

Nutritional Status of Preschool Children in Andaman and Nicobar Islands and Food Insecurity, Food Groups, and Nutrient Consumption among Population

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ABSTRACT

Background: Childhood undernutrition is a public health concern in India. But on such a serious issue, there are no data available from the Union Territory of Andaman and Nicobar (A and N) Islands. **Objectives:** Present study was designed to know the prevalence of food insecurity, to estimate food group and nutrient intake among the community, and undernutrition and clinical signs of micronutrient deficiency among the preschool children of A and N islands. **Materials and Methods:** Multistage random sampling was followed to select the households containing children aged 6-59 months. In the selected households' sociodemographic particulars, Household Food Insecurity Access Scale (HFIAS), among preschoolers the weight and height were recorded along with the documentation of clinical signs of micronutrient deficiency, morbidities suffered over previous fortnight, and measurement of hemoglobin. Diet survey was carried out in every fourth household. **Results:** A total of 1259 preschoolers residing in 1082 households were examined, HFIAS was measured in 710 households in Andaman group of islands and diet survey was conducted in 290 households. The prevalence of undernutrition was around 27%, stunting was 36%, and anemia was around 81%. Undernutrition and anemia prevalence were significantly low among Nicobarese children. After adjusting for all the determinants, tribal in domicile had favorable outcome [odds ratio (OR): 0.28 (0.18, 0.43)], while below poverty line family had adverse outcome on undernutrition [OR: 1.72 (1.20, 2.46)]. **Conclusion:** Though the prevalence of undernutrition is relatively low in the islands, but high prevalence of anemia needs to be addressed. Nicobarese children fare better in almost all indicators of nutritional well-being except for stunting.

Key Messages: The prevalence of undernutrition is relatively low in Andaman and Nicobar Islands. Nicobarese children fare better in almost all indicators of nutritional well-being. However, high prevalence of stunting among Nicobarese children needs further research with appropriate methodology. High prevalence of anemia in the islands needs to be addressed. A socially and culturally specific intervention strategy needs to be envisaged.

Keywords: Andaman and Nicobar Islands, children, diet, food insecurity, food groups, Nicobarese, nutritional status, preschoolers, undernutrition

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Introduction

Food insecurity, hunger, and undernutrition are often viewed as continuum, with food insecurity resulting in hunger and ultimately, if sufficiently severe and/ or of sufficient duration, in undernutrition. Each condition, not only undernutrition, has consequences for the individual, the family, and society.^[1] In spite of adequate food production, there are almost 21% of the populations in the developing world who suffer hunger.^[2] The prevalence of underweight and stunted children was 23% and 34%, respectively, by the end of first decade of 21st century in the developing world.^[3] Undernutrition is the main threat to health and well-being in middle- and low-income countries, as well as globally.

In India, 43% of children aged less than 5 years are underweight (wt./age), 48% in the same age group are stunted (ht/age), and 20% of the children aged less than 5 years are wasted (wt./ht). The prevalence of anemia in the same age group is 70%.^[4] The National Nutrition Monitoring Bureau data of 2005-06 reveal almost the same figure.^[5] But, we do not have the real estimate of food insecurity and hunger in our communities.

The comparable data for underweight, stunting, and anemia among children are not available for Andaman and Nicobar (AandN) Islands since National Family Health Survey-3 did not include the region in the study.^[4] However, among four aboriginal tribes (out of six) who inhabit this island, nutritional studies were carried out in the late 1990s.^[6-9] A similar study was carried out among Nicobarese of Great Nicobar Islands, Karens of Mayabunder, Punjabi settlers of Great Nicobar Islands, and Bengalis of Middle Andaman in early 1990s.^[10] The most recent study was conducted by National Institute of Nutrition among tsunami affected population of the islands living in the relief camps, which revealed, among preschool children about 48% were underweight, 37% were stunted and 16% were wasted. About 22% of adolescents were undernourished.^[11] These are the studies conducted on isolated population groups or particular tribes. There are no composite data on the nutritional status of children of AandN Islands. Understanding the nutritional status of the children and food security status of the population is more important in the context of tsunami and subsequent livelihood issues in the Island.^[12]

In this background, this study was designed to know the prevalence of food insecurity, hunger, to estimate food group and nutrient intake among the community, and undernutrition and micronutrient deficiency among the preschool children of AandN Islands with the intention to understand the factors responsible for such conditions and to suggest the remedy for the same.

Materials and Methods

Study setting

AandN Islands is a union territory, an archipelago of more than 500 islands, and islets (38 inhabited islands) located at longitude of 92°-94° east and latitude of 6°-14° north in the Bay of Bengal, 1200 km away from mainland of India.^[13] Over 356000 people live in this area, consisting of six Aboriginal tribes. A tsunami event devastated these islands in December 2004, where a large number of people lost their families, assets, and means of livelihood, and many were displaced from their homes predominantly in the Southern and Nicobar group of Islands.

