Ecology of Malnutrition in Distressed Areas of Bangladesh

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Introduction

Malnutrition is essentially an ecological problem in that it is the end-result of a complex set of overlapping and inter-related biological, social, economic and environmental factors [1, 2]. The quantity and quality of food and nutrients available at household level in a particular community will depend on the ecological setting of the community in general and the socio-economic status of households in particular. An understanding of the relationship of various ecological factors with the prevailing nutrition situation in a particular community is of paramount importance for formulation of appropriate remedial measures.

The purpose of this paper is to examine the association of some of these ecological factors with the nutrition situation in distressed areas of Bangladesh, which are by definition nutritionally 'at-risk'. In this analysis the nutritional status has been over-simplified as a function of energy (and protein) intake.

Materials and Methods

Empirical data used in this paper were collected during July 1978 - December 1979 from ten famine-prone distressed areas and two control (normal) areas of Bangladesh.

Sampling

For the purpose of this study the sampling universe comprised of all the famine-prone areas of Bangladesh. The famine-prone areas were identified in an earlier study by Bruce Currey [3]. The famine-prone areas were first divided into two broad ecological categories - those that are flood-prone and those that are not. Six locations (sub-districts) from among the flood-prone and four locations from among the non-flood-prone areas were then randomly selected using a population proportional multi-stage sampling technique described elsewhere [4]. The two control areas which are neither famine-prone nor flood-prone were selected arbitrarily. Each of the sampled locations (sub-districts) was then physically visited and first hand information about the most distressed villages in the sub-district were collected from the local officials and then *prima facie* the most distressed village was chosen for the study. In the chosen village where the total number of households was 200 or fewer the whole village was taken as the basic sampling unit. In the case of larger villages, each of them was divided into clusters of approximately 50 contiguous or

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neighbouring households, and 4 such clusters, selected at random, constituted the basic sampling unit. In the final stage all the households in the basic sampling unit were enumerated and stratified according to the local government's existing system of socio-economic stratification. Category 'A' house-holds, paying no tax to the local government, constitute the lowest stratum. Category 'B' households paying a certain minimum amount of local government tax constitute the second lowest stratum, while 'C' and 'D' category households have to pay progressively higher amounts of tax and constitute the upper two strata. Thirty households (50%) from A category, 15 (25%) from B, 9 (15%) from C and 6 (10%) from D category were then randomly chosen for the study.

Data collection and analysis

Each village was visited 5 times during the study period. Household food intake data were obtained by a 24-hour recall method. The method has been shown to provide household level food intake data within acceptable limits in rural Bangladesh [5] and at national level both weighing and recall methods were found to provide similar results [6]. Dietary investigators were university graduates and had undergone extensive training in interview techniques and estimating intakes. The methodology was fully standardized through practice field surveys and a full scale pilot survey. Household food intake data were converted into per capita energy (and protein) equivalents in the computer using local and regional Food Composition Tables [7, 8].

Table I. *Infra-structure facilities in and around the study villages by ecological category and scores obtained by each category.*

Ecological Category	No.of Villages	Scores (1) obtained for				
		Market facilities	Communication facilities	Education facilities	Total score	Mean score
Famine-prone and Flood-prone	6	5	6	3	14	2.3
Famine-prone but not flood-prone	4	4	3	9	16	4.0
Control (neither famine-prone nor flood-prone)	2	4	4	7	15	7.5

(1) Scores were arbitrarily assigned in the following manner :

a) Market facilities :
1 big market = 2 points, 1 small market = 1 point;

b) Communication facilities :
Bad = 0 point, Fair = 1 point, Good = 2 point;

c) Educational facilities :
1 Primary School = 1 point, 2 or more Primary Schools = 2 points,
1 High School = 2 Points, and 1 College = 2 points.

Detailed socio-economic information of the study households were collected by male investigators who were also university graduates and had similarly gone through extensive training and standardization procedure. Household income data were obtained on 3-monthly basis i.e. in each visit, cash and kind income during the previous three months, from all agricultural and other sources, were estimated.

General information about the study villages such as communication, marketing and educational facilities etc. available, were also collected.

Results

Table I gives an overview of the infra-structure facilities available in the study areas, grouped into three broad ecological categories and Table II shows the distribution of study households by major occupation, education and income groups. In terms of availability of public utility infra-structure, as Table I demonstrates, the distressed areas are worse off. The flood-prone distressed areas stand at the bottom.

