Original Article

Change in food and energy consumption among the ultra poor: is the poverty reduction programme making a difference?

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Background: Poverty persists at an alarming level in Bangladesh. To reduce extreme poverty and create the foundation for a sustainable livelihood change, BRAC undertook a targeted programme since 2002 named, Challenging the Frontiers of Poverty Reduction/Targeting the Ultra Poor (CFPR/TUP).
Objective: To investigate the impact of the CFPR/TUP programme on food and energy consumption.
Design: Two cross sectional surveys on food consumption were conducted, a pre-intervention survey in 2002 and a post-intervention survey in 2004 covering 180 intervention and 193 non-intervention households. Three days' recall method was administrated in both the survey rounds.
Results: The baseline food consumption survey showed an inadequate food intake in all households, which did not differ between the two groups. At post-intervention, the quality and quantity of food intake improved significantly in the intervention households as compared to baseline. In this group, the consumption of various food items such as rice, pulse, vegetables, fish, fruit, milk and egg showed significant improvement (p<0.001), particularly, the level of fish consumption doubled in intervention households while in control households it remained almost unchanged (14 g/day to 27 g/day for intervention vs. 11 g/day to 13 g/day for control). Energy intake increased from 1750±650 Kcal/day to 2138±704 Kcal/day in intervention households (p<0.001), whereas no significant change was observed in control households. Percentages of energy from cereals decreased from 85% to 78% in intervention households (p<0.001) while it remained unchanged in control households.
Conclusion: CFPR/TUP programme seems to have direct impact on ultra poor family's ability to significantly increase consumption of food and energy.

Key Words: food consumption, energy intake, poverty reduction programme, Bangladesh

Introduction

Remarkable improvements have been made in nutritional and poverty status over the last three decades in Bangladesh. Improvements, however, have not spread uniformly across the population; people living in extreme poverty have benefited little from the poverty-reduction programmes. Depending on method used, still nearly 20% to 34% population live under extreme poverty - they are called the ultra poor or poorest of the poor.[1] The visible effects of poverty are malnutrition, ill health, poor housing conditions and illiteracy. A combination of food insecurity, psychosocial instability, water and environmental sanitation, and inadequate health services are generally the underlying causes of malnutrition, which are closely related to poverty.[2]

One way of defining poverty is by considering the level of food consumption that provides energy below what is required (absolute poverty: <2122 Kcal/day; extreme poverty: <1805 Kcal/day). Based on this direct calorie intake (DCI) method, 44.3% of people of Bangladesh are living in absolute poverty, and 20% in extreme poverty.[1] The socioeconomic environment of the ultra poor is characterized by a lack in productive assets i.e. land, illiteracy, unemployment and low income. Given the socioeconomic condition and constraints of this group of population, it becomes clear that the mechanism for poverty alleviation requires multipronged efforts such as special pro-poor development programmes. BRAC, the largest NGO in Bangladesh has started a new programme targeted at the extreme poor, called 'Challenging the Frontiers of Poverty Reduction: Targeting the Ultra Poor (CFPR/TUP)' since January 2002 to combat various dimensions of extreme poverty and create the foundation for a sustainable livelihood change.[2] With women as specific targets, the programme uses new strategic instruments including asset transfer and stipend, dedicated training to increase their income and, health and social development inputs designed especially for the ultra poor. Strategies and interventions that focus on women and improve their status have been shown to improve the livelihood of household members and particularly that of children.[3, 4]

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Part of the increased household income controlled by women may be used to purchase non-staple foods, thus increase food diversity and micronutrient intake.[5] This is of particular importance because food and nutrient intakes in ultra poor households are precariously low and micronutrient deficiencies are prevalent.[2] It is assumed that the interactive development activities of the TUP programme would enhance the quality of life of the ultra poor in the form of increased purchasing capacity, home based food production, and households participation in development activities, which would eventually lead to improve food intake and finally improve nutritional status.

