Eurasian Journal of Anthropology Euras J Anthropol 4(2):36−44, 2013

Gender differences in nutritional status among the adult Meiteis of Cachar district of Assam, India

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Received August 7, 2013
Accepted December 24, 2013

Abstract

The present paper intends to study the gender differences in nutritional status with reference to age, education and family income. The data have been collected by household census method and nutritional anthropometry among 264 adult Meiteis (123 males, and 141 females) of 20 to 79 years age of Cachar District of Assam, India. The study reveals that more than 30 percentage of the populations are suffering from chronic energy deficiency (CED) malnutrition (males=27.6%, females=33.3%) while more than 7 percentage of the adults are battling with over-nutrition (males=8.1%, females=6.4%). Chi-square test doesn't show any significant (P=0.356) difference in nutritional status between males and females. Although slight positive association exists between body mass index (BMI) and age (r_{xy}=0.056) but BMI of the adult Meiteis show significant positive association with year of schooling (r_{xy}=0.143, P<0.05) and annual family income (r_{xy}=0.215, P<0.01).

Keywords: *Adult, sex, age group, educational status, income category*

Introduction

The body mass index (BMI) is a simple numeric measure to assess fatness or thinness of an individual which is widely used to determine nutritional status in a population group. BMI is the most established anthropometric indicator used not only for assessment of adult nutritional status but also the socio-economic situation of a population in a developing country like India (Khongsdier, 2002; Tungdim and Kapoor, 2001). Nutritional status based on BMI is also related to demographic, economic, social and environmental conditions of the population (Pryer and Rogers, 2006; Subramanian and Smith, 2006).

India is one of the few countries in the world where males and females have nearly the same life expectancy at birth (Mandal et al., 2011). The distinctive female advantage in life expectancy is not observed in India which advocates that there are

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ISSN: 2166-7411

organized problems with women's health. The health of Indian female is basically linked to their status in society as most of the Indian communities follow patrilineal social structure which bears strong influence on gender differences. Gender differences in eating behavior strengthen from early to late adolescence and explained by gender specific energetic demands and culture typical principles (Askovic and Kirchengast, 2012).

Cachar is one of the largest districts of Assam located in the north eastern part of India. Cachar is considered as a plain district but a number of hills spread across and surrounding the district. It is one of the most economically backward districts of India which is largely due to geographical barrier with the rest of the country. The district has a population of 1,736,319 with a sex ratio of 958 females per 1000 males and a literacy rate of 80.36% (http://www.census2011.co.in). Meiteis are one of the endogamous ethnic communities inhabiting in the district like Bengali, Brishnupriya, Dimasa Kachari, etc. Linguistically the Meiteis belong to the Tibeto-Burman ethnic group (Basu et al., 2005). Rice is their staple food and agriculture is their mainstay of livelihood. Their family structure is patrilineal in nature and marriage by negotiation is the prevailing practice among them.

Very few ethnic based studies have been undertaken on adult nutritional status from North East India (Basu, 2006; Khongsdier, 2001; Khongsdier and Basu, 2004). But there is lack of published data dealing with nutritional status of rural based adults of Meitei community from southern part of Assam, India. The present study is an attempt to find out of the prevalence of different grades of nutritional status among the Meitei males and females of the area. The main objectives are;

1. To assess the nutritional status based on BMI among the adult Meitei males and females.
2. To see the gender-wise distribution of nutritional status with reference to some socio-economic factors like age, education and family income.

Materials and methods

The data have been collected by household census method and nutritional anthropometry among 264 adult Meiteis (123 males, and 141 females) of 20 to 79 years age from Sundari Part-IV village of Sonai Block and Saint Katherine village of Palonghat Block of Cachar District, Assam. This cross-sectional study has been conducted between November and December, 2010. Socio-economic data have been collected by household census method from 118 households which include the relevant information such as sex, age (completed year), education (last qualified education status), occupation, total income from various sources, expenditure, household assets, cultivable land, crops and vegetable cultivations, etc. Anthropometric measurements such as weight and height have been taken by using standard techniques (Weiner and Lourie, 1981). Height and weight have been recorded to the nearest 0.1 cm and 0.5 kg, using standard anthropometer and weighing scale respectively.

The sample is free from any selection bias. All the available willing individuals who fall within the age group 20-79 years were included in the study. Pregnant women were excluded from the study. Assessment of nutritional status has been done by following James et al. classification (James et al., 1988). Nutritional status has also been assessed by following WHO classification to compare the present data with earlier findings of NFHS-3 data (WHO, 1995). Chi-square test has been applied and a *P* value of <0.05 was considered as significant. Pearson's correlation coefficient was performed to see the association of BMI with age (completed year), education (year of

schooling) and family income (total income from various sources).

