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Nutrient Intake and Anthropometric Profile of Healthy Adult Men and Women Couples from Selected Households in West Sea Coast Belt of South Karnataka-A Comparative Study

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Abstract

Health is a relative expression of metabolic efficiency, and is a valued state of existence in individuals especially during adulthood. Food intake is directly associated with the health and wellbeing of a person.

Background: Co existence of under nutrition and obesity is a matter of major concern.

Objective: It was proposed to develop data base about the mean nutrient intake, its difference among genders, and anthropometric profile of adult population and association between BMI and WHR.

Methodology: Demographic data, nutrient intake (diary technique), energy expenditure (WHO method) and anthropometric measurements (height, weight, MUAC, waist and hip circumferences) were obtained using standard procedures. 70 couples aged 45-54 yrs who were free from degenerative disease from different socioeconomic classes (SEC) of Karkala and Moodbidri Taluks formed the subjects.

Results: All the participant were educated, regarding occupation, 41% men had business and 58% women were homemakers others had varied kind of jobs. 51% couples were non vegetarians. Mean nutrient (Energy) intakes of male and females partners respectively are: 1916.0 ± 368.470 and 1745.0 ± 560.764 kcals; 50.3 ± 8.170 and 51.27 ± 24.569 g protein, 32.4 ± 5.997 and 56.91 ± 20.946 g fat; Compared to RDA, intake of all nutrients except fat and calcium was markedly low. Both men and women had normal BMI however WHR was higher indicating central obesity (1.08 ± 0.14 and 1.08 ± 0.13); MUAC was 29.05 ± 6.29 and 24.74 ± 9.28 cms for males and females respectively.

Conclusion: Central obesity was observed among both the adult group although they had normal BMI.

Keywords: Anthropometric profile; BMI; Central obesity; Nutrient intake; WHR

Introduction

Functional aspect of health status is determined by anthropometric an measurement which is influenced by dietary intake [1,2]. Health status is now seen by the public health community as a multidimensional construct [3,4]. Poor nutrition can lead to, impaired physical and mental development, reduce productivity and poor immunity [5-7]. It is not necessary that all the undernourished belong to nutritionally did not deprive households, nor it is true that all members of nutritionally deprived households have poor nutritional status [8]. There is a need to strength the involvement of men and women in Nutrition and Health programme and their governance. Poor nutritional outcomes of infants and children arise from the poor health status of women, overall poverty, and lack of hygiene and proper health facilities [9]. India is experiencing a rapid economic growth, however there has been a sustained decline in per capita calorie and protein consumption during the past 25 years; fats are the only major nutrient group whose per capita consumption is unambiguously increasing. Patnaik (2005) points out that during the same period the calorie intake in below-poverty-line (BPL) households also declined [10]. Programme and project activities would, thus, need to be analysed more sharply in view of their ultimate impact on Household Food Security (HFS) and individual nutritional status [11].

Productive group is very important for national development and therefore the Nutritional studies have to be studied from time to time. Calorie intake is a bottle neck deficiency in all the developing country including India. Fat intake was lower and was considered to bear and effect on low calorie intake. However India is experiencing a transition in all its food and nutritional aspect reports indicates a continuous incline in fat intake, however a paradox exist although fat intake there has been no change in the calorie deficit [12]. The Nutrition and health Status reflects strong science, supporting the health benefits of eating a healthful diet and maintaining a healthy body weight is often helped by a drug treatment [13,14]. Anthropometric indicators are used to evaluate the prognosis of chronic and acute diseases, and to guide medical intervention in the adults Anthropometric measures are highly reliable for determining the nutritional status as they relate to age and gender in healthy adults.

Methodology

The data is a part of epidemiological study conducted on700 households selected from Karkala and Moodbidri taluks according to

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cluster sampling. 70 (10%-35 each from taluks) of men and women couples were selected for a nutritional assessment. The inclusion exclusion criteria for selection of the sub sample were as follows: Age of men 45-64 women 40-55. The study was approved by Institutional Human Ethical Committee (IHEC), University of Mysore, Mysore, India. A consent letter was obtained form the participants. The content of the letter was read by the contracter/ head and explained to the labour groups

Inclusion criteria

Age >40 and 45 years for females and males, living together , not on any regular medication, noon diabetic, non-hypertensive, not undergone any medical or surgical procedures in previous six month, actively involved in personal, economic and households activities. Those who provided complete information required for the study.

Exclusion criteria

Men and women above 60 and 55 years couples either both or any one counterpart on regular medication or diabetes or hypertensive, also inactive for any reason was excluded.

