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Economic conditions and nutrients intake in a Birbhum village, West Bengal, India

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ABSTRACT

Background: *Many studies reported that family income plays an important role behind food accessibility and availability. This study reports nutrients intake among the APL (above poverty line) and BPL (below poverty line) households in a Birbhum village namely Sahajapur of West Bengal, India.*

Methods: *Households of Sahajapur were classified in two categories (APL and BPL) on the basis of monthly household income. Diet survey was conducted among the APL (n=23) and BPL (n=43) households to examine the role of income behind intake of different nutrients. Child nutrition was accessed following Waterlow (1992).*

Results: *There is not much variation in food types consumed by APL and BPL households. Energy gain is lower in both the APL and BPL households as per ICMR (Indian Council of Medical Research) recommended allowance, though this deficiency is comparatively higher among the BPL households than the APL households. BPL households are deficient in greater number of nutrients than the APL households. Side by side, APL children enjoy better nutritional status than the BPL children.*

Discussion: *Poverty plays an important role behind purchase of different food items which resulted in nutrient intake of the above and below poverty line households of Sahajapur village.*

Conclusion: *There is a need of initiation of supply of essential nutrients to the vulnerable households of Sahajapur village, particularly to the BPL households.*

INTRODUCTION

Many studies reported differences in food and nutrients intake according to socioeconomic inequalities (Giskes et al. 2010, Irala-Estevez et al. 2000). Income may influence dietary quality associated with food accessibility and availability (Turrell and Kavanagh 2006). Low-income families, in general, are exposed to greater food insecurity (Sarlio-Lahteenkorva and Lahelma 2001, Furness et al. 2004). As food insecurity increases, the intake of fruit and vegetables decreases (Kendall et al.1996). Food costs may contribute to differences in household diet quality in purchasing behavior for food. Diets of higher quality with low-energy, nutrient-dense foods tends to cost more than energy-dense diets (Drewnowski and Specter 2004, Darmon et al. 2004).

Rural population (% of total population) in India was reported at 63.64 % in 2023, according to the World Bank collection of development indicators

(radingeconomics.com/india/rural-population-percent-of-total-population-wb-data.htm). Often, rural regions have experienced rural poverty, poverty greater than urban or suburban economic regions due to lack of access to economic activities, and lack of investments in key infrastructure such as education (google.com/search?q=condition+of+rural+people+in+India&sca_esv). The state of West Bengal located in the eastern part of India having 91 million people (2011 Census) of whom about 68 percent live in rural areas to whom agriculture is an important means of livelihood. Around 68.13% of the entire population of West Bengal state of India resides in rural areas, according to government statistics (google.com/search?q=Percentage+of+rural+population+in+West+Bengal&oq). This paper examines the nutrients intake in relation to economic condition of the residents of Sahajapur village of Birbhum district, West Bengal, India.

MATERIALS AND METHODS

The classification of households as Below Poverty Line (BPL) or Above Poverty Line (APL) has been evolved by government over time, particularly with the implementation of the National Food Security Act (NFSA) and state-specific schemes like the Khadya Sathi Scheme. This study consists of 23 APL and 43 BPL households. Average of individuals in APL households is 4.4 and 4.8 in BPL households.

Below Poverty Line (BPL) households:

Traditionally, BPL status was determined based on income thresholds and other socio-economic indicators. For instance, under the Khadya Sathi Scheme, the BPL income limits were set at Rs. 6,400 per month for rural areas and Rs. 11,850 per month for urban areas. However, with the introduction of the NFSA, focus shifted to identifying Priority Household (PHH) and Antodaya Anna Yojana (AAY) on the basis of deprivation criteria set by the state government.

