Income Level and Food Intake Patterns among Male Bengalee Slum Dwellers in Kolkata, India

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ABSTRACT

This cross-sectional study explored the relationships between income levels and food intake patterns among slum dwellers in Kolkata, India. A total of 284 male subjects of Bengalee ethnicity participated in the study. The mean (SD) age, monthly family income and monthly per capita income of the subjects were 40.8 years (14.2), Indian Rupees (Rs.) 3259 (1574) and Rs. 700 (416) respectively. Potatoes, fresh vegetables, sweets and eggs were among the most frequently consumed food items on a daily basis. Butter, soft drinks, milk and ghee were least frequently consumed. The frequency of consumption of snacks, sweets and fruits showed strong significant correlations ($p <$ 0.001). Principal component analysis of the frequency of consumption of different foods showed five components that explained a cumulative variance of 56%. Eigen values of components one to five were: 1.49 for fruit, sweets and snacks; 1.36 for fish and soft drinks; 1.16 for ghee and butter; 0.65 for fresh vegetables; and 1.02 for milk. Individually, these components explained 14, 12, 11, 10 and 9% of the variations respectively. Regression analyses showed monthly per capita income to be significantly associated with frequency of consumption of soft drinks (F = 6.79, $p <$ 0.001) and fish (F = 7.90, $p<$ 0.005). Age showed a significantly positive association with butter consumption (F = 9.41, $p<$0.002), and was negatively associated with intake of soft drinks and fried snacks (F = 10.10, $p<$ 0.002). Using regression equations to predict the impact of increased income on consumption patterns, it was found that a 10% increase in income is associated with 1% increase in consumption of fish, which carries traditional prestige. A similar increase in income would also lead to 10% increase in consumption of soft drinks that has connotations of brand associated prestige.

INTRODUCTION

Several recent investigations have studied the relationship between socio-economic status and nutritional status (Khongsdier, 2002; Ulijaszek, 2003; Pryer & Rogers, 2006). Some of these studies show a strong relationship between nutritional status and several measures of income (Nube *et al.*, 1998; Pryer *et al.*, 2002; Ulijaszek, 2003; Godoy *et al.*, 2005; Bose *et al.*, 2007; Hong & Hong, 2007). Relationships among income, age and food consumption have also been widely demonstrated (Larrieu *et al.*, 2004; Giskes *et al.*, 2006; Pala *et al.*, 2006; Ard *et al.,* 2007; Deshmukh-Taskar *et al.*, 2007; Riediger *et al.*, 2007; Shin, Oh & Park, 2007). With the exception of one study in China (Cai *et al.,* 2007), the others focused on Western and industrialised populations. Price change has been shown to differentially influence purchase of different food items (Epstein *et al.,* 2007).

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Studies relating to income, age and food pattern on the Indian population are lacking, especially on low socio-economic groups. Among low income Bengalees, published dietary studies were restricted to studying the association between dietary patterns and cardiovascular risk factors (Ghosh, Bose & Das Chaudhuri, 2003; Das, Sanyal& Basu, 2005). Among Bengalee slum dwellers, it was shown that socio-economic status, especially income, had a positive effect on their nutritional status (Chakraborty,Bose & Bisai, 2006; 2009). The present investigation examines the relationship between income and frequency of intake of selected food items among male adult Bengalee slum dwellers from a suburb of Kolkata, West Bengal, India.

METHODOLOGY

This analysis is based on a cross-sectional survey carried out as part of a research project undertaken by the first two authors. The study area is a slum named *Bidhan Colony* situated approximately 15 km from Kolkata (formerly Calcutta) town centre. Kolkata is the capital city of West Bengal province. Most of the subjects had migrated from Bangladesh during the 1970-71 war in erstwhile East Pakistan.

A total of 474 apparently healthy male Bengalees, aged 18 years and above, participated in the study on a voluntary basis. At a monthly per capita income of Rs. 700, they are on average above the poverty line, which is set by the Indian government at Rs. 300, but below the minimum wage, which is set at Rs. 1,250. Education up to primary level or below and household income of Rs. 3,000 (median value) were chosen as the cut-off point for low socio-economic status in this study. Of the total of 474 subjects, 284 individuals satisfied this criterion for the present study.

