Relationship between Selected Socio-Demographic Factors and Body Mass Index of Rickshaw Pullers

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Introduction

A good number of studies in the developing countries have shown that there is a relation between body weight or lean body mass and work capacity[1-3]. Satyanarayana *et al*[3]. reported that body wieght or lean body mass of their study population could account for more than 50% of the variation in work output, whereas height could account for 19% of the variation, and thus suggested that the underlying causes of the individual differences in work output could be attributed to either the current nutritional status or the previous nutritional status of the workers. On the other hand, Berg[4] reported that in the developing nations where heavy physical labour is common, the prevalence of undernutrition is higher.

Malnutrition is widespread in Bangladesh as in many other developing countries[5]. Most health and nutrition research conducted in developing countries has been primarily concerned with pregnant and lactating women and preschool children, who have been identified as the most vulnerable groups of the society. Little data are available on Bangladeshi manual workers in relation to nutritional status[5, 6].

Several epidemiological studies have shown that there is influence of various socio-economic and personal factors on nutritional status of children[7,8]. Since poor nutritional status results in reduction in work output and economic productivity, the present study investigate the BMI as a measure of nutritional status of the rickshaw pullers and determines the association between BMI and selected socio-demographic factors.

Materials and Methods

The study was conducted on 252 rickshaw pullers, aged between 20

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and 60 years, of Dhaka city. The rickshaw pullers while taking a short break for having tea or snacks in a road side tea stall near the Dhaka University campus were invited to participate in the study. The purpose of the study was explained to each participant and after having obtained permission, the participants were included in the study. The study was conducted between January and August, 1993.

A questionnaire was developed to obtain relevant information on the socio-demographic and general health of the participants, and questionnaire was pretested before finalization. Body weight, to the nearest 100g, was measured for each participant whilst barefoot with minimum clothing using a Lever balance (Detecto-Medic, Detecto Scales Inc. USA). Height of the subjects was also measured bare footed in the standing position to the nearest 0.1 cm. Body mass index (BMI) of the subjects were calculated from weight and height of the subjects (BMI = weight in kg/height in square meter).

Data were analyzed using SPSS/PC (version 4.1; SPSS Inc., Chicago). Mean and standard deviations of body mass index were calculated : one way analysis of variance was used to analyze for differences between groups. Simple correlation analysis was performed to assess the relationship between socio demographic variables and BMI. Multiple regression analysis was used to examine the independent relation of each of the variables on BMI of the respondents.

Results

Of the participants, 41% were aged between 20 and 29 years, 38% were between 30 and 39 years and 21% were over 40 years of age. Eighty two per cent of the participants were married. Majority (53%) of the rickshaw pullers came from small families (≤ 4 members). Fifty six per cent of the participants did not take any formal education. Nearly 56% of the respondents had family income of Taka 3000 per month. Nearly 85% did not have any landed property. About 87% of the respondents were living in rented houses and 72% lived in kancha houses; 59% of the respondents had access to municipal water supply and 55% were found to use hygienic (pucca) toilet.

Mean ($\pm$ SD) BMI of the respondents was 18.3 ($\pm$ 1.4) kg/m^2, with a median of 18.3 kg/m^2. Nearly 52% of the respondents were found undernourished (BMI < 18.5 kg/m^2). Table 1 shows that age, family size and education level of the respondents had no significant association with BMI.

No significant differences in BMI were observed between the respondents of various family income and expenditure groups (Table 2). The respondents who had houses in village were found to have

Table 1. Relationship of Age, Family Size and Education Level with BMI.

Variable	*n*	Mean	(± SD)	*p*-Value
Age (year)				
20 - 29	104	18.4	(1.4)	
30 - 39	96	18.2	(1.3)	0.29
40 - 49	42	18.5	(1.4)	
≥ 50	10	18.0	(1.5)	
Family Size				
Small (≤4 member)	133	18.2	(1.4)	0.06
Large (>4 member)	119	18.5	(1.3)	
Education Level				
Illiterate	140	18.4	(1.4)	0.15
Literate	112	18.2	(1.3)	

Table 2. Relationship between Family Income, Expenditure and Immovable Assets and BMI of the Participants.