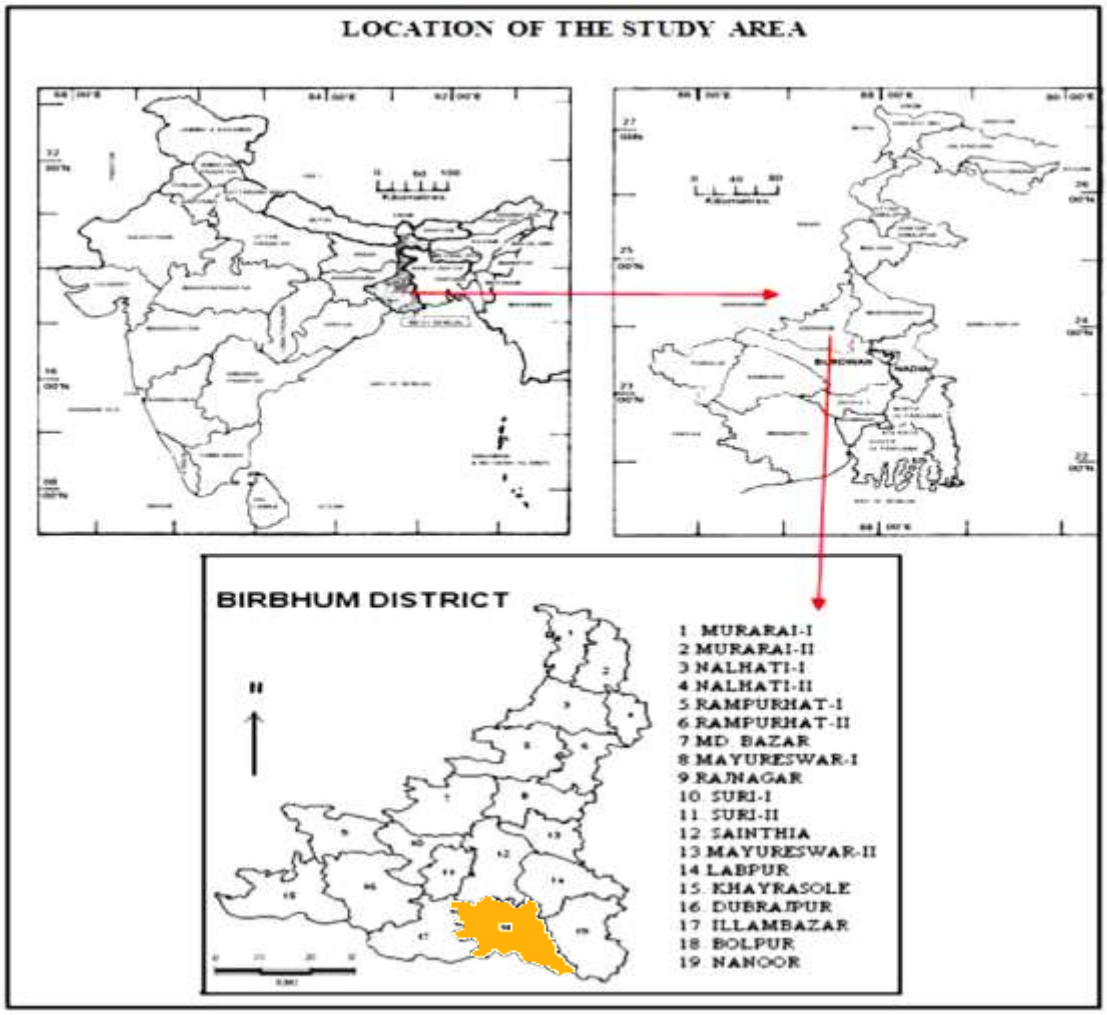
Above Poverty Line (APL) households:

Households classified as APL are those living above the poverty line. While traditional APL ration cards were issued to these households, the NFSA does not specifically categorize APL households. Instead, it focuses on PHH and AAY categories for subsidized food distribution. APL households may not be eligible for subsidized food grains under the NFSA but can apply for non-subsidized ration cards if needed.