As poverty lines were calculated using a basic needs approach whereby the food component of the poverty line is anchored to the recommended daily energy requirements of household members,[1] food consumption defines the food poverty line and is a critical way to assess improvement in poverty status. Food consumption could therefore be a useful indicator for assessing the impact of the programme on reduction of poverty among the ultra poor. This paper examines whether BRAC's CFPR/TUP programme has a positive impact on food and nutrient consumption of the programme participants.

Materials and method

Subjects

The targeting strategy followed by the CFPR/TUP programme gave rise to two groups of ultra poor households. The first step of the targeting consisted of carrying out a participatory wealth ranking (PWR). A survey and verification was then carried out in the households identified as the poorest in this exercise (the PWR ultra poor) to select programme participants (details description elsewhere).[6] Those finally selected were referred to as the 'Selected Ultra Poor' (SUP) households and those who were PWR ultra poor but not finally selected by the programme after survey and verification were referred to as the 'Not Selected Ultra Poor' (NSUP) households. Therefore, the intervention cannot be termed as truly random. Rather, these NSUP households were considered as the comparison group.

Study design and data collection

The CFPR/TUP programme purposively selected three extremely poverty stricken districts of Bangladesh- Nilphamari, Rangpur and Kurigram. The study was carried out on a cross-section of the target and comparison households of the three districts over two rounds with a two year interval. In 2002, a baseline survey on food consumption was conducted. In 2004, a repeat survey was done which allowed assessment of changes in food consumption over the period between 2002 and 2004. Three days' recall method was administrated to collect data on food consumption in both the survey rounds. In both surveys, data were collected during the same months (June-July) to minimize the factor of seasonal variation on food consumption and also to see the impact of intervention after two years.

Two-stage sampling technique was used. In the first stage, two BRAC area offices were selected depending on the highest concentration of both SUP and NSUP households from the three programme-operated districts. A complete sampling frame of the SUP and NSUP households was then prepared, using the probability proportion to size (PPS) technique. The desired numbers of SUP and NSUP households were randomly selected from the sampling frame of each selected area office. A BRAC area office encompasses approximately 400-600 households from SUP group.

As no data were available related with present research objective sample size was determined using the prevalence of malnutrition in under-5 children in country published by government.[7] Considering stunting prevalence rate (52%), the required change for the estimated changes as ±5% and width of the class interval as 14% the required sample size was 195 households for each group. A total of 400 households- 200 from SUP and 200 from NSUP had thus to be completed for statistically representative sample. Finally data of 373 households were analysed: 190 households in SUP and 183 in NSUP. Twenty two households (8 SUP and 14 NSUP) had incomplete information and 5 households (2 SUP and 3 NSUP) were excluded from analysis due to baseline consumption of more than 833 g/day of cereals, which was considered as maximum cereal consumption figure for the bottom 20% of rural population.[8] Inclusion criteria and socio-economic condition at baseline of the households lost to follow up from both groups were similar to those households who remain in the trial.

A structured questionnaire was used to collect data. The woman who was responsible for cooking was asked to recall all food items consumed last three days. Food consumption was recorded using a checklist of food to help the respondents to recall the names, frequencies and amounts of foods consumed during the last there days. The checklist included 16 food groups eaten generally in Bangladesh. The quantities of purchased foods consumed were estimated by recording their monetary equivalents. The quantities of other foods consumed were estimated in household measures, and the ingredients of cooked foods consumed were recorded. In order to convert the amounts of food consumed from household measures to gram weight estimates, a local conversion table was followed.[9]

Data calculation: All food items recorded were categorized in one of eight food groups: cereals, pulses, vegetables, fish, meat, egg, milk, fruit and oil. Food items such as water, tea, spices and beetle leaf were not included. The foods consumed were divided into selected food groups on the basis of food composition table with the following modification: rice and wheat were merged in cereals group, green leafy vegetables, non leafy vegetables and roots were pooled in the food group of vegetables, and fats, oils and oil seeds were in oils group. Expenditure of food was calculated based on local market price. The effect of money inflation was adjusted by comparing the same food basket between 2002 and 2004. Quality of diet was evaluated based on the allowance recommended for Bangladeshi people.[10] To avoid mistake in energy intake calculation caused by differences in food composition, the values of all foods were computed using the same food composition table pertinent for both 2002 (pre-intervention) and 2004 (post-intervention).