The presence of markets in any area with good communication facilities obviously increases commercial activities, creates employment opportunities and gives a general boost to the economy of the area. The existence of educational institutions indicates people's ability to utilise the services these institutions offer, which in itself is an indicator of higher purchasing power and increased dietary intake.

Table II shows that the average monthly household income is the lowest in the flood-prone areas. The non-flood-prone distressed areas are better off in respect of average house-hold income and interms of distribution of households in the lowest and the highest income ranges. Average income is the highest in control areas and the proportions of house holds in the lowest and in the highest income ranges respectively are also the lowest and the highest.

Table II. *Distribution of households by income, occupation and education groups.*

Ecological Category	No. of Household	Average Household income (Tk/ m)	% of households in the lowest & the highest income [1] ranges		Occupation (% distribution)			Occupation (% distribution)	
			Lowest	Highest	Farmer	Day Labs.	Others	Illite-rate	S.S.C passed & above
Famine-prone and flood-prone	360	255	59.3	10.5	26.7	51.4	21.9	64.4	6.1
Famine-prone but non-flood-prone	239	365	50.8	18.3	27.1	39.0	33.9	60.0	12.6
Control	120	477	28.0	34.0	26.7	40.0	33.3	51.7	20.8

[1] Income range :
Lowest = Per capita monthly income below Tk. 75.
Highest = Per capita monthly income above Tk. 150.

The proportions of farming households are similar in all the three categories of study areas but the proportion of day labourers is the highest in the flood-prone areas. As to the educational attainments, compared to the flood-prone areas, the non-flood-prone areas fare better. The control areas are still better. Percentage of illiterates among the household heads is the highest in flood-prone and the lowest in the control areas. The percentage of household heads that can be considered to have attained an economically meaningful level of education is barely 6. 1 in the flood-prone areas. It is more than double in non-flood-prone and more than three times in the control areas.

The mean year-round per head per day energy and protein intakes among different socio-economic groups, as classified under the existing system of stratification are presented in Table III, by broad ecological characteristics of study locations. Table III shows that the mean energy and protein intakes of all socio-economic groups are substantially lower in the flood-prone areas than in the non-flood-prone ones. And that the intakes of all groups in the control areas are higher than the corresponding groups in both the categories of distressed areas. Within each category of study areas the socio-economic differentials in intakes are quite marked. 'A' category households had the lowest mean intake. Progressively higher intake in each next higher stratum is evident.

Table III. *Mean energy and protein intake by socio-economicand ecological characteristics of study population*

Ecological Category	No. of Village	Per person per day energy (Kcal and KJ) and protein (Gm) intake by socio-economic classes									
		A		B		C		D		ALL	
		Energy	Pro-tein	Energy	Pro-tein	Energy	Pro-tein	Energy	Pro-tein	Energy	Pro-tein
Famine-prone and Flood-prone	6	1330 (5565)	38.0	1675 (7008)	46.2	2028 (8485)	57.3	2212 (9225)	63.0	1619 (6774)	47.7
Famine-Prone but not flood-prone	4	1510 (6318)	42.5	1763 (73376)	47.8	2366 (9899)	63.9	2551 (10673)	72.2	1927 (8063)	53.3
Control	2	1762 (7372)	47.0	2279 (9535)	60.7	2517 (10531)	66.7	2906 (12159)	78.7	2245 (9393)	59.8

Figures in parentheses are Kilojoules (KJ) of energy.

Energy intakes were also analysed by income groups as shown in Table IV. Differences in energy intakes between the distressed and the normal areas are clearly seen in all income groups. Also the non-flood areas are better off than the flood-prone ones. Within each ecological category the incremental effect of income on energy intake is obvious.