Results and discussion

The study reveals that more than 60 percent of adult Meitei populations are either belong to low normal (22.3%) or normal nutritional status (39.8%). But a major proportion of adult Meiteis are having chronic energy deficiency (CED) malnutrition (30.7%). While a small proportion of Meiteis are either overweight (6.8%) or obese (0.4%). The inhabitants of the area practice agriculture as their main occupation but under the impact of global industrialization, living standard of the people has improved being marked with over-nutrition. On the other hand, the influence of the same has not covered the whole society as a result of which a section of the population of the area are still battling with under-nutrition. The co-existing state of under and over nutrition among the population is evidenced from the results which is described as double burden of malnutrition by Shukla et al. (2002).

Table 1: Nutritional status among the adult Meiteis of Cachar district of Assam, India

Nutritional status based on BMI Category									
Sex		CED III	CED II	CED I	Total CED	Low Normal	Normal	Over Weight	Obesity I
		<16.0	16.0-17.0	17.0-18.5	<18.5	18.5-20.0	20.0-25.0	25.0-30.0	30.0-35.0
Male	No.	7	7	20	34	24	55	10	-
	%	5.7	5.7	16.3	27.6	19.5	44.7	8.1	-
Female	No.	11	8	28	47	35	50	8	1
	%	7.8	5.7	19.9	33.3	24.8	35.5	5.7	0.7
Total	No.	18	15	48	81	59	105	18	1
	%	6.8	5.7	18.2	30.7	22.3	39.8	6.8	0.4
Chi-square		-			χ^2=4.391, d.f.=4, *P*=0.356				

Frequency of CED malnutrition is very high (33.3%) among the females in comparison to males (27.6%). Males are found to have better (low normal & normal-64.2%) nutritional status in contrast to females (60.3%). Frequency of overweight males are more (8.1%) compared to overweight females (5.7%); while only one woman is found in obesity grade I (0.7%). Statistically no significant difference (χ^2=4.391, d.f.-4, Sig.-0.356) is observed between males and females in regard to their nutritional status. In an earlier research it was expressed that females were more likely to have musculoskeletal problems than males, which perhaps reflect harder life faced by females who never retire from household work unless totally disabled (Medhi et al., 2006). In India generally a male enjoys better socio-economic status compared to a female due to patrilineal nature of family organization. So, the present study tries to give emphasis on the gender difference and the findings show variations in nutritional status between two genders.

Health is one of the principal assets of every human being and it has a very close association with chronological age (Bhatia, 1983). An individual becomes more vulnerable to multiple diseases with the advancement of age and the effect of which are reflected in health status. In the present study age is categorized into three groups such as 20-39 years (young aged), 40-59 years (middle aged) and 60-79 years (old aged) age group to observe the nutritional status with reference to age (refer Table 2). It is observed from the study that CED malnutrition is very high (40.0%) among the old aged population (above 60 years) of both the sexes but old aged males are slightly

more prone to malnutrition (40.7%) compared to their female (38.9%) counterparts. Earlier findings also mentioned about high prevalence (male-40.79%, female-40.86%) of CED malnutrition among the adult Dimasa, a tribal population living in the same environment (Sarmah and Barbhuiya, 2011). In the same study it was also indicated that elderly males are slightly more prone to CED malnutrition in contrast to females of the same age group.

Table 2: Nutritional status on the basis of age group among the adult Meiteis

Nutritional Status based on BMI Category							
		CED	Low Normal	Normal	Over Weight	Obesity	Chi-square
Sex	Age group (years)	<18.5 No. (%)	18.5-20.0 No. (%)	20.0-25.0 No. (%)	25.0-30.0 No. (%)	>30.0 No. (%)	
Male	20-39	15 (26.8)	11 (19.6)	26 (46.4)	4 (7.1)		χ^2=5.447,
	40-59	8 (20.0)	7 (17.5)	20 (50.0)	5 (12.5)		d.f.=6
	60-79	11 (40.7)	6 (22.2)	9 (33.3)	1 (3.7)		*P*=0.488
Female	20-39	20 (30.8)	20 (30.8)	23 (35.4)	1 (1.5)	1 (1.5)	χ^2=8.409
	40-59	20 (34.5)	10 (17.2)	22 (37.9)	6 (10.3)	-	d.f.=8
	60-79	7 (38.9)	5 (27.8)	5 (27.8)	1 (5.6)	-	*P*=0.395
Both	20-39	35 (28.9)	31 (25.6)	49 (40.5)	5 (4.1)	1 (0.8)	χ^2=10.026
	40-59	28 (28.6)	17 (17.3)	42 (42.9)	11 (11.2)	-	d.f.=8
	60-79	18 (40.0)	11 (24.4)	14 (31.1)	2 (4.4)	-	*P*=0.263