Intake per person was calculated at the household level by dividing the total intake of each single food by the total

number of consumption units in the household. An adult individual present at every meal within the one day period was counted as a full-time consumer, with the value of one consumption unit. Children <12 years were considered as half (0.5) an adult person. All family members, including children were valued similarly in terms of consumption unit. In both 2002 and 2004 the same procedure was applied to calculate consumption unit though children aged 10 and 11 years old from 2002 crossed the consideration of half (0.5) an adult person in 2004. However, number of this age group was insignificant comparing the whole population, 72 out of 1247 individual (5%). In addition, the percentage of children in 2002 and 2004 was similar (31% and 30% respectively, p=0.54). Arithmetic adjustments of the numbers of consumption units was made for household members who were partially absent. If a household member was absent at one of the usual three meals consumed in the household, two-thirds of a consumption unit, instead of one, was allocated to this member.[11]

The data collection procedure was aided by the use of a kitchen scale, various standard utensils, such as measuring spoons, cups, glasses and different food models. Each interview lasted for 30 minutes and all information given was recorded by the investigator.

Ethical consideration

Ethical clearance was obtained from the Bangladesh Medical Research Council (BMRC), the responsible department of the government of Bangladesh. Written informed consent was obtained from each respondent before taking interview.

Data management and analysis

All completed questionnaires were checked for inconsistency and errors by the supervisor before sending to the BRAC head office for computerization so that any queries or inconsistency could be resolved by rechecking with the interviewers if necessary. A researcher prepared a coding manual and data entry layout and thereafter data were entered using the SPSSWIN 10.00 software. The same software was used for data cleaning and analysis. Converting food intake data into nutrients was also done using SPSSWIN considering the Bangladeshi food composition table.[12]

The differences in baseline mean food consumption between the intervention and control households were examined using independent t-test. Change in food and energy consumption within groups was analyzed using the Paired Student's t-test. The prevalence of inadequate intake and dietary poor quality before and after intervention were compared within groups using χ^2 analysis. Differences were considered significant at p<0.05.

Results

At baseline (2002), mean food intake (g/day) was comparable between the two groups. However, while significant increases in food intake in SUP households from pre- to post-intervention were seen for all food groups except oil, intake of only animal food (not fish) and fruit increased significantly in the NSUP households (Table 1). Fruit consumption increased 12 times in the SUP households (12 g/day to 143 g/day) and about 3 times in the NSUP households (27 g/day to 76 g/day). Fish consumption doubled over the intervention period in SUP households (14 g/day and 27 g/day) while it remained almost unchanged in NSUP households (11 g/day and 13 g/day). Milk consumption increased significantly to 41 g/day from 6 g/day in SUP households (p<0.001) and to 13 g/day from 7 g/day in NSUP households (p=0.072). The amount of oil consumption decreased during the post-intervention period in NSUP households, but it did not change in the SUP households.

Overall energy consumption of the SUP and NSUP was similar before the implementation of CFPR/TUP programme. Between 2002 and 2004, energy consumption increased significantly by 22% in SUP households (1750 Kcal/day to 2138 Kcal/day) (p<0.001), whereas it remained unchanged in NSUP households (1760 Kcal/d to 1787 Kcal/day) (p=0.685). Energy consumption of post-intervention period did not increase similarly for every category of energy consumer households of pre-intervention period though in SUP households it revealed an appreciable increase from pre- to post-intervention. Lower energy consumer households at baseline could increase their consumption more compared to higher energy consumer households. SUP households with energy intake less than 1600 Kcal/day (mean 1117 Kcal/day) had higher improvement (82%, mean 2038 Kcal/day) compared to households with energy intake more than l600 Kcal/day (0.4%, mean 2200 Kcal/day vs 2209 Kcal/day) in the post-intervention period. NSUP households also showed similar trend (52% vs - 20%) (data not shown).

