ANTHROPOMETRIC PROFILES AND ASSESSMENT OF NUTRITIONAL STATUS BASED ON BODY MASS INDEX (BMI) AMONG THE PRAWN SEED COLLECTORS OF SUNDERBAN, WEST BENGAL INDIA

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ABSTRACT ■ A cross-sectional study was undertaken to determine the anthropometric profile and nutritional status based on body mass index (BMI) among the prawn seed collectors of Sunderban, India. The study was performed on total 110 prawn seed collectors, which was randomly selected comprising 50 male and 60 female (aged 20 years to 40 years) were selected randomly from the villages of the Sajenakhali block and Sandeshkhali block of Sunderban. Anthropometric measurements including height, weight as well as BMI and waist-hip ratio (WHR) were measured. There was a significant change in waist circumference and waist-hip ratio among the male and female prawn seed collectors. This study also revealed that more female (45%) than male (38%) prawn seed collectors were undernourished based on BMI. This study shows that among the prawn seed collectors, 20–25 years age male groups suffer from (12%) moderate malnutrition whereas, in case of female prawn seed collectors, this age group suffers (17%) moderate malnutrition. In case 20–25 years age groups of female prawn seed collectors only 10% subjects suffer from severe malnutrition. This study concludes that the prevalence of adult undernutrition, moderate malnutrition and severe malnutrition is high among the female prawn seed collectors than the male subjects.

Key Words: Nutritional status, Body Mass Index, Prawn seed collectors, Anthropometry, Sunderban.

INTRODUCTION

The Sunderban is mainly known as the largest river deltas as well as the largest estuarine mangrove forest in the world. Most of the people of Sunderbans are mainly dependent on prawn seed collections which are treated as the backbone of Sunderbans economy (Das et al., 2012). Prawn seed collectors are compelled to carry out a considerable amount of hard, manual, rigorous tasks in the river of the Sunderban area for collecting prawn seeds because this is a major earning resource among them. Collection and cultivation of prawns are an alternative means of subsistence in the area. Prawn seed cultivation not only provides them with ready cash but it appears to provide more earning opportunities than agriculture (Gangopadhyay et al., 2008).

Nutrition and health were the most important contributory factors for human resource development in the country like India (Amirthaveni and Barikor, 2001). Knowledge of the nutritional status of a community is

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necessary to have a comprehensive idea about its development process, as under-nutrition is one of the major health problems in developing countries. It is reported that the basic causes of under-nutrition and infections in developing countries are poverty, poor hygienic conditions and little access to preventive health care (Mitra et al., 2001).

Malnutrition is a general term that has been used to mean overnutrition, undernutrition, specific nutrient deficiencies, or imbalances (Chen et al. 2001). Malnutrition which refers to an impairment of health either from a deficiency or excess or imbalance of nutrients is public health significance all over the world. Furthermore, malnutrition in a population requires an appropriate nutrition intervention to improve health and nutritional status (Yusof et al. 2007). The large sections of Indian population were suffered from varying degrees of protein-energy deficiency (Gopalan et al. 2002).

Nutrition is also increasingly used as an indicator of standard of living, and anthropometric measurements represent an important component of nutritional assessment. World Health Organization (WHO, 1995) has recommended that anthropometry could be used to assess the nutritional and health status of adults. Adult nutritional status can be evaluated in many ways; the BMI is most widely used because its use is simple, inexpensive, safe and suitable for large-scale surveys (James et al., 1994; Lee and Nieman, 2003; Bose and Chakraborty, 2005). Thus, BMI is the most established anthropometric indicator used for assessment of adult nutrition status (Lee and Nieman, 2003). BMI is generally considered a good indicator of not only the nutritional status but also the socio-economic condition of a population, especially adult populations of developing countries (Ferro-Luzzi et al., 1992;

Nube and Asenso-Okyere, 1998; Mosha, 2003; Das and Bose, 2010).

Evaluating the nutritional status of individuals and population groups is a vital tool in public health initiatives and a feasible indicator of standards of living (Nube and Asenso-Okyere, 1998). The main aim of the present study was to determine and compare the nutritional status of male and female prawn seed collectors of Sunderbans. This paper also focused on the socio-demographic as they affect the nutritional status among the prawn seed collectors of Sunderban.