Variable	*n*	Mean	(± SD)	*p*-Value
Family Income (Tk./Month)				
Up to 3,000	141	18.3	(1.3)	0.38
> 3,000	111	18.4	(1.4)	
Family Expenditure (Tk/Month)				
Up to 2,000	168	18.4	(1.3)	0.30
> 2,000	84	18.2	(1.5)	
Immovable Assests				
(i) House in Village				
Yes	213	18.4	(1.4)	0.05
No	39	17.9	(1.4)	
(ii) Farming Land in Village				
No Land	147	18.2	(1.4)	0.09
Have Land	105	18.5	(1.3)	

significantly (p=0.05) higher BMI compared with those who did not have houses in village. Those who had cultivable land in village had higher BMI compared with the respondents who did not have any cultivable land in village (p=0.09). Table 3 shows the relationship of occupancy, type of house and area of house with BMI. The respondents who lived in rented mess were found to have higher BMI than that of the respondents of any other occupancy groups (p=0.08). No significant difference in BMI was observed between the respondents who lived in semi-pucca/pucca houses and those who lived either in kancha houses. The respondents who lived in houses with an area of up to 40 square feet had significantly (p=0.001) lower BMI compared with the respondents who lived in bigger houses.

Sources of drinking water and type of toilet had no significant association with BMI of the study participants (Table 4). No significant difference in BMI was observed due to presence of illness. Non-smokers were found to have significantly higher BMI than those of the smokers (p=0.03).

Factors influencing BMI were explored in more detail using backward stepwise multiple regression analysis (Table 5). In the analyses

Table 3. Relationship of Occupancy, Type of House and Area of House with BMI.

Variable	*n*	Mean	(± SD)	*p*-Value
Occupancy				
Self House	7	18.2	(1.1)	
Rented House	189	18.2	(1.4)	0.08
Free House	25	18.4	(1.1)	
Rented Mess	30	18.9	(1.6)	
Type of House				
Kancha	181	18.3	(1.3)	0.56
Semi-pucca/pucca	70	18.4	(1.5)	
Area of House				
Up to 40 sq. ft.	73	17.9	(1.3)	
41 to 80 sq. ft.	119	18.5	(1.4)	0.001
≥ 80 sq. ft.	60	18.6	(1.4)	

Table 4. Relationship of Source of Drinking Water, Toilet Type, Illness and Smoking habit with BMI.

Variable	*n*	Mean	(± SD)	*p*-Value
Source of Drinking water				
Tap Water	149	18.4	(1.4)	0.44
Tube Well Water	103	18.3	(1.3)	
Toilet Type				
Hygienic	114	18.5	(1.5)	0.08
Unhygienic	138	18.2	(1.3)	
Presence of Illness				
Yes	144	18.3	(1.4)	0.87
No	108	18.3	(1.4)	
Smoking Habit				
Yes	188	18.2	(1.4)	0.03
No	64	18.6	(1.2)	

age, family size, education level, type of house, area of house, occupancy, house in village, farming land in village, family income, family expenditure, source of drinking water, type of toilet, incidence of disease and smoking habit were included. Using a P for exclusion of 0.10, age, family size, education level, family income, family expenditure, source of drinking water, type of house, occupancy, farming land in village and incidence of disease dropped out of the equation. For those variables left in the equation, area of house, house in village, smoking habit and type of toilet were strongly related to BMI. The overall F ratio was 7.1 (df=4) and was highly statistically significant (p=0.0000). The adjusted R square was 0.09 (multiple R=0.32) suggesting that the variables in the equation accounted for 9% of the variance in BMI of the rickshaw pullers.

Discussion

The present study explores the relationship of various socio-economic, environmental and health related factors with BMI of the rickshaw pullers of Dhaka city. The demographic and socio-economic data of the participants of this study bear a good resemblance to those observed by Gallagher[9], who did an extensive study on the socio-

Table 5. Regression Analysis (backward stepwise) for BMI.

Multiple R = 0.32; R - Square = 0.10; Adjusted R Square = 0.09

F = 7.1 ; df = 4 ; Sig F = 0.0000

Dependent variable = BMI

Variable	B	SEB	T	Sig T
Area of House	0.0037	0.0010	3.74	0.0002
No House in Village	-0.4381	0.2293	-1.91	0.057
Non Smoker	0.4163	0.1918	2.17	0.031
Unhygienic Toilet	-0.397	0.162	-2.45	0.015

economic aspects of rickshaw pullers of Bangladesh, and thus the study participants may be considered to be fairly representative of the whole population. To assess the nutritional status of the rickshaw pullers, body weight and height were recorded, and expressed as BMI. The BMI is a simple but objective anthropometric indicator of the nutritional status of the adult population[10]. An individual with a BMI of 18.5 kg/m^2 or more is expected to have adequate energy reserves and thus considered to be normal[10]. In the present study, about 52% of the respondents were found to be undernourished using a cut-off point of less than 18.5 kg/m^2 for BMI.

This study examined the association between various socio-demographic factors and BMI of the rickshaw pullers. Using bivariate analysis, we found no significant relationship of age (p = 0.29), family size (p = 0.38) and monthly family expenditure (p = 0.30) with BMI of the study participants. On the contrary, a number of studies have shown a significant relationship between various socio-economic conditions and the anthropometric indices of nutritional status of children[7,8]. This discrepancy in the findings may be due to different age groups of the study population.