Table 1. Per capita daily food and energy consumption in SUP and NSUP households in pre- (2002) and post-intervention (2004)[1]

Food	SUP (n=190)			NSUP (n=183)		
	Pre-intervention	Post-intervention	p^a	Pre-intervention	Post-intervention	p^a
Cereals (g)	434±179	482±161	0.004	434±176	430±169	0.845
Pulse (g)	7±16	11±14	0.005	8±13	6±13	0.115
Vegetables (g)	221±216	290±187	<0.001	218±132	236±136	0.186
Fish (g)	14±30	27±48	<0.001	11±25	13±27	0.582
Fruit (g)	12±48	143±206	<0.001	27±87	76±138	<0.001
Oil (g)	9±8	8±8	0.151	9±8	6±5	<0.001
Animal food[†] (g)	22±49	85±114	<0.001	22±43	34±64	0.024
Total food (g)	706±298	1019±446	<0.001	717±266	788±312	0.013
Energy (Kcal)	1750±650	2138±704	<0.001	1760±648	1787±654	0.685

[1] Mean±SD. [a] Paired t-test. [†] Fish, milk, meat, egg

Table 2. Daily dietary quality indices for the SUP and NSUP households during pre- and post-intervention

Indicator	SUP (n=190)			NSUP (n=183)		
	Pre-intervention	Post-intervention	*p*	Pre-intervention	Post-intervention	*p*
No. of different foods per day[1]	3.7±0.99	5.6±1.6	<0.001[a]	3.9±1.1	4.4±1.3	<0.001[a]
% Energy from cereals	84.5	78.4	<0.001[b]	84.2	82.6	0.160[b]
% Energy from animal source	1.3	3.2	<0.001[b]	1.2	1.8	0.020[b]

[1] Mean±SD. [a] Paired t-test. [b] Chi square

Table 3. Change of food (g/day) and energy (Kcal/day) consumption between 2002 and 2004 by sex of the household head[1]

Sex of HH head	Cereals	Vegetables	Animal food[†]	Oil	Total food	Energy
SUP						
Pre-intervention						
Male (n=90)	475±179	198±96	25±42	9±9	733±227	1880±634
Female (n=100)	398±171	242±283	19±54	10±8	681±341	1632±644
p[a]	0.003	0.163	0.426	0.206	0.232	0.008
Post-intervention						
Male (n=88)	474±139	245±124	71±78	7±7	916±341	2024±590
Female (n=102)	489±179	329±221	96±136	9±9	1107±505	2236±779
p[a]	0.539	0.002	0.138	0.014	0.003	0.038
NSUP						
Pre-intervention						
Male (n=98)	466±197	202±112	24±43	8±4	746±260	1870±702
Female (n=85)	396±140	235±150	19±43	10±11	684±272	1633±557
p[a]	0.007	0.095	0.405	0.037	0.118	0.013
Post-intervention						
Male (n=102)	424±158	224±117	32±45	6±5	756±272	1738±609
Female (n=81)	439±183	251±157	37±82	7±6	830±354	1848±706
p[a]	0.552	0.183	0.576	0.033	0.110	0.260

[1] Mean±SD. [a] Independent t-test. [†] Fish, milk, meat, egg

Dietary quality increased in both intervention and control households. More diverse diets were consumed after intervention compared to pre-intervention. However, increment was more pronounced in SUP household than NSUP household ($p<0.001$) though at baseline it was similar ($p=0.169$). The percentage of energy derived from cereals has dropped to 78% in 2004 (post intervention) from 85% in 2002 (pre intervention) in SUP households. On the other hand it remained almost constant in the NSUP households over time. Meanwhile, the percentage of energy from animal sources has risen 3 times from 1% to 3% in SUP households, and it did not increase at similar trend in NSUP households (Table 2).