Ethical approval and prior permission was obtained from the Vidyasagar University Ethics Committee. Informed consent was obtained from each participant. The municipal authorities and local community leaders were informed of the study prior to its commencement. Most households were approached in the evening, because of the greater likelihood of adult males being present. Occasionally, prior appointments were made with individuals for interviews to be carried out on a subsequent visit at a particular time. Each subject was interviewed at his respective household. In some cases, where logistical issues made it difficult to carry out the survey at home, the subjects were taken to a common place, e.g. nearest club, community centre, or a neighbouring house, where a number of them were interviewed. Care was taken to ensure that all participants resided within the boundary of Bidhan Colony. The overall response rate was around 80% of the total who had agreed to participate.

Information on ethnicity, age, monthly family income (MFI) and other socio-economic parameters were collected from each subject through a pre-tested questionnaire. All the participants were of Bengalee ethnicity. MFI was recorded in Indian Rupees (Rs) (for purposes of international comparison, the current exchange rate is approximately 38 Rs to one USD). Total monthly family income was divided by the total number of family members to obtain monthly per capita income (MPCI). Educational status of each individual was recorded as: no formal education, primary education, secondary education or tertiary education.

A pilot study was undertaken to determine the most commonly eaten food items in the study area. These were egg, milk, fish, chicken, mutton, *ghee* (clarified butter), butter, potato (in any form), fresh vegetables (except potato), fruits, Bengali sweets and fried snacks. Information on the daily frequency of consumption of these food items over a week was recorded using a food frequency questionnaire (FFQ). Although soft-drinks were not among the most

Table 1. Percentage of subjects consuming different food items on a weekly basis

Food Items	Number of times consumed per week		
	0	*1-6*	*>=7*
Butter	99	1	0
Soft drinks	91	6	3
Milk	89	6	5
Ghee	88	11	1
Sweets	37	39	23
Fried snacks	35	48	17
Fruits	32	49	19
Egg	14	63	22
Fish	2	82	16
Potato	2	5	93
Fresh Vegetables	1	60	38

commonly consumed items, it was added to the list to determine its pattern of consumption in this low socio-economic group.

Subjects were asked to recall the number of times they usually consumed particular food items. The frequencies were recorded as: zero (not at all); 1 through 7 times; or more than 7 times in the past week. Frequencies were then categorised into three groups: 0 = never or very occasionally; 1 = once through six times; and 2 = daily or sometimes more than once daily.

Correlation coefficients were computed to test the strength of association between consumption frequencies of different food items. Principal component analysis (PCA) was performed to identify the main food choice groups of the subjects and the importance of the frequency of consumption of food items. Multiple regression analyses were undertaken to test for the impact of age and MPCI on the frequency of consumption of different food items. Statistical significance was set at $p < 0.05$.

RESULTS

The mean (SD) age, MFI and MPCI of the subjects were 40.8 years (14.2), Rs 3259 (1574) and Rs 700 (416), respectively. Table 1 presents the weekly frequency of consumption of different food items. Potatoes were the most frequently consumed food item, with 93% of the subjects reporting eating them daily. This is followed by fresh vegetables, sweets and eggs, with 38, 23 and 22% of subjects consuming these foods daily, respectively. Butter, soft drinks, milk and ghee were the least frequently consumed items, with only 1, 9, 11 and 12% of subjects consuming them at least once per week. Fish consumption was also high with 97% of subjects reporting consuming it at least once per week, although only 16% of subjects report daily consumption of this item.

Table 2 shows that the frequency of consumption of snacks, sweets and fruits had strong significant ($p < 0.001$) correlation. Those consuming snacks were also likely to consume sweets and fruits. The frequency of consumption of potatoes and snacks, and of fish and soft drinks, was less strongly correlated ($p < 0.01$), while the least significant correlations ($p < 0.05$) were found between intake frequency for eggs and ghee; fish and eggs; potato and fish; and potatoes and milk.

Table 3 shows results of PCA of food consumption frequencies. The five main

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Table 2. Correlation coefficients between food items (based on frequency intake)

Food items	r	p
Snacks and sweets	0.23	< 0.001
Fruits and snacks	0.19	< 0.001
Fruits and sweets	0.16	< 0.001
Potato and snacks	0.14	< 0.01
Fish and soft drinks	0.14	< 0.01
Egg and ghee	0.13	< 0.05
Fish and egg	- 0.13	< 0.05
Potato and fish	- 0.13	< 0.05
Potato and milk	- 0.12	< 0.05

