstances associated with FI. After analyzing the data, the researcher obtained a score between Zero and 10. Households were categorized based on the format presented in Figure 1, following the guidelines provided by the United States Department of Agriculture. To assess the reliability of the scale, the Cronbach's alpha test was implemented, producing a value of 0.87. Positive correlation coefficients were found between 0.40 and 0.78. Individuals who exhibited a negative response were assigned a score of zero, Thus, indicating FI is expressed in the highest degree. Those scoring between zero and one were considered to have food security, while individuals receiving two or more points were classified as experiencing FI.

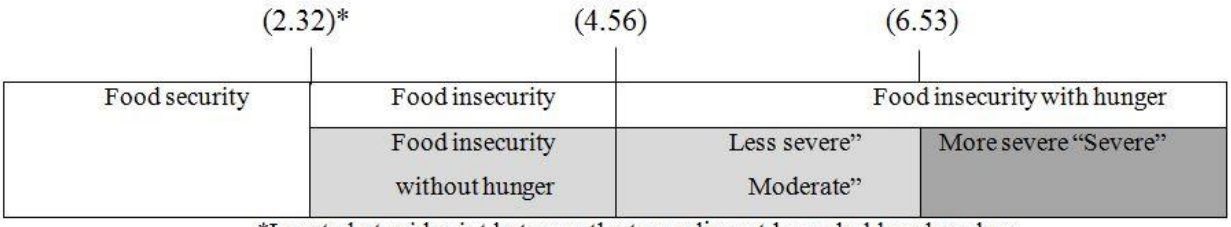

Figure 3: Household FI scale

2.6. Measures of mental health (MH)

The MH of the participants was assessed via three components in the questionnaire, namely, psychological anxiety, psychotic disorders, and mood disorders, as follows:

Mood disorders: Mood disorders were measured in the questionnaire using a patient health questionnaire consisting of ten items, including MH and patient food security. The questionnaire was tested using Cronbach's alpha, yielding a result of 0.85. Participants were asked questions in the questionnaire regarding the frequency of mood disorders symptoms. The responses indicated either the absence of mood disorders, symptoms resembling mood disorders, or the presence of mood disorders. Participants who scored above 10 on the scale were classified as having mood disorders.

Psychological anxiety: The psychological anxiety scale consists of six items used to examine the extent of participants' psychological disorder. Scores above 13 indicate higher levels of psychological anxiety, which is considered the cut-off point. Any score above this threshold indicates that the participant is suffering from severe psychological anxiety.

Psychotic disorders: psychotic disorders was measured using a scale consisting of four items. Responses ranged from no disorders to very much disorders, and were related to the 30-day period prior to participation. The measured Cronbach's

alpha value was 0.69. Higher scores indicate a stronger association with tension, mood disorders, anxiety, and significant pressure.

2.7. Demographic variables

The questionnaire included a set of demographic characteristics of the respondents, (Table 1).

Table 1 : Demographic characteristics of the respondents

Demographic characteristics	Type of variable
Respondent age	Continuous/by years
Sex	M, F
Level of Education	Illiterate / First level / Second level or University
Marital status	(S/Sep/Div/Wid) not married Married
Income (per month)	'Poor' < 5000 Rupees per month 'Low' between 5000 and 10000 Rupees 'Moderate" from 10000 up to 25000 Rupees 'High income' above 25000 Rupees

Source: Questionnaire, 2023 (F: Female, M: Male, S: Single, Sep: Separated, Div: Divorced, Wid: Widowed)

2.8. Statistical analysis

The potential correlation between survey respondents' (MH) and (FI) status was examined using a variety of statistical analytic techniques. Firstly, frequency and percentage of demographic variables such as age, gender, educational status, income, and social status were utilized. Secondly, the FI Scale was calculated and compared with demographic variables using a chi-square test. Throughout the use of logistic regression method during the third step, with FI as the dependent variable and demographic characteristics as independent variables, we examined the relationship between FI status and MH outcomes among survey respondents. A three-level linear regression model was also applied to enhance comprehension of the association between MH outcomes and FI. In each model, the dependent variable was changed, with the first model using mood disorders score, the second model using anxiety score, and the third model using perceived psychotic disorders score. The common independent variables in all three models were FI and the demographic characteristics of the survey participants. The statistical procedures were executed utilizing the STATA software, version 14. To determine statistical significance.