Sahajapur village

Sahajapur (Map 1 and 2) is a medium sized village situated in Bolpur-Sriniketan block of Bolpur subdivision in the district of Birbhum in state of West Bengal in India. Sahajapur is a multiethnic village comprising of twenty-four ethnic groups (Brahmin, Bairagya, Sadgop, Aguri, Ranakarmakar, Tantubay, Tili, Sutradhar, Swarnakar, Moyra, Kumbhakar, Goala, Akure Dom, Magheya Dom, Turi Dom, Jele Kaibarta, Namasudra, Lohar, Poundrakshatriya, Ruidas, Sunri, Mahali, Santal and Bedia) including subgroups mainly Hindus by religion. The total population of the village is 1426 as enumerated from door-to-door census. Most of the villagers in Sahajapur

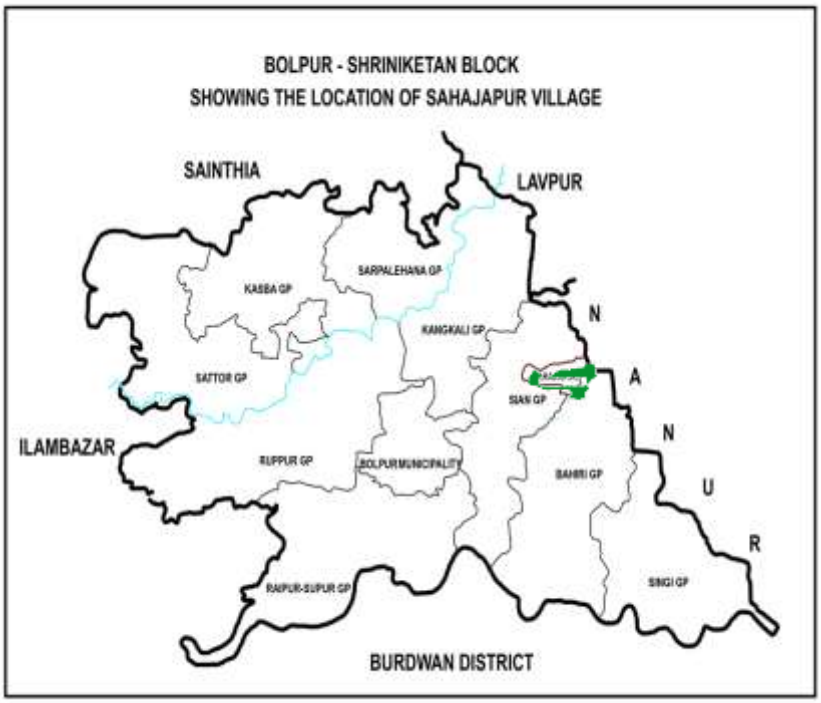
subsist on cultivation and associated agricultural activities. Though agriculture is the main economic activity, the villagers are also engaged in non-agricultural activities.



Map 1. Location of the Study Area

Inequality in income

Gini coefficient is calculated to understand the inequality in income in APL (23 households) and BPL (43 households) groups. Lorenz Curves are drawn for both the groups. It is well assumed that a low Gini coefficient indicates a more equal income distribution. It can be seen from the Figures 1 and 2 that the BPL families were represented by a more or less equal income distribution (Gini coefficient = 0.19), whereas the APL families were represented by considerably unequal distribution of income (Gini coefficient = 0.42). While, the monthly household income ranges between Rs. 10000/ to Rs. 50000/ among the APL households, it ranges between Rs. 2000/ to Rs. 10000/ among the BPL households.



Map 2. Location of Sahajapur Village

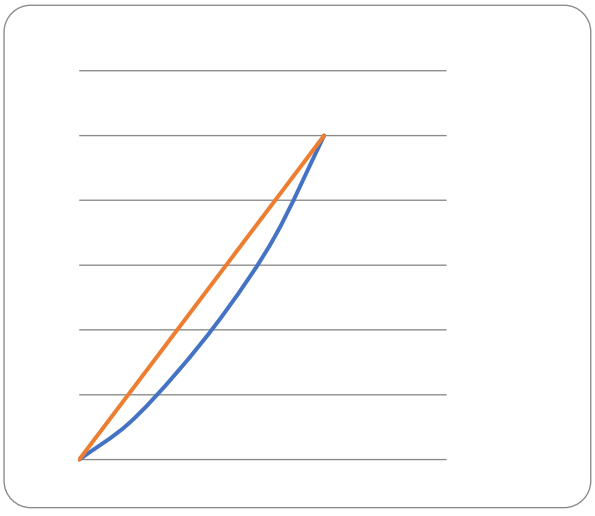


Figure 1. Lorenz Curve showing inequality in income distribution: BPL households
Gini coefficient = 0.19