Family demography, education, occupation and income of the couples were obtained using self-reporting questionnaire. Food intake was recorded by 7 days dairy technique. The female partners were trained to record the intakes using a 200 ml cup identified form their respective households. They were contacted every alternate day to ensure correct entries. Anthropometric measurements like height, weight, mid upper arm circumference (MUAC), waist circumference (WC) and hip circumference (HC) were obtained using standard technique. The methods of measurement was as described by Jelliffee [15]. Body weight was measured using electronic body weighing machine waist recorded nearest to 0.1 Kg. The machine was checked in standard weights everytime before use. Height was measured using a height scale, measurement was made nearest to 0.1 cms.

Statistical Analysis

Descriptive analysis was used to analyze the data; Chi-square analysis was employed for comparisons between variables. Mean, Standard Error and co efficient of variation was calculated. The means were compared using student 't' test, period 't' and Coefficient Correlation was performed among the variables to indicate the dependence on one another (Pearson's correlation tests).

Results and Discussion

The demographic profile of the selected households is presented in Table 1. Nuclear families formed 67% and joint families are 24%. 97% of the families comprised of less than 6 members, and had children ≤ 4. Majority of the participants practised Hinduism followed by Jainism. There was an essentially similar distribution of the families practising vegetarianism/Non vegetarianism.

Table 2 presents the education and occupation status of the couples. All the couples who from study population were literates 64 and 54% of males and females respectively had graduates and professional degrees. 59% of female counterparts were homemakers, while 56% male counterparts were businessmen. Others professions were teachers, professionals. 20 and 21% of male and female couples worked on daily wages.

The mean anthropometric profile of the participants in the in-depth study is presented in Table 3. It can be seen that mean age of the participating male and female couples was 54.0 ± 10.0 and 47.0 ± 9.0; mean height was 165.0 ± 0.20 and 157.0 ± 0.20 respectively. Females were shorter than their male counterparts and also lighter since men weighed on an average 64.6 kgs while females weighed 60.3 kgs, their actual body weights were closer to the ideal body weight. Thereby men and women were found in the normal Body Mass Index (BMI) (Table 4). The mean waist and hip circumferences for males were 92.9 ± 13.57 and 84.6 ± 13.27 cms respectively whereas for women it was 88.3 ± 14.6 and 80.1 ± 13.01 cms. The waist circumference for both men and women were high indicating abdominal adiposity. When Waist Hip Ratio (WHR) was computed all men and women had WHR more than 1.0, thus have central obesity. Hence it can be commented that majority of the couples had ideal body weight but their WHR was high indication of central obesity, this is the characteristic of Indian population. Haemoglobin content of both

Variables	Characteristics	% (No.)
Family Type	Nuclear	67.0(47)
	Joint	24.0(17)
	Extended	8.0(06)
Family Size	2-4	54.0(38)
	5-6	43.0(30)
	7-8	3.0(02)
No. of Children	1-2	53.0(37)
	3-4	44.0(31)
	>5	3.0(02)
Religion	Hindu	66.0(46)
	Christians	4.0(03)
	Jainism	30.0(21)
Type of diet	Vegetarian	49.0(34)
	Non vegetarian	51.0(36)

Table 1: Demographic details of the couples (n=70).

Variables	Characteristics	Male % (No.)	Female % (No.)	Chi Square
Education	Attended school	36.0(25)	46.0(32)	6.554^{NS}
	Graduates	44.0(31)	48.0(34)	
	Professionals	20.0(14)	6.0(04)	
Occupation	Home Maker	---	59.0(41)	67.365***
	Daily wagers	21.0(15)	20.0(14)	
	Profession/Teachers	21.0(15)	11.0(8)	
	Business/Govt. Officials	56.0(39)	8.0(6)	
	Retired	2.0(1)	2.0(1)	

*P<0.05, **P<0.01, ***P <0.0001 and NS-Non Significant

Table 2: Education, occupation and income status of the male and female couples.

Subjects (70 couples)	Males	Female
	Mean ± sd	Mean ± sd
Age (yrs)	54.0 ± 10.0	47.0 ± 9.0
Ht (cms)	165.0 ± 0.20	157.0 ± 0.20
Actual wt (kgs)	64.6 ± 10.17	60.3 ± 9.65
Ideal wt (kgs)	61.2 ± 8.57	57.7 ± 7.0
Muac (cms)	29.0 ± 6.29	24.7 ± 9.28
Wc (cms)	93.0 ± 13.57	88.3 ± 14.16
Hip (cms)	84.6 ± 13.27	80.1 ± 13.01
Bmi	23.23 ± 1.84	22.68 ± 3.50
Whr	1.08 ± 0.14	1.08 ± 0.13
Hb(%)	13.5 ± 1.64	12.0 ± 1.55

Table 3: Mean anthropometric profile of the selected participants: male and female couples of the households.