More than 65 percentage of young aged population (low normal-25.6% & normal-40.5%) are found to be in better nutritional status. Gender wise distribution also indicates similar trends (male- 66.0%, females-66.2%) besides 67.5 percentage (combination of low normal &normal) among middle aged males. Although overweight status is found to be in almost equal proportion in both young and old aged people but it is comparatively very high among the middle aged people (male-12.5%, female-10.3%, combine-11.2%). Nutritional status in relation to age group doesn't show any significant difference (Chi-square test) among the adult Meiteis. Pearson's correlation coefficient (refer Table 5) among the adult Meiteis disclose a negligible positive correlation between BMI and age (r_{xy}= male: 0.092, female: 0.019, total: 0.056). Earlier findings pointed out a negative association between age and BMI of adults (Banik, 2009). A sizeable number of middle aged Meiteis (especially 50-59 age groups) live in relatively better socio-economic condition shows high BMI value due to which a slight positive relation may be observed between age and BMI of the present study.

Health awareness and health-seeking behavior are influenced by educational status which in turn contributes to nutritional status. Education of the people has been divided into three categories such as up to Primary School level (illiterate to class IV), Middle to High School level (class V to X) and Beyond High school level (above class X or beyond matriculation). The study reveals that CED malnutrition (refer Table 3) is very high (42.6%) among those adult Meiteis who are either illiterate or studied up to primary school level. But Meitei males (53.8%) of the same educational status are more prone to CED than their female (39.0%) counterparts. Though overweight category is uniformly distributed among the adults yet it is slightly more (7.8%) among those who studied up to middle or high school level. Earlier study also accounted more than 45 percentage of CED malnutrition and almost 10 percentage of overweight among adult females with no formal education (Bose et al., 2009).

Table 3: Nutritional status on the basis of educational status among the adult Meiteis

Nutritional status based on BMI Category							
Sex	Educational status (schooling)	CED <18.5 No. (%)	Low normal 18.5-20.0 No. (%)	Normal 20.0-25.0 No. (%)	Over weight 25.0-30.0 No. (%)	Obesity >30.0 No. (%)	Chi-square
Male	Up to primary[1]	7 (53.8)	2 (15.4)	4 (30.8)	-		χ^2=6.237
	Middle to high[2]	19 (23.8)	15 (18.8)	38 (47.5)	8 (10.0)		d.f.=6
	Beyond high[3]	8 (26.7)	7 (23.3)	13 (43.3)	2 (6.7)		*P*=0.397
Female	Up to primary[1]	16 (39.0)	10 (24.4)	11 (26.8)	4 (9.8)	-	χ^2=15.374
	Middle to high[2]	27 (37.0)	14 (19.2)	28 (38.4)	4 (5.5)	-	d.f.=8
	Beyond high[3]	4 (14.8)	11 (40.7)	11 (40.7)	-	1 (3.7)	*P*=0.052
Both	Up to primary[1]	23 (42.6)	12 (22.2)	15 (27.8)	4 (7.4)	-	χ^2=14.478
	Middle to high[2]	46 (30.1)	29 (19.0)	66 (43.1)	12 (7.8)	-	d.f.=8
	Beyond high[3]	12 (21.1)	18 (31.6)	24 (42.1)	2 (3.5)	1 (1.8)	*P*=0.070

1: illiterate to class IV
2: class V to X
3: above class X (beyond matriculation)

Nearly 75 percentage of adult Meiteis who studied beyond high school level are seemed to be in good health status (low normal-31.6% & nomal-42.1%) but the combination is found to be very high in females (81.4%) compared to males (66.6%). No statistical (Chi square) significant difference is observed among different categories of educational level in nutritional status. But it has almost touched 0.05 cut off value among the females (π^2- 15.374, df-8, Sig.-0.052). So, the above results indicate a positive effect of individual's education on their nutritional status. Pearson's correlation coefficient also shows significant positive association between BMI and education (r_{xy}=0.143, p<0.05) of the adult Meiteis (refer Table 5). Similar result is also noticed among the males (r_{xy}=0.241, p<0.01) but in case of females BMI has a very low positive association with education (r_{xy}=0.066). In a developing country like India, where less educated people are engaged in labor concentrated occupations but highly educated people are living a more or less sedentary way of life, a positive association between education and BMI can be seen, as in the present study. Shukla et al. (2002) mentioned similar remarks in their study on body mass index of adult population in western India.