Table 3. Principal components analysis of food consumption frequency

	Component				
	1	2	3	4	5
Eigen value	1.49	1.36	1.16	0.65	1.02
Percent of variance explained	14.0	12.0	11.0	10.0	9.0
Percent of cumulative variance explained	14.0	26.0	37.0	47.0	56.0
Foods	Snacks, sweets, fruits	Fish, soft drinks	Ghee, butter	Fresh vegetables	Milk
Eigen value	0.66 0.52 0.51	0.56 0.53	0.66 0.56	0.65	0.54

components (food choice groups) explained a cumulative variance of 56.0%. Their eigen values were 1.49, 1.36, 1.16, 0.65 and 1.02 respectively. Individually, these components explained 14%, 12%, 11%, 10% and 9% of variation, respectively. The first food frequency consumption group consisted of fruits, sweets and snacks while the second was that of fish and soft drinks. The third component was ghee and butter, while fresh vegetables, and milk, were the fourth and fifth food frequency consumption groups respectively.

Results of multiple linear regression analyses of food consumption items used as dependent variables on age and MPCI are shown in Table 4. The MPCI was significantly and positively associated with the frequency of consumption of soft drinks (F = 6.89, $p < 0.001$) and fish (F = 7.9, $p < 0.005$) while age was significantly and positively associated with the frequency of consumption of butter (F = 9.4, $p < 0.002$). Age showed a negative significant association with the frequency of consumption of soft drinks and fried snacks (F = 10.1, $p < 0.002$). Among the food items significantly associated with age and/or MCPI were fish and fried snacks which were consumed by more than half the subjects.

Based on the regression equations of MPCI with frequency of fish and soft-drink

Table4. Linear regressions of individual diet component against age and monthly per capita income

Food	Equation	F	p	(Whether) consumed by over half of males
Soft drinks	0.06 −0.01 (Age) + 0.0006 (MPCI)	8.2	< 0.001	No
Soft drinks	- 0.11 +0.0006 (MPCI)	6.8	< 0.001	No
Fish	3.48 +0.0008 (MPCI)	7.9	< 0.005	Yes
Butter	- 0.05 +0.00008 (Age)	9.4	< 0.002	No
Fried snacks	4.57 −0.03 (Age)	10.1	< 0.002	Yes

consumption, it was found that even a small increase in income would result in increased consumption of a food which carries traditional prestige (fish), and of an item that carries prestige associated with modern brands (soft-drinks). For every 10% increase in MPCI, a 1% increase in frequency of fish consumption would take place, but there would also be a 10% increase in consumption of soft drinks.

DISCUSSION

This study shows the most frequently consumed food items to be potatoes, fresh vegetables, sweets and eggs. Most of these items are both relatively cheap and typical of the Bengali diet. In contrast, butter, soft drinks, milk and ghee were the least frequently consumed items. They are also relatively expensive and are not considered essential to the Bengali diet, particularly among persons with low income. Fish consumption, which is the main characteristic of the Bengali cuisine, was also relatively expensive.

The consumption of fruits, snacks and sweets is very highly significantly correlated. All these items are relatively inexpensive and are regularly eaten not only at home but also on every special and auspicious occasion. Moreover, the practice of offering these items to guests or as gifts is prevalent among Bengalees, regardless of socio-economic status. They are also routinely offered to various Hindu deities and then consumed by the devotees on every religious occasion. The strong significant correlation found between the frequencies of consumption of potatoes and snacks might be because many snacks are made from potatoes. The low consumption of both fish and soft drinks is likely to be due to the high relative price of both these items. The significant correlation between eggs and fish was due to the common Bengali practice of consuming eggs instead of fish occasionally, especially among low income individuals. The significant correlation between potato and fish could be attributed to the inclusion of potatoes in several Bengali fish recipes.

The results of the PCA were interesting. The first food choice group consisted of fruits, sweets and snacks which are items frequently consumed in the typical Bengali diet. The second component represented fish and soft drinks. While perhaps counter-intuitive, these two items carry prestige, the first being traditional and the second, modern. The regression equations which model the relationship between the frequency of consumption of food items and income showed their consumption to be (most) strikingly higher with higher income, relative to all other foods.

The significant negative relationship between age and the frequency of consumption of fried snacks may be due to

greater health awareness and/or ill health of the middle-aged and elderly, while the negative association between age and frequency of consumption of soft drinks might be due to a general dislike of, or lack of familiarity with, soft drinks among older people. While an increase in income has the potential of leading to an improved nutritional status, as shown in previous studies on the same group (Chakraborty *et al.*, 2006; 2009), it may also lead to increased consumption of non-nutritious foods including soft drinks. This is an issue that has significant nutritional implications on modernising Indian society.

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