3. Results and Discussion

Table 1 presents the descriptive statistical analysis of the demographic characteristics of the survey participants (n=150). Based on the findings, it can be inferred that 44% of the entire sample size is comprised of individuals between the ages of 20 and 38 years. Additionally, 60.67% of the total sample population consists of female, and 52.67% of the sample population have attained primary education. With regard to marital status, 71.33% of the total sample population are married. Furthermore, the majority of the sample population (47.33%) falls within the poverty category, indicating that they belong to the lowest income group.

Table 1: Descriptive statistics results of demographic characteristics (n 150).

Demographic characteristics	Category	Frequencies	%
Respondent age	20-38	66	44
	39-60	49	32.67
	61-90	35	23.33
Sex	M	59	39.33
	F	91	60.67
Level of Education	Illiterate	48	32
	First level	79	52.67
	Second level	23	15.33
Marital status	Married	107	71.33

	Not married	43	28.67
Income (per month)	Poor	71	47.33
	Low	40	26.67
	Moderate	29	19.33
	High	10	6.67

Source: Data analysis, 2023

To calculate the percentage and 95% confidence interval (CI) of (FI) among each demographic group, the study used the Chi-squared test. The values were then contrasted to look for any significant differences. The outcomes underscored a poignant reality - that FI is a prevalent and pervasive issue that affects individuals of every demographic, regardless of their background or circumstances, with 74.1% of the total sample population being affected. The values obtained from the Chi-squared test are shown in Table 2, which compares the food security status across various demographic characteristics of the population. Among the variables that were examined, only age demonstrated a statistically significant correlation with the levels of food insecurity (FI). The study revealed that FI was more prevalent among younger age groups, indicating that they may be more susceptible to this issue, with 80.1% of individuals aged 20 to 38 years reporting experiencing FI, in contrast, the corresponding figures for those aged 39 to 60 years and 61 to 90 years were 70.4% and 66.9%, respectively

Table 2: The prevalence of FI according to age, gender, income, and education (Food insecure (%95 % CI)).

Total results		**Value**	**95 %**	**Confidence Interval**	***P***
		74.1	66.4	87.1	-
Respondent age	20-38	80.1	55.2	68.3	0.01 *
	39-60	70.4	80.1	88.7	
	61-90	66.9	50.9	66.4	
Sex	M	76.8	43.5	51.2	0.26
	F	82.5	75.8	79.6	
Level of Education	Illiterate	50.4	80.4	89.1	0.17
	First level	88.3	90.9	92.3	
	Second level	40.9	83.1	90.2	
Income (per month)	Poor	85.3	69.8	76.4	0.33
	Low	71.6	63.6	87.0	
	Moderate	63.1	74.3	95.1	
	High	50.8	52.7	87.1	

* significance at two-tailed alpha level of $P < 0.05$, M: Male, F: Female,

An analysis of the linear regression model presented in Table 3 reveals association between demographic characteristics and the experience of FI among the sample population. younger individuals (20-38) are at a greater risk of experiencing FI, according to the study's model findings. The scores revealed a strong association between younger and (FI), as evidenced by a value of 0.15 and a 95% confidence interval (CI) of 0.03 to 0.64. These published results are in line with past research on the same topic.

Table 3: Independent variables associated with FI.

		Value	**95 %**	**Confidence Interval**
Respondent age	20-38	(Ref)	-	-
	39-60	0.56	0.17	1.21
	61-90	0.15*	0.03	0.64
Sex	M (Ref)	(Ref)	-	-
	F	1.25	0.41	3.54
Level of Education	Illiterate	(Ref)	-	-

	First level	0.49	0.09	1.40
	Second level	0.31	0.07	2.81
Income (per month)	Poor	(Ref)	-	-
	Low	1.89	0.38	3.91
	Moderate	0.43	0.08	1.54
	High	0.22	0.07	1.20
Marital status	Married	(Ref)	-	-
	Not married	2.81	0.82	5.13

* significance at two-tailed alpha level of $P < 0.05$

Table 4 reports the findings of the linear regression model that aimed to investigate the relationship between FI and MH outcomes. The analysis revealed that FI was significantly associated with symptoms of mood disorders (β=0.46) and psychological anxiety (β=0.63), while no significant correlation was found with psychotic disorders (β=0.14).

Table 4: Independent association between FI and MH

	Value	**95 %**	**CI**
Mood disorders	0.46*	0.11	0.81
Psychological anxiety	0.63*	0.21	1.04
Psychotic disorders	-0.14	0.47	0.05

* significance at two-tailed alpha level of $P < 0.05$

4. Discussion and conclusions

According to the survey's findings, a sizable fraction nearly (74.1%) of the Nicobar Islands' tribal community suffers from FI. The majority of those affected were younger individuals aged 20-38 years. Linear regression models revealed a significant association between FI and symptoms of psychological anxiety and mood disorders, while no association was found with psychotic disorders.