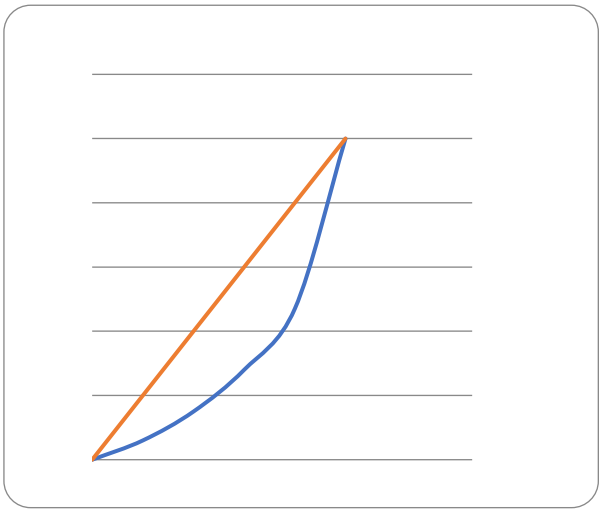


Figure 2. Lorenz Curve showing inequality in income distribution: APL households
Gini coefficient = 0.42

In six rounds, 66 households (APL: 23; BPL: 43) were studied for dietary survey. Each phase covered 11 households. Prior to each household's cooking for five days in a row, at least two visits were made to each as part of the dietary survey. A portable single-pan digital salter balance was used to measure the raw food materials that needed to be cooked for each home. Visitors who shared food from the home and family members who ate outdoors while away on the day of the investigation were also noted. Information on cooked or uncooked food waste was also documented. The amount of intake of fats, oils, sugar, jaggery, and other nutrients was calculated based on their weekly or monthly use. Based on the food consumption tables included in the ICMR publication (Gopalan, et al. 2017), the nutritional value of the ingested food item was computed. Each household's daily average intake of various foods and nutrients was calculated. It enables us to compute the consumption of various foods and nutrients per capita and per consumption unit. The basis for estimating the consumption unit is the individual's calorie need. Therefore, a healthy working reference man with a body weight of 60 kg is used as the benchmark. The moderately active reference man needs 2875 calories, which is equal to one consumption unit. Therefore, a person who needs X calories represents X 2875 units. The calorie requirements of each household's members were used to calculate the consumption unit. For the purpose of estimating calorie requirements, the woman's pregnancy and lactation status were also taken into account. The energy consumption on diets worked out with the help of ICMR food consumption tables (Gopalan et al. 2017).

RESULTS

Consumption of different food items is furnished in Table 1 during the period of diet survey for APL and BPL households separately. Both the APL and BPL groups in Sahajapur village consume wheat and rice as their staple food. Diet of these groups is constituted by leafy and non-leafy vegetables including roots and tubers. Among the pulses they mainly consume black gram and lentils. However, APL households consume dry peas in addition to lentil and black gram in this category. A variety of foods are consumed by the APL group, whereas there is not much variation in consumption of fruits in BPL group. A similarity in food consumption is noticed in APL and BPL groups in the category of saccharides, condiments and spices and fish, meat, egg etc. Beside these, they consume milk and milk products. Mustard oil is used as a cooking medium in APL and BPL groups both.

Table 1. Food consumption during diet survey

Type of the foods	Name of the foods	
	APL households	BPL households
Cereals	Wheat, rice	Wheat, rice
Pulses	Lentil, black gram, dry peas	Lentil, black gram
Leafy vegetables	Spinach, cabbage, fenugreek leaves, coriander leaves, Radish leaves, bottle gourd leaves, pumpkin leaves, fenugreek leaves	Spinach, cabbage, coriander leaves, radish leaves, bottle gourd leaves, pumpkin leaves
Non-leafy vegetables	Brinjal, cauliflower, bottle gourd, ladies finger, cowpea	Brinjal, cauliflower, bottle gourd, ladies finger, cowpea