	Males				Females			
Nurtrients	**Rda Mean ± sd**	**Actual intake mean ± sd**	**% adequacy**	**P Value**	**Rda Mean ± sd**	**Actual intake mean ± sd**	**% adequacy**	**P value**
Energy (kcal)	3168.0 ± 526.47	2042.0 ± 369.92	64		2200.0 ± 422.702	1875.0 ± 511.090	85	***
Protein (g)	60 ± 0	50.3 ± 8.170	83		50 ± 0	51.2 ± 24.569	102	*
Fat (g)	25 ± 0	32.4 ± 5.997	130		25 ± 0	53.1 ± 16.07	212	Ns
Ca (mg)	400 ± 0	865.0 ± 267.499	219	Ns	400 ± 0	651.4 ± 163.052	163	
Iron (mg)	28 ± 0	27.6 ± 7.182	100	*	30 ± 0	35.0 ± 14.970	116	**
Retinol(µg)	600 ± 0	488.8 ± 126.783	81	Ns	600 ± 0	498.5 ± 107.329	83	Ns
B carotene (µg)	2400 ± 0	1245.88 ± 471.110	52	Ns	2400 ± 0	1643.70 ± 1184.048	68	Ns
	t value-1.99-2.0							

*p<0.05, **p<0.01, ***p <0.0001 and ns-non significant

Table 4: Mean daily nutrient intake: comparison between male and female couples.

Nutrients	Males				Females			
	Mean	**Variance**	**Cv**	**Sem**	**Mean**	**Variance**	**Cv**	**Sem**
Energy (k cals)	2042.0	77460.0	19.0	44.24	1875.0	261213.4	27.0	61.13
Protein (g)	50.3	66.7	16.0	0.97	51.5	603.7	47.0	2.93
Fat (g)	32.4	36.0	18.0	0.71	57.0	438.8	36.0.	2.50
Ca (mg)	916.1	115665.0	37.0	40.64	651.4	26586.1	25.0	19.48
Iron (mg)	27.6	51.50	26.0	0.85	35.0	224.2	42.0	1.78
Retinol(µg)	488.8	16074.04	25.0	15.15	498.5	11519.69	21.0	12.82
B carotene (µg)	1245.88	221944.8	37.0	56.30	1643.70	1401971.0	72.0	141.52

cv- coefficient of variation **sem**- standard error

Table 5: Mean daily nutrient intake: comparison between male and female couples-variance and coefficient of variation.

men and women was also in normal range. Especially the iron status appears to be good, it is important to mention here that, the mean iron intake was satisfactory. This could have been a major factor for better haemoglobin status. Literature presents the aetiology for anaemia to be cereal based diets with meagre greens, and vegetable [16]. In the present study population although rice was major cereal but parboiled rice was predominant. Parboiled rice is known to be rich in minerals as compared to raw rice. Further the seasonal vegetable could have contributed to iron and antioxidants from foods like 'Kashaya' may potentially make iron bio available.

Assessment of gender differences in particular with food and nutrition security is appropriate in assessing nutrition security [17]. So, present study is considered to investigate the gender differences in nutrient intake as one of the objectives. The nutrient intake by adult male and female counterparts selected from each family is provided in Table 5. The table provides mean intake of selected nutrients i.e., energy, proteins, fats, calcium, iron, retinol and β carotene. There is an obvious difference in the intake pattern of man and woman as compared to their respective Recommended Dietary Allowances' (RDA). Compared to the family intakes, intakes of individual men and women were found to vary enormously for most of the nutrient studied.

Energy intake in general for both males and females was less compared to their RDA's. Nevertheless, females were found to meet 85% of the requirement while male members consumed only 64% of the RDA's. Therefore, statistically extremely significant differences were found. Protein intake of males was found to be 83% RDA while female consumed enough proteins thereby their mean intake was essentially similar to their respective RDA's. Fat intake in general was high wherein intake among females was markedly higher as compared to males. It can be perused from table that female consumed two times more fat than their RDA's while men consumed 1.3 times higher. Calcium, iron and retinol intakes were satisfactory. Gender differences in intake of all nutrients did existed to certain extent. Majority of nutrients consumed by females were higher than those of men according to the percentage sufficiency calculated. Some of the nutrients, with particular reference to proteins in our case were consumed less by the adult males and females. So we could highlight two salient factors. 1. Family per capita nutrient intake does not reflect the individual intakes. Therefore, such data projects only a broad perspective of food and nutrition security. It is important to consider food and nutrition security of individual members of the family to assign total food and nutrition security. Secondly, that the adult members differ in their pattern of food intake thereby their nutrient intakes vary from those of other family members. Also distinct differences were noted in intake of males and females where in intakes for females were high for most nutrients. It is encouraging however to point that females from the study population were better in their nutrient consumption as compared to men.