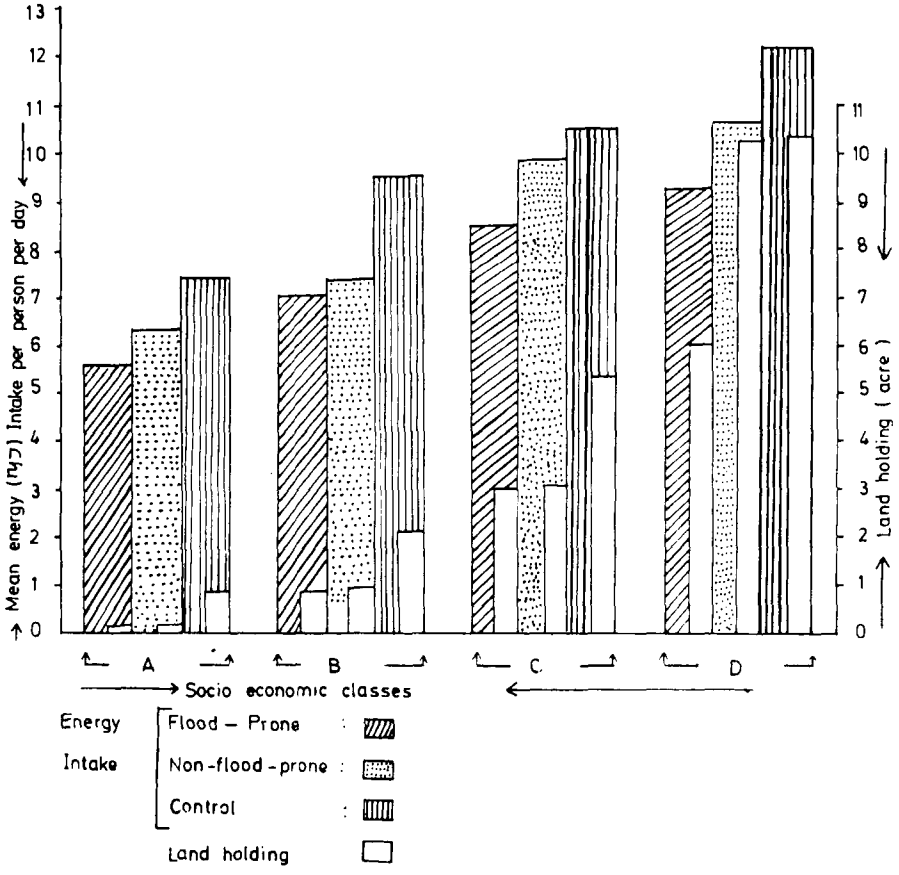
Table IV. *Energy intake by income groups and by ecological characteristics of locations*

Ecological Category	Energy Kcal (KJ) / person/day by income group (Tk/person/month)			
	0-49	50-99	100-149	150 & above
Famine-prone and flood-prone	1236 (5171)	1652 (6912)	2119 (8866)	2186 (9146)
Famine-prone but non-flood-prone	1280 (5356)	1796 (7514)	2128 (8904)	2428 (10159)
Control	1346 (5632)	1847 (7728)	2386 (9983)	2534 (10602)

Figures in parentheses are Kilojoules (KJ) of energy.

Figure : I

Mean energy intake and land holding by socio economic class by ecological category



Access to land is the most important indicator of socio-economic status of rural households in Bangladesh. The existing system of classification of rural households into different socio-economic groups (e.g. A,B,C and D) fairly correlate with their ownership of land. Although dietary intake has been shown to correlate with land holding, yet size of holding cannot be regarded as a uniform predictor of dietary intake under differing ecological conditions. Figure 1 compares the mean energy intake and land holding of each socio-economic group in different ecological settings. It will be seen that the 'A' category households in both the flood-prone and non-flood-prone areas possess the same amount of land (although negligible) but the mean energy intake is higher in the non-flood-prone areas than in the flood-prone ones. Category 'A' households in the control areas, on the other hand, possess less land than the B's in both kinds of distressed areas, but their mean energy intake is higher than the B's in flood-prone areas and same as the B's in non-flood-prone distressed areas. Figure 1 also demonstrates that category 'B' households in the control areas possess less land than the C's and far less than the D's in flood-prone distressed areas but the energy intake of the former (B in control) is higher than both the latter two groups (upper two socio-economic groups in flood-prone areas), Also; C's in both categories of distressed areas have similar size of holding but the energy intake is lower in flood-prone than in the non-flood-prone areas. Similarly the C's in the control areas possess less land than the D's in flood-prone and almost half that of D's in the non-flood-prone areas, but their energy intake was higher than the D's in flood prone and only slightly lower than that of the D's in non-flood-prone distressed areas. Within each socio-economic group the intake is the lowest in the flood-prone and the highest in the control areas.