The studied population has been categorized as low (less than 1 lac), medium (1 lac to 2 lacs) and high income group (more than 2 lacs) on the basis of yearly family income (in Indian rupees) to see it's relation with nutritional status (refer Table 4). It is noticed from the results that CED malnutrition (26.9%) is found to be very less among the high income group but overweight (8.7%) and obesity (1.0%) status are also observed to be more in the same income group. The results indicate that individuals whose family income is high enjoy better nutritional status (low normal & normal-63.4%). A significant positive correlation (refer Table 5) is observed between BMI and annual family income of the adult Meiteis in general (r_{xy}=0.215, p<0.01) and specifically in both males (r_{xy}=0.244, p<0.01) and females (r_{xy}=0.180, p<0.05). India is passing through a transitional phase where occupation of an individual is influenced by his or her educational status which in turn made an impact on his or her income. These factors to a great extent influence the overall socio-economic status and effect of which can be observed in health status of an individual.

Table 4: Nutritional status on the basis of annual family income (category) among the adults

Nutritional status based on BMI category							
		CED	Low normal	Normal	Over weight	Obesity	
Sex	Annual family income (INR)	<18.5 No. (%)	18.5-20.0 No. (%)	20.0-25.0 No. (%)	25.0-30.0 No. (%)	>30.0 No. (%)	Chi-Square
Male	Less than 1 Lac[A]	12 (30.0)	10 (25.0)	15 (37.5)	3 (7.5)	-	χ^2=4.309d.f.=6 *P*=0.635
	1 Lac to 2 Lacs[B]	8 (25.0)	7 (21.9)	16 (50.0)	1 (3.1)	-	
	More than 2 Lacs[C]	14 (27.5)	7 (13.7)	24 (47.1)	6 (11.8)	-	
Female	Less than 1 Lac[A]	19 (33.9)	14 (25.0)	20 (35.7)	3 (5.4)	-	χ^2=5.036d.f.=8 *P*=0.754
	1 Lac to 2 Lacs[B]	14 (43.8)	8 (25.0)	8 (25.0)	2 (6.2)	-	
	More than 2 Lacs[C]	14 (26.4)	13 (24.5)	22 (41.5)	3 (5.7)	1 (1.9)	
Both	Less than 1 Lac[A]	31 (32.3)	24 (25.0)	35 (36.5)	6 (6.2)	-	χ^2=5.025d.f.=8 *P*=0.755
	1 Lac to 2 Lacs[B]	22 (34.4)	15 (23.4)	24 (37.5)	3 (4.7)	-	
	More than 2 Lacs[C]	28 (26.9)	20 (19.2)	46 (44.2)	9 (8.7)	1 (1.0)	

[1] Indian Rupee (INR) =0.019 US Dollar (USD) (http://www.prokerala.com/news/finance/currency.php)

Gender wise distribution of nutrition status on the basis of family income shows less number of CED malnutrition among the males (25.0%) and the females (26.4%) of middle and high income group respectively. Overweight males are less (3.1%) in middle income group but among the females it shows marginal difference among the three income groups. Shafique et al. (2006) observed that overweight was more prevalent among the comparatively wealthiest group of both urban and rural areas and also indicated about the double burden of malnutrition among the women of Bangladesh. In the present study, it is observed on the basis of different grades of nutritional status that males of middle income group and females of high income group are enjoying healthier nutritional status (BMI=18.5-25.0: male-71.9%, female-66.0%). Chi-square tests do not show any statistical significant difference among the three income groups in case of males and females separately and combine as a whole. Pal et al. (2011) indicated that some important aspects of living circumstances such as food, shelter, health, etc. matters much more than the conventional income.

National Family Health Survey-3 data (NFHS-3 during the year 2005-06) of state of Assam showed that the frequency of underweight, normal, overweight and obese adult individuals are 34.5%, 56.7%, 7.6% and 1.1% respectively (Shome et al., 2011). Normal nutritional status is found to be very high (71.0%) in the North-East zone (refer Table 6) against country's (57.1%). Underweight (19.2%), overweight (8.6%) and obese individuals (1.2%) are found to be very less in the north east zone in comparison to overall picture of the country (29.1%, 11.0%, and 2.8% respectively).

