

Study on Nutritional Status of Tea Garden Workers of Assam with Special Emphasis to Body Mass Index (BMI) and Central Obesity

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INTRODUCTION

Body mass index is an important Anthropometric index which is most frequently used for detection of early cases of protein-calorie malnutrition among adults. It is independent of age and takes into consideration of weight in kilograms (kgs) in relation to height in meters (mts.) (Yadu et al., 2000) Body mass index with its universal usage has emerged as an important indicator of health and nutritional status among human subjects at different age levels (Kaur and Singh, 2000). Obesity is a chronic disease with multi factorial etiology including genetics, environment, metabolism, life style and behavioral component (Sharma, 2000). There is strong association between obesity and co-morbidities such as coronary heart disease, type-II Diabetes, Hypertension and Dyslipidemia (Rippe et al., 1998). Human generally put on weight usually as a result of fat gain and women do so more than men (Rosenbaum et al., 1985; Stini, 1996). The individuals who are relatively inactive are more likely to gain weight and thus carry a higher risk than those who frequently engaged in physical activity (Kaur and Singh, 2000). Not only does the higher but lower BMI also increases the expectancy of health risk as revealed by study in Norway (Waler, 1984, 1988). A typical 'U' shaped curve expresses the relationship between BMI and all cause mortality, people on both ends i.e. BMI <19 and BMI of 31 and higher seem to be most vulnerable and are susceptible to the process of pruning by nature (Waler, 1984). The predominant form of protein-energy malnutrition in adult is under nutrition i.e. the result of a sustained negative energy (calorie) balance. This may be due to insufficient food supply in famine or where food is available, to anorexia, increased energy requirement or increased energy loss. Undernourished individuals are susceptible to infections with respiratory, muscular weakness by wasting, bronchopneumonia, carries an increased mortality (Edwards et

al., 1995).

Tea garden workers have migrated to Assam in the latter part of nineteenth century and early part of twentieth century from central and south India viz. Madhya Pradesh, Bihar, Orissa and Andhra Pradesh (Griffiths, 1967). At present they are an integral part of Assamese society. They are involved in a major industrial economy of Assam. Most of them are hard working labours working in tea industry. Reports available reveal a gloomy picture of nutritional and morbidity profile among the community. But no specific base line study have been undertaken for comparison with other standards or for future reference till date. This centre has decided to take up a study on their anthropometric parameters in adults with specific emphasis on BMI and obesity. This study is expected to form a baseline for future study on nutritional status in this group of population.

MATERIAL AND METHODS

A total of 1014 Tea garden workers aged 30 years and above were selected randomly from one of the tea garden of Assam. Out of which 511 were males and 503 females. Trained persons according to standard protocol (Rose et al., 1982) measured height and body weight, with participants barefooted and with light clothing. Height was recorded using portable stadiometer (SECA, Germany) and weight was measured using digital electronic balance (SECA). Waist and hip girth were measured over light clothing with participants standing in erect position with feet together. Waist girth was measured at the level of umbilicus and the hip circumference at the iliac crest. Body mass index (weight in kg / height in m²) (Rameshwar, 1993) and waist-hip ratio were calculated as indices of general obesity and central obesity, respectively. BMI was calculated and classified according to the WHO (1995) criteria. Degree of severe malnutrition was also added to the classification.

Table 1: Age and gender wise distribution of tea garden workers (n=1014) according to BMI

Age groups	Classifi-	30 to 39 yrs		40 to 49 yrs		50 to 59 yrs		60 yrs & above		Total	
BMI	cation	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
ranges											
<16.00	Severe	12	41	16	34	8	22	15	24	51	121
	malnutrition	2.35%	8.15%	3.13%	6.76%	1.57%	4.37%	2.94%	4.77%	9.98%	24.06%
16.00	Grade-II	35	39	17	21	13	13	17	16	82	89
-16.99	Thinness	6.85%	7.75%	3.33%	4.17%	2.54%	2.58%	3.33%	3.18%	16.05%	17.69%
17.00-	Grade-I	57	87	54	36	30	28	19	16	160	167
18.49	Thinness	11.15%	17.3%	10.57%	7.16%	5.87%	5.57%	3.72%	3.18%	31.31%	33.20%
18.50-	Normal	91	77	69	30	32	9	24	9	216	125
24.99	range	17.81%	15.3%	13.5%	5.96%	6.26%	1.79%	4.7%	1.79%	42.27%	24.85%
25.00-	Grade-I	2			1					2	1
29.99	over weight	0.39%	-	-	0.2%	-	-	-	-	0.39%	0.2%
30.00-	Grade-II										
39.99	over weight	-	-	-	-	-	-	-	-	-	-
Total		197	244	156	122	83	72	75	65	511	503

Statistical analysis of variance was done with the help of computer software.

RESULTS

It was observed that 42.27% male and 24.85% females had normal grade of BMI (Table 1). Higher percentage (male 31.31% and females 33.2%) of both the sexes were found to be in grade-I thinness. Grade-II thinness was found among 16.05% male and 17.69% females. Only 0.3% workers (in male 0.39% and in females 0.2%) were in Grade-I obesity. None of them were with grade-II obesity. It was noticeable that severe degree of malnutrition BMI <16.00 was observed in 16.96% subjects (in male 9.98% and in females 24.06%) among the workers.