	beans, gourd, capsicum, bitter gourd, tomtato, drumstick, french beans, green papaya, pumpkin	beans, gourd, bitter gourd, tomato, drumstick, brinjal, green papaya, pumpkin
Roots and tubers	Potato, onion, garlic, ginger, radish, carrot, beet root, sweet potato, yam	Potato, onion, garlic, ginger, radish, sweet potato, yam
Fish, meat, egg etc.	Goat meat, chicken, fish, egg, crab, lobster	Chicken, fish, egg, crab
Saccharides	Sugar, molasses	Sugar, molasses
Fruits	Ripe banana, apple, guava, grapes, pine apples, dried dates, pomegranate, mango, water melon, ripe jackfruit, lemon, lichi	Ripe banana, apple, guava, mango, water melon, ripe jackfruit
Condiments and spices	Red chili, turmeric, cumin seeds, coriander, mustard seeds, dry chilies, poppy seeds	Red chili, turmeric, cumin seeds, coriander, mustard seeds, dry chilies, poppy seeds

Nutrients

Average dietary consumption of different food items according to per consumption unit is furnished in Table 2. There exists a considerable overlap in the ranges of consumption of every variable in APL and BPL. The APL group, however, shows comparatively better consumption than their counterpart. It can be mentioned that diet of APL and BPL groups both are principally cereals. Among the BPL household diets are deficient in a greater number of nutrients than that of the APL households.

In Table 3 deficiency or excess of different nutrients are furnished according to ICMR recommended dietary allowance (Gopalan 1993) in APL and BPL groups. Recommended allowance of calorie intake for a moderately active male of 60 kg body weight is 2875 kcal. The Apl and BPL individuals both are moderate worker. Food energy gain per day per consumption unit in APL group is 2509.96 kcal and among the BPL is 2139.17 kcal, which is 365.04 kcal lesser than the ICMR recommended allowance in APL group. While in BPL group this deficiency is much higher (735.83 kcal) than that of the APL group (Table 3). However, deficit is comparatively more in case of per capita unit in both the APL and BPL groups.

Protein

APL and BPL groups are gaining 31.12 gm and 13 gm of total protein respectively per day per consumption unit from their diet, which is considerably more than the ICMR recommended allowance of 60 gm. This gain is slightly lower in case of per capita unit in both the groups. However, gain is considerably higher in APL group than their counterpart (Table 2 and 3).

Fat

ICMR recommended allowance of fat is 20 gm. Per day per consumption unit gain of fat in APL group is 29.46 gm and 24.34 gm in case of per capita unit gain. In BPL group this gain is considerably lower, which is 4.22 gm and 2.33 gm respectively (Table 2 and 3).

Calcium

A moderately active adult male requires 400 mg of calcium as recommended by ICMR. The APL households are getting 511.72 mg per day per consumption unit, which is more in quantity than the recommended allowance. The same is true in case of per capita unit. But in case of BPL group a reverse trend is perceptible. They are deficient in both the categories (per consumption unit: -101.26 mg; per capita unit: -121.56 mg) (Table 2 and 3).

Iron

The daily intake of iron per consumption unit is 20.13 mg and 17.33 mg in APL and BPL group respectively and per capita unit is 17.33 mg and 15.82 mg respectively, which are deficient in quantity than the ICMR recommended allowance. Thus, in case of this nutrient both the groups emerge as deficient. However, this deficiency is comparatively lower in APL group than their counterpart (Table 2 and 3).

Vitamin A (Retinol)

The ICMR recommended allowance of vitamin A (retinol) per day per adult male is 600 micrograms. Intake of vitamin A (retinol) in the APL and BPL groups is 791.32 micrograms and -439.07 micrograms respectively per consumption unit. Thus, while the APL group is gaining in calorie in case of this nutrient BPL group is showing a marked deficiency. The same is true in case of per capita unit in these group. (Table 2 and 3).