Possession of house in village was found to have significant relationship with BMI (p = 0.05); the respondents who had houses in village had significantly higher BMI than that of the respondents who had no house in village (p = 0.09). It is generally accepted that the possession of house and/or land is an indicator of better economic condition. Area of house was also

found to have significant association with BMI of the rickshaw pullers. The respondents who lived in a larger housing area had higher BMI ($p = 0.001$). Larger housing area probably reflects better economic condition of the respondents. The findings of the present study, therefore, indicate that the better economic condition may be an important determinant of nutritional status of the rickshaw pullers. Smoking habit was found to have a significant association with BMI; non-smokers had significantly (p=0.03) higher BMI than the smokers.

In this study, the findings of bivariate analyses reveal a complex set of relationship between various socio-demographic factors and the BMI of the rickshaw pullers. It has been recognized that various socio-demographi factors have significant relation with the nutritional status of different population group, especially of infants and children. There is, however, considerable doubt about the factors which have independent association with the nutritional status. The most important reason for the descrepant findings has been the failure to distinguish associated factors from causal determinants. Many of the potential determinants are highly associated and their effects are thus mutually confounding. As bivariate analysis tends to ignore the effect of other variables while examining the relationship between a given variable and any index of nutritional status, it is suggested that such approach can only provide a preliminary idea of how important each variable is by itself. Thus it is essential to adjust for the effect of correlated variables in order to determine whether a set of variables is an important determinant of nutritional status. Therefore, we adopted a multivariate analysis approach, such as multiple regression analysis in order to examine the independent relationship of each variable on BMI of the respondents with other variables controlled.

Using multiple regression analysis, only area of house, type of toilet, possession of house in village and smoking habit were found to have significant independent relationship with the BMI of the rickshaw pullers when other factors were taken into account.

Summary

A cross sectional study was carried out of investigate the relationship between varius socio-demographic factors and body mass index of the rickshaw pullers. Two hundred fifty two rickshaw pullers, aged between 20 and 60 years, of Dhaka city participated in the study. Socio-

economic and other relevant information were collected using a pretested questionnaire. Body weight and height were recorded, and body mass index were calculated. By cut-off point for BMI < 18.5 kg/m^2, about 52% of the study participants were found to be undernourished. Using bivariate analysis, area of house, possession of house in village and smoking habit were found to have significant effect on body mass index of the participants. When age, family size, education level, type of house, area of house, occupancy, house in village, farming land in village, family income, family expenditure, source of dirinking water, type of toilet, incidence of disease and smoking habit were accounted for by multiple regression analysis, a strong relationship was found for BMI with area of house, possession of house in village, type of toilet and smoking habit.

References

1. Vitery F. Considerations on the effect of nutrition on the body composition and physical working capacity of young Guatemelan adults. In. *Amino Acid Fortification of Protein Foods.* (Scrimashow, N. S. and Altschul, A.M. eds). Cambridge, Massachusetts : The MIT Press. 1971.
2. Spurr GB, Barac-Nieto M and Maksud MG. Clinical and sub-clinical malnutrition : their influence on the capacity to do work. *Annual Progress Report to Agency for International Development Project.* No. AID/CSD 2943. 1974.
3. Satyanarayana K, Naidu AN, Chatterjee B and Rao BSN. Body size and work output. *Am. J. Clin. Nutr.* 1977 30 : 322-325.
4. Berg A. *The Nutrition Factors.* Washington D. C. Brook-lings Institution. 1973.
5. INFS. Nutrition Survey of Rural Bangladesh (1981-82). Institute of Nutrition and Food Science. Univeristy of Dhaka. Dhaka. Bangladesh. 1983.
6. Bhuiyan MNH. Nutritional status of the rickshaw pullers of the slum areas of the Dhaka city. *M. Phil. thesis. Institute of Nutrition and Food Science,* University of Dhaka, 1993.
7. Ahmed F, Bhuyan MAH, Shaheen N, Barua S, Margetts BM and Jackson AA. Effect of socio-demographic conditions on growth of urban school children of Bangladesh. *Eur. J. Clin. Nutr.* 1991, 45 : 327-330.
8. Henry FJ, Briend A, Fauveau V, Huttly SRA, Yunus M and Chakraborty J. Risk factors for clinical marasmas : a case-control study of Bangladeshi children. *Int. J. Epidemiol.* 1993, 22 (2) : 278-283.
9. Gallagher R. *The Rickshaws of Bangladesh.* University Press Ltd., Dhaka. 1992.
10. Shetty PS and James WPT. Body mass index : a measure of chronic energy deficiency in adults. FAO Food and Nutrition Paper 56. FAO, Rome, Italy. 1994.