Study design, population, sample size, and sampling method

A cross-sectional population-based survey was carried out to assess the prevalence of food insecurity, hunger, and to estimate food group and nutrient intake among the community and undernutrition and micronutrient deficiency among the preschool children (6M-59M) of AandN Islands during 2012-13. The Institutional Ethics Committee has approved the study.

There are three administrative districts in AandN Islands that is, North and Middle (NandM) Andaman Districts, South Andaman District, and Nicobar District. Assuming the prevalence of undernutrition to be 48%, absolute precision of 5%, a sample size of 384 children aged 6M-59M, was fixed for each administrative districts.^[11]

We adopted multistage random sampling to select the households and children aged 6M-59M. In the first stage, villages were selected by simple random choice within the district, whereas in the second stage, 20 households having children aged 6M-59M were selected within the village by random choice. A total of 20 households were chosen randomly from the household enumeration list prepared by the field staff. If the chosen household does not contain a child aged 6M-59M, an adjacent house was taken. This procedure was followed until 20 households were covered in each village.

Data collection

In the selected households' sociodemographic particulars and in a subsample of household's, Household Food Insecurity Access Scale (HFIAS) by using a structured and pretested questionnaire developed by United States Agency for International Development (USAID) (only in NandM Andaman District and South Andaman District) were recorded.^[14] The present study used 9-item adapted HFIAS which was studied by USAID for internal, external, and cross-cultural validity. For that, they used seven HFIAS data sets collected in diverse contexts and countries: Mozambique (two data sets), Malawi, West

Bank/Gaza strip, Kenya, Zimbabwe, and South Africa. This was also validated in rural Tanzania, urban West Africa, urban Iran, and urban and rural Ethiopia. In all these settings, HFIAS was found to have good internal consistency.^[15-19] In the chosen households, the weight (accuracy of 100 gm) and height (with accuracy of 2 mm) of the children aged 6M-59M were recorded. The length was recorded among children aged less than 2 years by using infantometer. They were examined for the clinical signs of micronutrient deficiency. Morbidities suffered by the preschoolers over the previous fortnight were recorded. Among the same children hemoglobin (Hb) estimation was carried out by cyanmethemoglobin method.

Diet survey was carried out in every fourth household chosen in the village, first house being random choice (i.e., five per village). This was carried out by using semiquantitative 24 hour recall method of diet survey.^[5]

Statistical analysis

The distribution of various sociodemographic characteristics was calculated. The proportion of households falling under various household insecurity categories was calculated with 95% confidence interval (CI). Since the study adopted multistage random sampling, the proportion of preschoolers, who are underweight, stunted, and anemic was calculated with 95% CI with the sampling weightage (reciprocal of sampling fraction). The proportion of different clinical signs of micronutrient deficiency and morbidities suffered over previous fortnight was calculated. The consumption of various food groups and nutrient was calculated per consumption unit and the proportion of households consuming less than the recommended daily allowance (RDA) of various nutrients was calculated.

Bivariate regression analysis was carried out to look for the association between underweight among preschoolers and various independent variables. Multiple logistic regression (MLR) analysis was carried out by putting the independent variables which were significant in the bivariate regression analysis into the equation.

Results

A total of 1082 households were surveyed in three districts. In these households, 1259 children were aged 6M-59M (preschoolers). Among these, 484 children were residing in NandM Andaman district (22 villages), 428 in South Andaman district (20 villages), and 347 in Nicobar district (23 villages). Diet survey was conducted in 290 households, of which 115 households were in NandM Andaman district, 107 were in South Andaman district, and 68 households were in Nicobar district. Household food insecurity was ascertained in 710 households in NandM Andaman District and South Andaman District.

The population studied involved all the religious and linguistic communities of AandN Islands. Almost 63% were living in nuclear family and 84% of the households were electrified. Major source of drinking water was tap water and 70% of the households studied were using sanitary latrine. Those living below poverty line (BPL) were 8.3%.

Prevalence of food insecurity among the households, undernutrition, stunting, and anemia among 6M-59M children

Among the households surveyed, 67.5% (95% CI: 63.9, 70.9) were food secure, 18.5% were mildly food insecure, 11.1% were moderately food insecure, and 3.0% severely food insecure. Almost 27% children were underweight and 36% of children were stunted [Table 1] and [Table 2]. The prevalence of anemia (Hb < 11.0 gm%) was 81.2% (95% CI: 81.0, 81.4). It was 86.8% in NandM Andaman district, 87% in South Andaman district, and 19.4% in Nicobar district.