Vitamin B_1 (Thiamin)

Intake of vitamin B_1 is found to be more than recommended allowance in APL and BPL groups both. This is true in case of per consumption unit and per capita unit both. However, this excess is considerably more in the APL than that of the BPL (APL: - per consumption unit: +3 mg; per capita unit: +2.45 mg; BPL: - per consumption unit: +2.13 mg; per capita unit: +1.94 mg) (Table 2 and 3).

Vitamin B_2 (Riboflavin)

A more or less similar trend is evident in case of vitamin B_2 like vitamin B_1 in the APL and BPL groups both (Table 2 and 3).

Vitamin B_3 (Nicotinic acid)

Nicotinic acid consumption in APL and BPL groups is 25.81 mg and 8.70 mg respectively per day per consumption unit, which is 7.81 mg more than the ICMR recommended allowance in APL group but 9.3 mg less in BPL group. More or less similar trend is perceptible in case of per

capita unit. Thus, APL households are getting more nicotinic acid than requirement and BPL households are getting less nicotinic acid than requirement.

Vitamin C (Ascorbic acid)

The daily consumption of vitamin C in APL and BPL groups is 37.39 mg and 31.19 mg respectively per day per consumption unit, which is less than the ICMR recommended allowance of 2.61 mg in APL group and 1.72 mg in BPL group. A more or less similar trend is perceptible in case of per capita unit also.

Table 2. Means of consumption of various nutrients in the APL and BPL households

Nutrients	APL households (n= 23)		BPL households (n= 43)		Recommended dietary allowance, (Gopalan et al. 1993)
	Per consumption unit	Per capita unit	Per consumption unit	Per capita unit	
Net Energy (kcal/d)	2509.96	2230.43	2139.17	1961.23	2875
Total Protein (g/d)	91.12	82.04	73	67	60
Fat (g/d)	49.46	44.34	24.22	22.33	20
Calcium (mg/d)	511.72	469.13	298.74	278.44	400
Iron (mg/d)	20.13	17.33	17.43	15.82	28
Vitamin A: Retinol (µ g/d)	791.32	696.19	439.07	412.66	600
Vitamin B_1: Thiamin (mg/d)	4.4	3.85	3.53	3.34	1.4
Vitamin B_2: Riboflavin (mg/d)	4.4	3.84	2.92	2.74	1.6
Vitamin B_3: Nicotinic acid (mg/d)	25.81	22.75	8.70	8.38	18
Vitamin C: Ascorbic acid (mg/d)	37.39	22.99	22.88	20.85	40

Table 3. Deficiency or excess of different nutrients in terms of recommended allowance in APL and BPL households

Nutrients	APL families (n= 23)		BPL families (n= 43)		Recommended dietary allowance, (Gopalan et al. 1993)
	per consumption unit: deficiency/ excess	per capita unit: deficiency/ excess	per consumption unit: deficiency/ excess	per capita unit: deficiency/ excess	
Net Energy (kcal/d)	-365.04	-644.57	-735.83	-913.77	2875
Total Protein (g/d)	+31.12	+22.04	+13.00	+7.00	60
Fat (g/d)	+29.46	+24.34	+4.22	+2.33	20
Calcium (mg/d)	+111.72	+69.13	-101.26	-121.56	400
Iron (mg/d)	-7.87	-10.67	-10.57	-12.18	28
Vitamin A: Retinol (µg/d)	+191.32	+96.19	-160.93	-187.34	600
Vitamin B_1: Thiamin (mg/d)	+3.00	+2.45	+2.13	+1.94	1.4
Vitamin B_2: Riboflavin (mg/d)	+2.80	+2.24	+1.32	+1.14	1.6
Vitamin B_3: Nicotinic acid (mg/d)	+7.81	+4.75	-9.3	-9.62	18
Vitamin C: Ascorbic acid (mg/d)	-2.61	-17.01	-1.72	-19.15	40

'+' = excess; '-' = deficit

Child nutrition

Nutritional status according to weight for height index is the index of choice in all situations that involve short-term actions; screening, particularly in emergencies, the assessment of short-term interventions and early warning of impending food shortage (Sachdev 1995). For the sake of weight for height index the methods and classification of Waterlow (1992) has been followed in the present study. In this respect the selected children are measured for body height and weight following standard technique.