These findings represent the first study on the association between MH of tribes in the Nicobar Islands and FI, which facilitates the provision of any interventions aimed at promoting MH among the population.

A thorough analysis of food insecurity (FI) in rural and peasant groups shed light on the scarcity of studies carried out in the Nicobar Islands, exposing a huge knowledge and comprehension gap of this important issue in the area which concentrated on determining the frequency of FI among an indigenous people living in Nicobar.

Our study has highlighted a concerning prevalence of FI within the Nicobar community, which is known to have adverse long-term health effects based on evidence from other regions. Given the high frequency of FI among the Nicobar inhabitants sheds light on the critical need for urgent action to address this concerning issue. Furthermore, there is a necessity for additional research to identify the distinctive obstacles encountered by indigenous individuals in the age group of 20 to 38 years, which contribute to the higher prevalence rate in this group. This will enable targeted interventions to be designed to address the specific needs of this demographic.

Another issue that was discovered in the Nicobar Indian locals is the correlation between FI and the co-occurrence of major mood disorders and severe psychological anxiety, highlighting the importance of addressing MH concerns by making sure social determinants of health are taken into account.

In addition, the present study has furnished empirical evidence of a substantial correlation between FI and mood disorders, along with severe psychological anxiety, within the Nicobar tribal. These results underscore the critical importance of social determinants of health in mitigating MH issues, especially within socioeconomically disadvantaged communities that are grappling with FI.

A research conducted on the wellbeing of Aboriginal individuals, living outside of the reserves, has illuminated a significant correlation between FI and heightened levels of psychotic disorders (Willows et al., 2011).

Similarly, In a related study, Deaton et al., (2020) found that FI was associated with self-reported diagnoses of MH disorders by healthcare practitioners among the First Nations population in Canada. Ali & Vallianatos, (2017) conducted a study in Bangladesh to explore how individuals coped with FI and found that although FI was prevalent across all groups, the coping mechanisms employed varied based on ethnicity. The study found that indigenous groups tended to use more protective and effective coping strategies compared to other groups

A defining characteristic of indigenous communities is the presence of robust social support mechanisms and a high degree of social cohesion within the community (Power, 2008; Walch et al., 2018).

Examining and analyzing relationship between social structures and FI was analyzed by a group researchers such as (Nagata et al., 2015) within a rural society in Kenya, found that lower levels of instrumental forms of support were associated with higher FI (37).

There may be a reduction in psychotic disorders and anxiety associated with FI through the use of social networks.

Thus, indigenous populations may experience a change in relationship direction. Having access to indigenous farms and food sources might also be a specific factor for indigenous populations. According to a study conducted in Botswana, a lower level of FI was found in households with higher access to traditional and indigenous foods (Kasimba et al., 2018).

Indigenous communities tend to have a distinct perspective on health that differs from western models of health. This perspective encompasses not only physical well-being, but also mental and spiritual health, and extends to the health of the community as a whole, including those around them (Stephens et al., 2005).

This viewpoint allows for the implementation of solutions that address multiple concerns simultaneously, these include concerns like FI and MH issues. By taking into account how FI and MH are interconnected, integrating Indigenous persons' cultural perspectives into the implementation of mental health treatments should lead to better results in both areas.

Although this study offers distinctive insights into an indigenous population in Nicobar that has been neglected in research, it is not without its limitations. Even while the results point to the need and requirements for additional study on how FI and MH interact in Indigenous communities, it is important to note that the unique cultural and environmental factors of each community may be one key limit to the applicability of these findings to other populations. Nonetheless, given the relative lack of research in this area, it is crucial to explore these issues in other historically marginalized populations. Despite the fact that Indigenous populations' FI and MH challenges require a quick response, it is crucial to bear in mind that the study's conclusions are also constrained by the limitations of sample volume and cross-sectional data gathering methods. As a result, the findings cannot be used to infer causality and should be interpreted only as associations.

Instead of being verified throughout the interviews Conducted within clinics. As a result, by just relying solely on self-reported signs, it is insufficient to make a final mental health diagnosis.

The findings of this study provide evidence in favor of a focused effort to combat FI within this population. In addition, the findings emphasize the necessity of including considerations related to MH and access to food as part of a combined intervention strategy.

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