Relative body weight with increasing age in both the sexes showed a decreasing trend (Table

2). Mean body weight of male 47.30 ± 5.93 in 30 to 39 years age group decreased to 44.07 ± 7.01 in 60 years and above age group ($F=6.40$, $P=0.000$). Similarly in case of females mean body weight of 39.53 ± 5.06 in 30 to 39 years age decreased to 36.37 ± 5.15 in 60 years and above age group ($F=9.65$, $P=0.000$). Similarly the mean BMI of both the sexes though below normal (17.81 ± 2.06) showed a decreasing trend with the increase of age. In 30 to 39 years age group mean BMI of 18.45 ± 1.98 in male and 17.78 ± 1.85 in females decreased to 17.66 ± 2.25 and 16.72 ± 2.12 respectively in 60 years and above age group (male $F=3.33$, $P=0.019$ and female $F=7.82$, $P=0.000$). The waist to hip ratio was below normal in both the sexes yet, within this range in males it showed an increasing trend with the increase in age and the difference was statistically significant ($F=5.57$, $P=0.001$).

Table 2: Age and sex wise comparison of Weight, BMI and WHR of Tea garden workers.

Age groups	30-39 yrs		40-49 yrs		50-59 yrs		60 yrs & above		Analysis of Variance
	Mean	± SD	Mean	± SD	Mean	± SD	Mean	± SD	
Male (n=511)									
Weight	47.30	5.93	46.73	5.71	45.14	6.20	44.07	7.01	F=6.40 P=0.000
BMI	18.45	1.98	18.26	1.73	18.05	1.82	17.66	2.25	F=3.33 P=0.019
WHR	0.85	0.05	0.86	0.05	0.87	0.05	0.88	0.06	F=5.57 P=0.001
Female (n=503)									
Weight	39.53	5.06	37.89	5.07	36.89	5.73	36.37	5.15	F=9.65 P=0.000
BMI	17.78	1.85	17.48	2.09	16.85	1.77	16.72	2.12	F=7.82 P=0.000
WHR	0.83	0.05	0.84	0.05	0.84	0.06	0.84	0.06	F=1.04 P=0.38

DISCUSSION

In our study it was observed that 42.27% male were with normal BMI in comparison to females (24.85%) but the difference was minimal in 30 to 39 years age (Male 17.81% and females 15.3%). The overall percentage of workers with normal BMI was 33.63%. This is much lower than the results of other studies conducted in different states (Yadu et al., 2000; Yadav et al., 1999). In a study among Sugalis, a tribal population of Andhra Pradesh higher percentage of normal BMI was observed in both the sexes with female preponderance (male 48.23% and females 49.93%) (Yadu et al., 2000). Though malnutrition was prevalent among tribal and rural population of Bihar, yet 59.2% males and 43.5% females and 57.8% males and 39.5% females respectively had normal BMI (Yadav et al., 1999; Yadav and Singh, 1999). In our study severe malnutrition was observed in 9.98% males and 24.06% females out of which 8.15% of females suffered from severe malnutrition in a vital period of life i.e. in 30 to 39 years age group. Whereas in case of Sugalis it was observed that severe malnutrition was prevalent in 6.52% males and 5.99% females (Yadu et al., 2000). While comparing thinness it was observed that percentage of thinness in both grade-I (mild) and grade-II (moderate) were higher in the study population than that of the Sugalis (Yadu et al., 2000). Grade-I thinness was prevalent in 31.31% males and 33.20% females and grade-II thinness in 16.05% males and 17.69% females in our study population but in Sugalis grade-I thinness was detected in 32.91% males and 31.94% females and grade-II thinness in 11.77% males and 11.16% females. In terms of chronic energy deficiency (CED) i.e. BMI <18.5 was detected in 57.34% male and 74.95% females among tea garden workers which was higher than the results documented in tribal population of Bihar (male 39.1% and female 55.4%) (Yadav et al., 1999) and also higher than the rural districts of Bihar where CED has been detected in 40.5% male and 59.8% females (Yadav and Singh, 1999). Overweight was virtually non-existent in our study population and only in 0.39% male and 0.2% females BMI was observed to be more than 24.99.

It was observed that with the increase of age there was a significant decrease of mean body

weight and mean BMI in both the sexes. The WHR of male observed an increasing trend with increasing age and the difference of mean was significant ($F=5.57, P=0.001$) but in case of females WHR in all the age groups, it was more or less similar. This finding was in contrast to other reported studies (Kaur and Singh, 2000; Kuskowska and Bergstrom, 1993). Study conducted among Punjabi females documented an increase of body weight and WHR in older age group of females than younger age group (Kaur and Singh, 2000) and an another study conducted among Swedish women with a follow up after eight years showed an increase of mean BMI and the prevalence of over weight and obesity in both the sexes (Kuskowska and Bergstrom, 1993).

CONCLUSION

This study reveals that there is high degree of under nutrition among tea garden workers of Assam where females were the worst sufferer. Moreover, these hard working labour force is with chronic energy deficiency which may result to huge loss in work capacity. In depth analysis of the underlying causes of malnutrition and effective intervention is the need of the hour.

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KEY WORDS Tea Garden Workers. BMI. WHR.

ABSTRACT A cross sectional study was done on 1014 (Male 511 and female 503) tea garden workers of Assam to assess their nutritional status in terms of Body Mass Index (BMI) and central obesity. Normal BMI was observed only in 33.63 percent workers (In males 42.27 percent and in females 24.85 percent). It was observed that BMI decreased with the increase in age in both the sexes which was statistically significant (male $F=3.33, P=0.019$ and female $F=7.82, P=0.000$). As per WHO classification grade-I thinness was detected in 31.31% males and 33.2% of females. 16.05% males and 17.69% females had grade-II thinness. Severe degree of malnutrition was observed in 16.96% of the study subjects (In males 9.98% and in females 24.06%). Though waist to hip ratio (WHR) was below normal in both the sexes yet in males it showed an increasing trend with the increase in age and the difference was statistically significant ($F=5.57, P=0.001$).

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