MATERIALS AND METHODS

i) Selection of working sites:

The study was conducted in the Sajenakhali block and Sandeshkhali block of Sunderban. The village under study is within the district of South 24 Parganas, which lies in the extreme southeastern part of the state of West Bengal, India.

ii) Selection of Subjects:

The study was performed on total 110 prawn seed collectors, which was randomly selected comprising 50 male and 60 female. Prior permission was obtained from local community leaders as well as relevant authorities before the commencement of the study and ethical approval was approved by the Institute Ethical Committee.

iii) Measurement of socioeconomic status:

Socio-demographic profile data were collected using a set of questionnaires among both male and female prawn seed collectors.

iv) Anthropometric measurement:

The height and weight of the prawn seed collectors were measured by an anthropometer (Martin's Anthropometer) and "Crown" weighing machine (Mfg. by Raymon Surgical Co.) respectively. Height and weight were recorded with a barefooted, wearing only light clothes. Height and weight were measured using standardized calibrated scales

to the nearest 0.1 cm and 0.5 kg respectively. Weighing scale was calibrated periodically against known standards and weighing scale was calibrated to the zero before taking every measurement. The Body Mass Index (BMI) of all the subjects was also computed by using the following formula:

BMI (kg/m2) = Weight (kg) / height (m2)

The Waist-Hip Ratio (WHR) and Conicity Index were computed by using the following formula: WHR = Waist circumference (cm)/ Hip circumference (cm) (Valdez et al. 1993).

CI = Waist Circumference (m)/0.109?vweight (kg)/height (m)

v) Assessment of nutritional status:

Nutritional status was evaluated using internationally accepted World Health Organization (WHO, 1995) BMI guidelines. The following cut-off points were used: Undernutrition: BMI < 18.5; Normal: 18.5 = BMI < 25.0; Overweight: BMI = 25.0 (Bose and Chakraborty, 2005). Undernutrition was further classified as moderate malnutrition and severe malnutrition. BMI <18 to 17 is known as undernutrition, whereas BMI <17 to 15 and BMI <15 is mainly known as moderate malnutrition and severe malnutrition respectively (Cole et al., 2007).

vi) Statistical Analysis:

Student "t" tests were done to evaluate the any significant differences (p < 0.05) in the stature, weight, BMI, waist and hip circumference and waist/hip ratio among male and female prawn seed collectors. Chi-square test was utilized to compute sex differences in nutritional status among the prawn seed collectors for the chosen level of significance (p < 0.05). Statistical analysis was performed using the statistical package PRIMER OF BIOSTATISTICS (Primer of Biostatistics5.0.msi, Msi Version = 1.20.1827.0, Primer for Windows, McGraw-Hill).

RESULTS

The socio-demographic characteristics of both group (male and female) prawn seed collectors were shown in table 1. A total 110 prawn seed collectors comprising 50 male and 60 female, who gave consent to participate in this study. The mean age of male prawn seed collectors was 26.9 (±5.45) and the mean age

Table 1. Socio-Demographic characteristics of the Prawn seed collectors

Variables	Frequency	Percentage
Gender		
Male	50	45.5
Female	60	54.5
Religion		
Hindu	64	58.2
Muslim	46	41.8
Age Structure		
20-25	49	44.6
26-30	37	33.6
31-35	16	14.6
36-40	04	3.6
40+	04	3.6
Family Structure		
Nuclear	63	57.3
Joint	47	42.7
Education Level		
No Formal Education	39	35.5
Primary Education	49	44.5
Secondary Education	18	16.4
Higher Education	04	3.6
Martial Status		
Married	50	45.5
Unmarried	58	52.7
Widow	02	1.8
Annual Per capita income (Quartiles)		
I (Rs. 1500- 2000)	27	24.5
II (Rs. 2001- 2500)	42	38.2
III (Rs. 2501- 3500)	34	30.9
IV (Rs. 3501-4000)	07	6.4

of female prawn seed collectors was 26.45 (±5.35). This demographic study shows that 44.6% of the prawn seed collectors from the age group of 20- 25 years, whereas in this study next dominating age group was 25 – 30 years (33.6%) followed by 30 – 35 years (14.6%), 35 – 40 years (3.6%) and 40+ years (3.6%). A majority of the households were Hindus (58.2%) and Muslims (41.8%). About 57% of the families were nuclear, while about 43% were joint families. Another important demographic characteristic is education level of the workers. The majority of the prawn seed collectors have low educational attainment. Only 44.5% have qualified for primary educational level, whereas only 35.5% of the prawn seed collectors did not have any formal education. Only 16.4% of the prawn seed collectors qualify at the secondary education level and only 3.6% qualify for the higher secondary education level. About 53% of the respondents were unmarried whilst 45.5% were married and only 1.8% was widowed.