Prevalence of clinical signs of micronutrient deficiency and the morbidities suffered by preschoolers during previous fortnight

Among the clinical signs of micronutrient deficiency in children aged 6M-59M, dental caries is the lead one (10%). The morbidities suffered by preschoolers during the previous fortnight were acute respiratory infection (28.6%), followed by fever (20.3%) and diarrhea (2.7%).

Table 1: Distribution of undernutrition among children aged 6M-59M in Andaman and Nicobar Islands (weight/age)

S. No	District	Sample size	Sample statistics (%)			Population size	Population estimate (%) and [CI]		
			Normal	Moderate	Severe		Normal	Moderate	Severe
1	N&M Andaman	484	348 (71.9)	102 (21.1)	34 (7.0)	74052	53244 (71.9) [71.6, 72.2]	15606 (21.1) [20.8, 21.4]	5202 (7.0) [6.8, 7.2]
2	South Andaman	428	303 (70.8)	89 (20.8)	36 (8.4)	46652	33027 (70.8) [70.4, 71.2]	9701 (20.8) [20.4, 21.2]	3924 (8.4) [8.2, 8.7]
3	Nicobar	347	296 (85.3)	39 (11.2)	12 (3.5)	13186	11248 (85.3) [84.7, 85.9]	1482 (11.2) [10.7, 11.7]	456 (3.5) [3.2, 3.8]
	Total	1259	947 (75.2)	230 (18.3)	82 (6.5)	133890	97519 (72.8) [72.6, 73.0]	26789 (20.0) [19.8, 20.2]	9582 (7.2) [7.0, 7.3]

Consumption of food groups and nutrients among the population of A and N Islands

Average household consumption of food groups (g/CU/day) showed intake of cereal grains and products (87.6% of RDA), leafy vegetables (74.6% of RDA), other vegetables (72.0% of RDA), milk and milk products (8.4% of RDA), and sugars (19.0% of RDA) less than the RDA. Almost 74% of the families surveyed in AandN Islands consume less than RDA (CU/day) for energy and almost 38% families consume less than RDA (CU/day) for proteins. Table 3 shows the proportion of families consuming less than RDA (CU/day) for important nutrients and micronutrients.

Variables associated with undernutrition

In bivariate regression analysis being in tribal area (Nicobar district), Christian religion, being a Nicobarese tribe, having separate kitchen in home, use of petroleum fuel for cooking, beneficiary of housing scheme of government had protective influence on undernutrition, while nonelectrified household, having no sanitary latrine, family having income of BPL, and large family (more than 6 members) had deleterious effect on undernutrition [Table 4].

When these variables were put into MLR model, being in tribal area found to be of protective factor for undernutrition [odds ratio (OR): 0.28 (0.18, 0.43)], while family having income that of BPL [OR: 1.72 (1.20, 2.46)] and large family [OR: 1.39 (1.0, 1.94)] was found to be of increasing the risk of undernutrition [Table 4].

Four variables, nontribal area, nonelectrified household, family income that of BPL, and large family could explain the cause of undernutrition to the extent of around 75%.

Discussion

Present study was carried out to know the prevalence of food insecurity, hunger, to estimate food group and nutrient intake among the community, and undernutrition and micronutrient deficiency among the preschool children of AandN Islands with an intention to understand the factors responsible for such conditions and to suggest the remedy for the same.

The present study made a modest attempt to use HFIAS developed by USAID in the Indian context for the first time to the best of our knowledge.

The prevalence of undernutrition (wt./age) among preschoolers in AandN Islands is around 27%. This is substantially low compared with rest of India.^[5] In South Andaman and N and M Andaman district prevalence of undernutrition is around 30%, while in Nicobar district which is inhabited entirely by Nicobarese aborigines this is almost half, that is, 15%.

Prevalence of stunting among preschoolers in the islands has shown surprising results. Overall prevalence of stunting is 36%, it is 30% in South Andaman district, around 35% in NandM Andaman district, and it is almost 59% in Nicobar district, highest among all the districts.

Table 2: Distribution of stunting among children aged 6M-59M in Andaman and Nicobar Islands (height/age)

S. No	District	Sample size	Sample statistics (%)			Population size	Population estimate (%) and [CI]		
			Normal	Moderate	Severe		Normal	Moderate	Severe
1	N&M Andaman	484	313 (64.7)	113 (23.3)	58 (12.0)	74052	47889 (64.7) [66.4, 65.0]	17289 (23.3) [23.0, 23.6]	8874 (12.0) [11.8, 12.2]
2	South Andaman	428	297 (69.4)	90 (21.0)	41 (9.6)	46652	32373 (69.4) [69.0, 69.8]	9810 (21.0) [20.6, 21.4]	4469 (9.6) [9.3, 9.9]
3	Nicobar	347	144 (41.5)	64 (18.4)	139 (40.1)	13186	5472 (41.5) [40.7, 42.3]	2432 (18.4) [17.7, 19.0]	5282 (40.1) [39.3, 40.9]
	Total	1259	754 (59.9)	267 (21.2)	238 (18.9)	133890	85734 (64.0) [63.7, 64.3]	29531 (22.1) [21.9, 22.3]	18625 (13.9) [13.7, 14.0]