Discussion

Household dietary intakes were estimated in 10 locations drawn from two broad categories of distressed areas of Bangladesh and compared with those in two arbitrarily selected non-distressed control areas, so as to identify some of the major ecological characteristics that explain the observed differences in the dietary intake in different ecological settings. Data presented in Tables I and II clearly show that there are major ecological differences between the distressed and the control areas. Within the distressed areas also there are ecological differences, the most important one being the flood-proneness. The distressed areas are less well communicated, have fewer educational institutions and there are not adequate facilities for people to engage themselves in money earning activities related to trade and commerce. Average household income is the lowest in flood-prone areas and about 60% of the study households are in the lowest income range. On the other hand, in the control areas, with the highest average income, only 28% of the households are in the lowest income range. Only 10.5% of the households in the flood-prone areas are in the highest income range, which is more than three times as much in the control areas. The non-flood-prone distressed areas stand in-between. Over a half of the households in the flood-prone areas are headed by landless day-labourers. Illiteracy is very high throughout Bangladesh but the situation is worse off in the distressed areas. About 65% of the household heads in the flood-prone distressed areas are illiterate as against 60% in non-flood-prone distressed ones and 51.7% in the controls. As regards educational attainment to a meaningful level the situation is the worst in the flood-prone areas.

It is evident that the distressed areas of the country are ecologically disadvantaged and the flood-prone distressed areas constitute to be the most disadvantaged in all respects. Variations in the dietary intake across different ecological situations should be viewed in the light of ecological characteristics of any particular geographical area. The close relationship between food intake and socio-economic forces around the world, including Bangladesh are beyond argument [9,10,11,6,12]. Significant differences in the intake among various socio-economic groups are also evident in the present study. The lowest socio-economic group had the lowest intake in all the three ecological situations investigated in this study (Table III). Each subsequent higher socio-economic group had higher intake in the specific situation. The impact of differing ecological conditions on the dietary intake of the same socio-economic group is also clearly demonstrated. The intakes of all the socio-economic groups in the ecologically disadvantaged areas are substantially lower than those of the corresponding groups in the control areas. Lowest intakes were recorded in the ecologically most disadvantaged flood-prone distressed areas.

Analysis of energy intake by income groups shows a similar trend (Table IV). However, there are differences in the figures in Tables III and IV. Firstly, because the classification of households into 4 different socio-economic groups (i.e. A, B, C and D) and into different income groups are not the same. Secondly, there are some inherent

discrepancies in categorising rural households into different socio-economic groups under the local government's existing system of classification and also into different income groups where income assessment is never precise. Nevertheless for practical purposes these classifications fairly predict the socio-economic status of households.

Land ownership is the most important index of socio-economic status of rural households and a predictor of dietary intake. Mean land ownership is lower in distressed than in control areas, the lowest being in the flood-prone areas. Furthermore, ownership of the same amount of land under different ecological situations does not mean the same thing. As Figure 1 demonstrates, even though the upper socio-economic groups in the distressed areas own more land than the lower socio-economic groups in control areas, the average dietary intake of the former is lower than of the latter.

In sum it can be said that ecological characteristics of a particular geographical area have great influence on the dietary intake and nutritional well-being of the people of that area. In Bangladesh context the ecologically disadvantaged areas are those that are backward, have little access to public service utilities and among them the most disadvantaged ones are those that are also subject to recurring annual flooding. Improved communication, provision of public service utilities and creation of employment opportunities with particular focus to absorbing the excessively high landless labour force in the flood-prone areas deserve especial consideration, along with other strategies of addressing the overall problem of malnutrition in the country.

Summary

A five-round household dietary survey by a 24-hr recall method was conducted in six flood-prone and four non-flood-prone distressed locations, selected randomly using a multi-stage population proportional sampling technique and in two arbitrarily selected non-distressed control locations of rural Bangladesh. Within each location households were stratified according to the existing system of socio-economic classification of rural households and from each socio-economic stratum requisite number of households were selected at random. In all, 719 households were studied. Information on socio-economic characteristics of households were also obtained. Food intakes were converted into percapita energy and protein equivalents and analysed by socio-economic characteristics of households and by ecological attributes of the study areas.

The study demonstrated the existence of major variations in the dietary intake of people in different ecological settings. Intakes of all socio-economic classes in the distressed areas were substantially lower than their respective counterparts in the non-distressed ones. Lowest intakes were evidenced in the flood-prone distressed areas. The so-called distressed areas of the country which are, generally speaking, backward, poorly communicated and not provided with adequate public service utilities can be regarded as 'ecologically disadvantaged' and nutritionally 'at-risk'- the most 'disadvantaged' and the most 'at-risk' are those distressed areas that are also subject to annual recurring flooding.

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