Table 4 reveal a better nutritional status among the APL children than their counterpart. Considerably high per cent of children fall in the category of normal nutritional status among the APL children (Boys: 45.00; Girls: 44.44) than the BPL (Boys: 28.57; Girls: 30.77). Half of the BPL boys fall in the category of marginal malnutrition, while 46.15% girls belong to this category in this group. APL boys (40.00%) and girls (38.90) show comparatively less occurrence in the category of marginal malnutrition. More than 21 per cent of the BPL children suffer from moderate

malnutrition, while 15 per cent of the boys and 16.66 per cent of the girls in APL group fall in this category. However, no child is recorded in the category of severe malnutrition.

Table 4. Child nutrition according to weight for height index (Waterlow 1992)

Nutritional status	APL children (1-6 years)		BPL children (1-6 years)	
	Boys (n=20)	Girls (n=18)	Boys (n=28)	Girls (n=26)
1.Normal (>90%)	9 (45.00)	8 (44.44)	8 (28.57)	8 (30.77)
2.Marginal malnutrition (90%-85%)	8 (40.00)	7 (38.90)	14 (50.00)	12 (46.15)
3.Moderate Malnutrition (84%-75%)	3 (15.00)	3 (16.66)	6 (21.43)	6 (23.08)
4.Severe malnutrition (<75%)	-	-	-	-

Note: The values in parenthesis are expressed in percentage

DISCUSSION

Giskes et al (2010) presented a literature searches of studies published between 1990 and 2007 examining socioeconomic position (SEP) and the consumption of energy, fat, fiber, fruit, vegetables, energy-rich drinks and meal patterns. The direction of associations between SEP and energy intakes were inconsistent. Approximately half of the associations examined between SEP and fat intakes showed higher total fat intakes among socioeconomically disadvantaged groups. There was some evidence that these groups consume a diet lower in fiber. The most consistent evidence of dietary inequalities was for fruit and vegetable consumption; lower socioeconomic groups were less likely to consume fruit and vegetables. Differences in energy, fat and fiber intakes (when found) were small-to-moderate in magnitude; however, differences were moderate-to-large for fruit and vegetable intakes. The findings suggest that dietary behaviors may contribute to socioeconomic inequalities in overweight/obesity in Europe. However, there is only consistent evidence that fruit and vegetables may make an important contribution to inequalities in weight status across European regions.

Energy gain in the above poverty line (APL) and below poverty line (BPL) households of the present Sahajapur village is lesser than the ICMR recommended allowance. This deficiency in BPL group is much higher (735.83 kcal) than that of the APL group (365.04 kcal). It can be recapitulated that monthly household income is considerably more among the APL households than that of the BPL households. Findings of the present study buttressed this. Present study reveals a better nutritional status among the APL children than their counterpart. While 45% of the boys and 44% of the girls in APL group enjoy normal status of nutrition it is only 28 % among the boys and 31% among the girls in BPL group.

Fat consumption is much more in APL group than that of the BPL. While calcium, vitamin A and vitamin B_3 consumption is more than the recommended allowance in APL group it is deficient than the recommended allowance in BPL group. It is interesting to note that both the APL and BPL households show more consumption of vitamin B_1 and B_2 and less consumption of iron and vitamin C in this village. Thus, poverty plays an important role behind nutrient intake of the above and below poverty line households of Sahajapur village. Present study shows that the living conditions of BPL families, particularly the scheduled castes and scheduled tribes, in Sahajapur are deplorable, characterized with marked poverty, lack of sewage and housing which consists mainly of insufficient dwelling rooms per household. In fine, it can be inferred that BPL households are exposed to greater food insecurity due to low income level, which resulted in low calorie intake among them.

Conclusion

Intake of nutrients among BPL households is poor because of their economic backwardness. Though total energy intake is also low among the APL households it is much lower among the BPL households. Most of the scheduled castes and scheduled tribe households of Sahajapur fall in the category of BPL. They are socio-economically backward. There is an urgent need of initiation of supply of nutritious diet to the vulnerable households of Sahajapur village, particularly to the BPL households.

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