North-East zone of India consists of 8 (eight) different states such as Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura. But apart from Assam and Tripura numerically dominant inhabitants of other six states are tribal population. Gender wise comparison of nutritional status on the basis of the same data indicates that males are enjoying better nutritional status compared to their female counterparts. Comparison of nutritional status of the adult Meiteis of the present study indicates that it is worse than North East zone scenario but better than state (Assam) and country (India) picture. Same trend is also visible when it is considered gender wise. Some of the earlier researchers mentioned that women malnutrition is associated with various demographic and socio-economic factors like age, occupation, education, standard of living, etc. (Griffiths and Bentley, 2001; Radhakrishna and Ravi, 2004; Roy et al., 2004).Thus it can be said that there is gender

and spatial variation in the proportion of different grades of nutritional status.

Table 5: Pearson's correlation coefficient between BMI and bio-social factors

	Pearson's correlation coefficient					
	Age	Education	Family inc	Weight	Height	BMI
Male (n=123)						
Age (years)	1	-.441**	.115	-.056	-.319**	.092
Education (year of schooling)	-.441**	1	.217*	.303**	.243**	.241**
Yearly family Income (INR)	.115	.217*	1	.209*	.021	.244**
Weight (kg)	-.056	.303**	.209*	1	.524**	.894**
Height (cm)	-.319**	.243**	.021	.524**	1	.094
BMI (kg/m^2)	.092	.241**	.244**	.894**	.094	1
Female (n=141)						
Age (years)	1	-.723**	-.026	-.138	-.373**	.019
Education (year of schooling)	-.723**	1	.133	.206*	.336**	.066
Yearly family income (INR)	-.026	.133	1	.211*	.092	.180*
Weight (kg)	-.138	.206*	.211*	1	.357**	.896**
Height (cm)	-.373**	.336**	.092	.357**	1	-.091
BMI (kg/m^2)	.019	.066	.180*	.896**	-.091	1
Combine (n=264)						
Age (years)	1	-.570**	.054	-.069	-.222**	.056
Education (year of schooling)	-.570**	1	.179**	.315**	.361**	.143*
Yearly family income (INR)	.054	.179**	1	.225**	.097	.215**
Weight (kg)	-.069	.315**	.225**	1	.611**	.817**
Height (cm)	-.222**	.361**	.097	.611**	1	.052
BMI (kg/m^2)	.056	.143*	.215**	.817**	.052	1

Correlation is significant at the: - **- 0.01 level;*- 0.05 level; (2- tailed).

Table 6: Comparison of nutritional status of adult Meiteis with state, zone and country data

Nutritional status based on BMI category						
Sex	Area	Underweight <18.50	Normal 18.50-24.99	Over weight 25.0-29.99	Obese ≥30.00	Reference
Male	Meitei, district[1]	27.6	64.2	8.1	-	Present study
	Assam, State	35.0	59.0	5.5	0.4	(Shome et al., 2011)
	North-East, Zone	18.2	73.4	7.7	0.7	
	India, Country	29.1	59.5	9.7	1.6	
Female	Meitei, district[1]	33.3	60.3	5.7	0.7	Present study
	Assam, State	34.4	56.0	8.3	1.3	(Shome et al., 2011)
	North-East, Zone	19.7	69.6	9.2	1.5	
	India, Country	29.0	55.8	11.7	3.5	
Both	Meitei, district[1]	30.7	62.1	6.8	0.4	Present study
	Assam, State	34.5	56.7	7.6	1.1	(Shome et al., 2011)
	North-East, Zone	19.2	71.0	8.6	1.2	
	India, Country	29.1	57.1	11.0	2.8	

[1]Adult Meiteis of two villages of Cachar district of Assam, India.

Conclusion

The present study reveals that Meitei males are enjoying better nutritional status in contrast to their female counterparts. Frequency of normal nutritional status is comparatively high among the middle aged adults resulting very low positive association between age and BMI of both males and females. CED malnutrition is high among those adults who are illiterate or studied up to primary school level. Education (year of schooling) shows positive association with BMI but it is significant among the males only. Family income shows a significant positive correlation with BMI in both males and females and so better (normal) nutritional status is observed in higher family income group. Further studies are required to get deep insight knowledge as present study is an attempt to get base line information on adult nutritional status of the Meitei community living in two villages of Cachar district of Assam, India.

Acknowledgement

Authors are thankful to Mr. Dilip Singha of Saint Katherine village for his kind co-operation and help while conducting the field work. Authors are also grateful to University Grant Commission for providing financial assistance under UGC- MANF scheme.

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