Physical characteristics of the two groups (male and female prawn seed collectors) of workers are presented in table 2. The mean heights of the male and female prawn seed collectors were almost same. The other physical parameters like weight, BSA and BMI, no significant difference was observed between these two working groups. There is a significant change in waist circumference and waist/hip ratio among male and female prawn seed collectors, but hip circumferences and conicity index doesn't show any significant change between these two working groups.

Table 3 represents the nutritional status of both group of prawn seed collectors based on BMI. This table shows that 62 percent male prawn seed collectors and 53 percent female prawn seed collectors' shows under the category of normal weight according to BMI. Whereas 16 percent male and 12 percent female prawn seed collector was underweight. This table also indicates that 20 percent male prawn seed collectors and 23 percent female prawn seed collectors were under the category of moderate malnutrition according to BMI. Only 02 percent male prawn seed collectors suffered from severe malnutrition, whereas 10 percent female prawn seed collectors suffered from severe malnutrition based on BMI. This table also showed that there is no significant relationship in between male and female prawn seed collector in terms of different categories of malnutrition based on BMI.

Table 4 indicates that nutritional status of male and female prawn seed collectors based

Table 2. Anthropometric characteristics of male and female Prawn seed collectors

Variables	Male	Female	t Value	P value
	Mean SD	Mean SD		
Height (cm)	159.5 (± 5.06)	159.6 (± 6.20)	0.09	0.927
Weight (kg)	46.60 (± 7.47)	45.57 (± 6.78)	0.757	0.450
BSA	1.44 (± 0.08)	1.43 (± 0.11)	0.535	0.593
BMI (kg/ m^2)	18.64 (± 1.79)	18.32 (± 2.83)	0.692	0.490
Waist Circumference (cm)	90.34 (± 4.16)	88.07 (± 2.88)	3.36	0.001
Hip Circumference (cm)	92.7 (± 4.07)	92.9 (± 2.71)	0.308	0.759
Waist / Hip Ratio	0.974 (± 0.005)	0.947 (± 0.007)	22.84	0.001
Conicity index (CI)	1.52 (± 0.08)	1.50 (± 0.10)	1.40	0.162

Table 3. Nutritional status of prawn seed collectors based on BMI

MI (kg/m2)	Males		Females		χ^2 value	OR	95% CI	P valu
	N	%	N	%				
MI <15 evere malnutrition	01	02	06	10	1.74	0.183	0.02 – 1.58	0.187
MI <17 loderate malnutrition	10	20	14	23	0.036	0.821	0.32 – 2.05	0.850
MI 17 - <18 nder-weight	08	16	07	12	0.145	1.442	0.48 – 4.29	0.704
MI 18-24.9 ormal Weight	31	62	32	53	0.52	1.427	0.66 – 3.06	0.471
MI 25.0 – 29.9 ver weight	00	00	01	02	----	-----	------	-----

Table 4. Nutritional status of male and female prawn seed collectors based on BMI and different age group

SEX	AGE GROUP	BMI <15 Severe Malnutrition	BMI <17 Moderate Malnutrition	BMI 17 - <18 Under Nutrition	BMI 18-24.9 Normal Nutrition	BMI 25.0 – 29.9 Overweight	Total
Male	20-25	01 (02)	06 (12)	04 (08)	08 (16)	00 (00)	19 (38)
	26-30	00 (00)	03 (06)	03 (06)	14 (28)	00 (00)	20 (40)
	31-35	00 (00)	01 (02)	01 (02)	05 (10)	00 (00)	07 (14)
	35-40	00 (00)	00 (00)	00 (00)	02 (04)	00 (00)	02 (04)
	>40	00 (00)	00 (00)	00 (00)	02 (04)	00 (00)	02 (04)
Total		01 (02)	10 (20)	08 (16)	31 (62)	00 (00)	50 (100)
Female	20-25	06 (10)	10 (17)	03 (05)	11 (18)	00 (00)	30 (50)
	26-30	00 (00)	03 (05)	03 (05)	11 (18)	00 (00)	17 (29)
	31-35	00 (00)	01 (02)	00 (00)	07 (12)	01 (02)	09 (15)
	35-40	00 (00)	00 (00)	01 (02)	01 (02)	00 (00)	02 (03)
	>40	00 (00)	00 (00)	00 (00)	02 (03)	00 (00)	02 (03)
Total		06 (10)	14 (23)	07 (12)	32 (53)	01 (02))	60 (100)