Table 3: Proportion of families consuming less than the RDA (CU/day)

S. No	Nutrient	N&M Andaman (n = 115)		South Andaman (n = 107)		Nicobar (n = 68)		Overall (n = 290)	
		No. of families<RDA	%	No. of families<RDA	%	No. of families<RDA	%	No. of families<RDA	%
1	Energy	86	74.8	87	81.3	42	61.8	215	74.1
2	Protein	50	43.5	40	37.4	20	29.4	110	37.9
3	Iron	110	95.6	99	92.5	58	85.3	277	95.5
4	Calcium	57	49.6	41	38.3	22	32.4	120	41.4
5	Carotene	93	80.9	95	88.8	55	80.9	243	83.8
6	Free Folic Acid	106	92.2	100	93.5	56	82.4	262	90.3
7	Vitamin C	86	74.8	80	74.8	41	60.3	207	71.4

Table 4: Variables associated with under nutrition among the preschool children in A and N Islands

Factor	Odds Ratio	Univariate			Multivariate (Stepwise methods)			
		95% CI of OR		P	Odds ratio	95% CI of OR		P
		Low	High			Low	High	
Tribal area	0.27	0.18	0.40	<0.0001	0.28	0.18	0.43	<0.0001
Christian*	0.56	0.41	0.74	<0.0001	-	-	-	-
Nicobarese*	0.31	0.21	0.46	<0.0001	-	-	-	-
Joint family*	1.06	0.82	1.38	0.658	-	-	-	-
Nonelectrified house*	1.75	1.27	2.40	<0.0001	-	-	-	-
No sanitary latrine*	1.75	1.34	2.28	<0.0001	-	-	-	-
Well water use for drinking*	0.76	0.49	1.18	0.224	-	-	-	-
Separate kitchen*	0.56	0.33	0.98	0.039	-	-	-	-
Use of petroleum fuel for cooking*	0.59	0.44	0.80	<0.0001	-	-	-	-
Beneficiary of employment schemes*	1.13	0.77	1.65	0.538	-	-	-	-
Beneficiary of housing scheme*	0.46	0.33	0.65	<0.0001	-	-	-	-
Below poverty line family	1.69	1.20	2.38	<0.0001	1.72	1.20	2.46	0.003
Large family (more than 6 members)	1.54	1.12	2.13	0.008	1.39	1.00	1.94	0.047

*In stepwise logistic regression model, these variables were removed from the multivariate analysis

In the absence of undernutrition (wt./age), high level of stunting among Nicobarese children poses a challenge. The one logical explanation is the international standard used for the measurement of ht/age in children aged 6M-59M may not be applicable among these aboriginal populations. Further studies are required to substantiate these points or to find out other appropriate explanations. In line with general trend throughout India, prevalence of severe undernutrition (wt./age) is very low in AandN Islands.

The proportion of families living BPL is around 8% in AandN Islands. This is substantially low compared with rest of India.^[4] Almost 68% of the families (in Andaman group of islands) felt they are food secure. Only 3% families had severe food insecurity or they go to bed hungry. We do not have the actual national estimate of food insecurity, but it is said that almost 320 million Indians go to bed without enough food in the night.^[20] It shows that the prevalence of hunger also low in AandN Islands.

Overall prevalence of anemia is higher than the rest of the India data in AandN Islands.^[4] Calorie and protein deficit in the diet and other micronutrient deficit are widely prevalent in A andN Islands.

Among the factors which are responsible for undernutrition, after MLR analysis, being tribal in domicile has emerged as protective factor, in spite of being highest proportion of BPL families (19%) live in tribal area. The risk of child being undernourished increases when the family is BPL. This seemingly contradictory finding points toward the protective influence of the social and cultural norms of the Nicobarese tribe. It may be the commune life, the value attached to the new life, and so on. These things can be

elicited through a qualitative research. The quantitative research methodology has inherent limitation in identifying the cultural and social norms, beliefs, and practices of the population.

Conclusion

The present study could estimate the prevalence of food insecurity and food group and nutrient intake among the community in A&N Islands. It could also assess the prevalence of undernutrition and micronutrient deficiency among the preschool children of A & N Islands. For the best of our knowledge such a comprehensive study on the nutritional indicators of the population in archipelago is first of its kind.

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Conflicts of interest

There are no conflicts of interest.

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