The data on mean daily consumption of selected food groups and energy for SUP and NSUP households according to the sex of the household head are presented in Table 3. At baseline, mean consumption of cereals, animal food, total food and energy was significantly higher in male-headed households of SUP and NSUP. Vegetable consumption was found more in female-headed households but the difference was not significant. In 2004, intake of total energy, total food, oil and vegetables increased significantly in female-headed SUP households compared to male-headed households. Female-headed NSUP households were also found to consume more food and energy than male-headed households but again, the differences were not significant.

Over the two years intervention the marital status of 12% household heads changed. In currently-married group 92% were male-headed and in not currently married group all households were women-headed (widow, divorced, separated). The households where headship did not change

Table 4. Influence of marital status of the household head on food (g/day) and energy (Kcal/day) consumption in SUP households[1]

	Pre-intervention			Post-intervention		
	Married (n=96)	Not currently married‡ (n=68)	p^a	Married (n=96)	Not currently married‡ (n=68)	p^a
Cereals (g)	463±183	407±178	0.054	472±142	499±183	0.306
Pulses (g)	6±12	10±21	0.199	10±12	12±16	0.451
Vegetables (g)	192±98	245±327	0.133	244±120	345±238	<0.001
Fish (g)	18±32	6±15	0.003	24±35	30±62	0.511
Oil (g)	9±9	9±6	0.768	6±4	11±9	<0.001
Fruit (g)	19±62	4±24	0.069	97±144	191±258	0.003
Animal food† (g)	25±42	17±50	0.267	71±73	99±151	0.113
Total food (g)	713±240	692±382	0.667	900±312	1168±520	<0.001
Energy (Kcal)	1833±655	1659±658	0.096	2000±577	2315±802	0.004

[1] Mean±SD. [a] Independent t-test. ‡ Divorced, widow, separated. † Fish, milk, meat, egg

within intervention period were analysed separately and data of intervention households (SUP) were presented in Table 4. In 2002, households with married-head had significantly higher cereals and vegetables intakes compared to households with not currently married head. Energy, total food amount, animal food and fruit consumption was also found higher among married-headed households. Over the years, not currently married-headed households showed significant improvement in food consumption. The consumption of energy, total food amount as well as vegetable, fruit, and meat was significantly higher compared to married-headed households. For NSUP households no significant improvement of food consumption was observed in not currently married households, except vegetables after 2 years (p=0.051) (data not shown).

Expenditure on food in SUP households increased significantly over the intervention period, while NSUP households also spent more money on food in 2004 compared to 2002, but the difference was not significant. Per capita daily expenditure on food (PCDEF) per day is considered as an indicator of poverty measurement and Tk. 14.24 is the indication of poverty line.[2] SUP households were able to spend more money after intervention compared to pre-intervention, expenditure on food increased from 61% to 95%, and nearly reached to cross the poverty line, while the NSUP households were far below this line (70%). Before intervention PCDFE was 8.7 Tk in SUP households, it reached to 13.5 Tk after intervention (p<0.001); on the other hand in NSUP households PCDEF was 8.9 Tk and 9.9 Tk before and after intervention respectively (p=0.08) (data not shown).

Discussion

Over a period of two years intervention, significant changes were observed in food and energy intake in the SUP households. Cereals, pulses, vegetables, animal foods, and fruits all contributed to an increased total intake of food between 2002 and 2004 in SUP households. Such increases were however, not seen in the NSUP households.

Rice is the main staple food for the Bangladeshi poor households. FAO's food balance sheet shows that the domestic use of rice as food per capita increased over the time.[13] Therefore, falling rice prices and increased income tend to point towards increased availability of rice.[14, 15] The influence of income on consumption of rice was observed in SUP households while no change of rice consumption was found in NSUP households.