Percentage of total number of subjects in parentheses

on BMI and different age group. This table shows that among the male prawn seed collectors, 20–25 years age groups suffer maximum (12%) moderate malnutrition, whereas 26–30 years age group suffered next (06%) from moderate malnutrition based on BMI. In case of undernutrition based on BMI among the male prawn seed collectors 20–25 years, age groups suffered most. 26–30 years age group of male prawn seed collectors having the highest (28%) in normal nutrition category based on BMI, whereas 20–25 years and 31–35 age group of male prawn seed collectors constitute the normal nutrition

based on BMI as 16 % and 10 % respectively. In this study, no male subjects have been found as overweight based on BMI. In case of female prawn seed collectors 20–25 years age groups suffers maximum (17%) moderate malnutrition, whereas 26–30 years age group suffered next (05%) from moderate malnutrition based on BMI. In case of undernutrition based on BMI among the female prawn seed collectors 20– 25 years and 26–30 years age group having the same percentage (05%) affected. 20– 25 years and 26–30 years age group of female prawn seed collectors also having the same percentage

(18%) in normal nutrition category based on BMI, but 31-35 years age group of female subjects having 12% in normal nutrition category. Only one female subjects of 31-35 years age group having the overweight category based on BMI.

DISCUSSION

Socioeconomic factors are one of the essential and correlate components with nutritional status. Olasunbo and Olubode (2006) suggested that demographic aspects of the population such as age, gender and township status are all factors that may explain the differences in nutritional status. In this study, most of the prawn seed collectors are from the low socioeconomic group. Owing to poor socio-economic conditions, both groups of prawn seed collectors are compelled to carry out a considerable number of manual, rigorous tasks in the prawn seed collection activities to earn the money and help their family and their children to maintain the minimum requirement of nutritional status.

Anthropometric measurements are widely used as a tool for assessing nutritional status. These measurements are easily performed with appropriate training, do not require sophisticated equipment, can be performed in field settings and are inexpensive, yet still play an important role in clinical practice. The BMI is, therefore, a useful tool in both clinical and public health practice for assessing adult nutritional status. Nutritional status was evaluated using the World Health Organization (WHO) recommended age and sex-specific cut-off points of BMI based on the National Health and Nutrition Examination Survey (NHANES) percentile values (WHO, 1995). Undernutrition was defined as BMI <15 is known as severe malnutrition as recommended by WHO (WHO, 1995). This study shows that female prawn seed collectors suffered from severe and moderate malnutrition (according to WHO) than male prawn seed collectors. Body mass index (BMI) is often used to reflect total body fat, while the waist circumference and WHR are used as surrogates for body fat centralization. Therefore, our study was able to compare the two different study group for the classification of body status, which was BMI and body fat content.

Malnutrition is a widespread problem and an important concern for public health in India. In this study, it was revealed that 45% of the female prawn seed collectors and 38% male prawn seed collectors are suffering from malnutrition. According to Rousham (1996) and Choudhury et al. (2000), gender inequalities in health varied significantly according to occupational status. Poverty is the main cause of the malnutrition. In the Sunderban area, most of the people are mainly dependent on prawn seed collections which are treated as the backbone of Sunderbans economy due to salinity in the Sunderban delta area is not suitable for agriculture.

Using a cut-off point of <18.5 kg/m2 as the criterion for chronic energy deficiency or severe malnutrition (James et al., 1988). This study shows that 42% of the male and female prawn seed collectors suffered from undernutrition category. Some of the reasons for underweight among the adults could be poor dietary intake, poor education, early marriage and high morbidity caused by unhygienic practices, environmental and economic factors (Nube and Asenso-Okyere, 1998). According to Yousuf et al. (2007) undernutrition of adults, with special regard to mothers, may be carried over to their children. Hence, there is a need to pay special attention to this isolated group to improve their overall nutritional status. This study concludes that due to poor socioeconomic condition and lack of education the people of

Sunderban mainly prawn seed collectors suffering from low nutritional status, which indicates major public-health problem among them.

CONCLUSION

It appeared from the BMI study that a large percentage of the prawn seed collectors was undernourished, which might be related to their low socioeconomic status. There was a significant change in waist circumference and waist-hip ratio among the male and female prawn seed collectors. This study also revealed that more female (45%) than male (38%) prawn seed collectors were undernourished based on BMI. This study shows that among the prawn seed collectors, 20–25 years age male groups suffer from (12%) moderate malnutrition whereas, in case of female prawn seed collectors, this age group suffers (17%) moderate malnutrition. In case 20–25 years age groups of female prawn seed collectors only 10% subjects suffer from severe malnutrition. This study concludes that the prevalence of adult undernutrition, moderate malnutrition and severe malnutrition is high among the female prawn seed collectors than the male subjects.

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