Findings also indicated that, females had a higher proportion of nutrient intake than males. Mean intake of protein and energy was slightly lower than recommended values in both sexes [18,19]. Population developing countries like India, which is rapidly urbanising, demonstrate an increase in energy intake, dramatic increases in fat intake along with increased levels of sedentarianism and less gender disparity [20]. While Surveys from western countries reported gender differences in energy intake and micronutrient [17].

Variance and Coefficient of Variance (CV) have been used in studies to express the intergroup variation in characteristics that are naturally occurring in populations. It helps to arrive at a better understanding in the nature of dispersion occurring in the intakes. Hence we attempted to present the data obtained with respect to nutrient intake of male and female couples. A perusal of Table 5 presents the details of the nutrient intake and their dispersion among male and female participants. The variance was large for energy, calcium and β carotene. The CV for males for the macro nutrients like protein, fat and energy varied from 16-19% indicating a larger inter group homogeneity in intakes. CV for micronutrient was relatively high. High variability was seen

	Bmi range	<18.5 Ced	18.5-22.9 Normal	23.0-24.9 Over weight	>25.0 Obesity	Coefficient correlation "r"
(n=70)	%(n)	1.0(01)	41.0(29)	43.0(30)	14.0(10)	
Males	BMI Mean ± sd	18.2 ± 0	21.80 ± 0.91	23.78 ± 0.559	26.21 ± 1.32	0.017^{ns}
	WHR Mean ± sd	1.08 ± 0	1.10 ± 0.08	1.16 ± 0.03	1.10 ± 0.05	
Females	%(n)	0	44.0(31)	36.0(25)	20.0(14)	
	BMI Mean ± sd	---	21.1 ± 1.13	23.67 ± 0.48	26.58 ± 1.40	-0.123^{ns}
	WHR Mean ± SD	--	1.06 ± 0.06	1.11 ± 0.03	1.11 ± 0.04	

Table 6: Association between BMI and WHR of male & female participants.

for calcium and β carotene. Female consumption pattern appeared to vary enormously as against male members, both macro and micro nutrients exhibited high CV suggesting large intergroup variations. CV for energy and fat was 27-36%, variations for protein were very large being 47%. Hence this suggests female in general have a different consumption pattern in both quality and quantity. Among the micro nutrient β carotene intake varied enormously with a 72% variation followed by iron (42%). Other studies have also reported variations in food intake among males and females [21].

Nutrient intakes of individuals are influenced by diet pattern hence it was considered imperative to compare nutrient intake data of selected nutrients between the genders as well as across the vegetarian and non-vegetarians. It is important to mention here that such exercises although appear to be repetitive, are essential to highlight the nutrient characteristics of diet. As it is well understood that nutrient consumption varies enormously in different regions and also within the region, especially in country like India variations are very large due to diversified culture and different practises coexisting in a region and is appreciated worldwide.

Out of academic interest the participating males and females were distributed into the various classification of BMI indicating weight status. The corresponding WHR was also given under each BMI classification to note the association between the two indices and to show the occurrence of central obesity in different BMI categories. Distribution of participants in BMI (WHO based cut off applicable to South East Asian population) category, indicates that majority of the participants both men and women occupied the normal and overweight category while underweight and obese were small.

Hence mean BMI for normal was 21.80 ± 0.91 and for overweight has 23.78 ± 0.559. Those who were obese according to this cut- off level, the mean BMI was 26.21 ± 1.32. When WHR was presented under each category there was a small but linear increase in WHR until overweight indicating a close relation between BMI and WHR, an essentially similar results were seen with females. Females falling into normal BMI category had a mean BMI of 21.1 ± 1.13, and those in overweight category was 23.7 ± 0.48. Obese females had 26.6 ± 1.4 BMI. WHR among females also exhibited linearity with increase in BMI up till overweight category. It is a clear evidence that WHR although is independent of obesity, in Indian population exhibited an association to BMI. The correlation coefficient performed between BMI and WHR, did not show statistically significant association (Table 6).

Conclusion

Our study has brought forth important and useful information regarding the anthropometric profile of healthy adult men and women we also exercised to present the gender differences in nutrient intake and association between BMI and WHR, adult men and women who are head of the family and stakeholder were chosen for assessment. Among the two taluks studied, Karkala was more urbanised than Moodbidri. Traditional system was practiced in Moodbiri,

Percaput intake of Energy of the family members was less than requirements by 37%, while vitamin A and its precursor were consumed less compared to RDA. The gender effect studied indicated less difference in all the assessed parameter. Nutrient intake between male and females were negligible. Anthropometric profile was essentially similar among men and women; both the genders consumed less energy while other nutrients such as protein, calcium, fat and iron intakes were higher than their respective requirements. A critical view of the intakes suggests that women consumed all nutrients in little higher quantities than those of their male counterparts. Among the micronutrients, β carotene and retinol intakes were very low among both men and women.

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