The consumption of non-staple food such as pulses, vegetables, meat, fish, egg, milk and fruits in 2004 was much higher compared to 2002 in SUP households. Total animal food consumption was 85 g/day on average, more than four times as high as that in 2002. Food and nutrient per capita values are good indicators of trends in dietary patterns.[16] The data clearly show that the energy intake of SUP households increased significantly since 2002. Energy levels increased due to improvement of consumption of meat, egg, milk, fish and fruit but not of oil. This is a point of concern. Nevertheless, the findings of increased consumption of nutrient-dense foods such as vegetables, fish and other animal foods point to the direction of an improved diet in both types of households. However, the increased intake of different food groups was not enough to result in a significant increase in energy intake in NSUP households.

The post-intervention survey of 2004 showed that the SUP household's dietary intake also improved in terms of quality. Foods were more diversified compared to pre-intervention. The drop in the percentage of energy intake from cereals from 85% to 78% during the intervention was an encouraging indication that SUP households' diet tended to improve towards a more balanced one.[10]

It is pronounced that women-headed households are the 'poorest of the poor', a notion that proliferated not only in developing regions, but at a global scale.[17, 18, 19] Jazairy *et al*.[19] and Buvinic and Gupta[20] argue that female-headed households deserve special attention because they face the triple burden of poverty, discrimination, and absence of support as heads of household. According to World Bank the female-headed households are more likely to be poor in rural areas than male-headed households - 45% vs. 39%.[21] The same scenario was observed in pre-intervention period in SUP and NSUP households. After intervention, with reduction of poverty total per capita consumption was found higher in female-headed households, they consumed relatively more nutritionally rich food items such as vegetables, animal food, and their total food and energy intake was significantly higher than the male headed households. Several studies show that if the female head has decision-making power and control over household income, she will invariably spend more on

household well-being, primarily food.[22, 23, 24] Sometimes this recognition has led to development programme that focus on female-headed households. Therefore, CFPR/TUP programme can be considered as successful in terms of reducing vulnerability and increasing the consumption of food and energy in SUP female-headed households.

Households headed by lone women, such as widows, divorced women, or unmarried women are often assumed to be worse-off than two-partner or married women-headed households because, lacking a 'breadwinning' partner they are not only deprived of an adult male's earnings, but also have relatively more dependents to support.[18, 25, 26] On top of this, single-handed management of income-generation, housework and childcare further compromises economic efficiency and well-being. Households reliant on a single wage have greater risks of destitution that was reflected in lower consumption of food and energy in SUP households headed by not currently married women compared to married-headed households before intervention. CFPR/TUP programme thus appeared to help the widows, divorced and separated household heads to come-out from their misery.

A drawback of collecting data of food group rather than individual food item, is that only energy from average food composition table can be captured, nutrients consumption is ignored. Another limitation of this study was that the study was based on two surveys in 2002 and in 2004 where food consumption data were not collected on individual diet. Therefore, individual food consumption patterns could not be examined.

A high level of community participation was observed in CFPR/TUP programme implementation. It is possible that targeting of women enabled them to increase their participation in community life, as well as strength their influence on their neighboring poor households. Education regarding food, family welfare and nutrition can be shared by the target women with others in community. Large changes in attitudes to food and feeding behaviour can be observed as a result of such sharing[27] and that may be the reason of the observed increase of consumption of vegetables, fruits and animal food among NSUP households even though they did not get any intervention.

Obviously, when a change in food consumption occurs in the community, there are two critical concerns: (a) the differences in the amount of energy intake (quantity) and (b) the structure of food consumption (quality). CFPR/TUP programme in improving consumption of food during two years was successful. This programme can be considered to be an effective solution for poverty alleviation, dietary improvement and the prevention of malnutrition among ultra poor households. Their dietary intake clearly improved in terms of both quality and quantity.

The study concluded that improving the capacity of poor rural households in managing their livelihood, has a direct impact on a family's ability to challenge the vicious circle of poverty and can significantly increase their consumption of food as well as energy. Poverty reduction programme in Bangladesh has shown tangible improvement in food security status at the poorest household level that may be replicable in other developing countries.

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