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Energy and Nutrients Intakes of Male and Female University Students

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Abstract: Male and female students residing in the on campus hostels were explained the aim and importance of this study. Among the students registered were 30 male and 30 female who volunteered to participate in this study. The age range of the registered students was 22 – 26 years. On the day of the registration the age, height and weight were recorded and at the same time, they were given food frequency questionnaires (FFQs). They were asked to record alternately for three days whatever they ate during the prescribed week. Out of sixty students 51 (22 male and 29 female) returned the FFQs and the rest were excluded from the study. From the anthropometry, the weight and height for the given ages were compared with the international standards. From the FFQs the energy and nutrients intake was calculated using the food composition table for all students and compared with the recommended nutrients intakes (RNIs) reported by the FAO/WHO for the same age, height and weight. The total energy consumption was more in the female students than in the male students. Eighty two percent of the male and 21% of the female students had lower energy intake than their RNIs for energy. Eighty two percent of the male students had lower relative energy from protein and 91% had lower energy from carbohydrate intake than their respective RNIs. Similarly, in 48% of the female students had lower relative energy from protein and 76% had lower energy from carbohydrate intake than their respective RNIs. The relative contribution of energy from fat was higher in 95 % of the male and 97 % of the female students than their RNIs. The mean mineral intake was lower both for male and female students with the exception that the intake of P was more than the RNIs by 18.4 and 11.5 % for the male and female students respectively. The mean Fe intake was more than the RNIs by 37.3% in male students. Similarly, the vitamins intake was lower as well, both in male and female students with exception that they were having higher intake for vitamin A and C. Apart from these nutrients, all the students surveyed had lower dietary intake of fibre and cholesterol. This study indicates that the students are at the risk of specific nutrient deficiencies and the energy requirement is mainly met through dietary fat intake instead of carbohydrate.

Key Words: Energy, nutrients, intakes, anthropometry, nutritional status

Introduction

Proper nutrition is important in improving the community health in general and of the risk groups in particular. Balance nutrition can protect against many diseases/disorders resulting from nutrient deficiencies or excess. Under nutrition in terms of protein and energy results in poor growth, poor resistant to bacterial or viral infection and to the very known disorders of kwashiorkor and marasmus (WHO, 1979). The consumption of more sugar and fat (particularly saturated fat) is associated with the development of diabetes (Jenkins *et al*., 1978) and heart diseases respectively (Gurr, 1984; David, 1994). The minerals and vitamins deficiencies result in many biochemical and physiological defects. It is just possible that minerals and vitamins may have role in the utilization of the major nutrients (protein, carbohydrates and fats). Faulty nutrition aggravates a wide spectrum of disease condition, diminishing the quality of life, personal productivity and longevity as well. The knowledge of the nutritional status of a community is important for proper planning in the health sector. The nutritional status of a community indicates that whether or not the intakes of the macro and micronutrient are adequate, deficient or in excess. Nutritional status of an individual's is determined by anthropometric measurements, comparison of nutrient intakes with reference values or by biochemical investigations of nutrients related parameters. The anthropometric measurements and comparison of nutrient intakes with reference values are easy and noninvasive, economical and sufficiently reliable method for the determination of nutritional status (Jelliffe, 1966; McMahahon and Bistrain, 1991). According to some recommendation, the combination of the macro-nutrient should be in such a way that protein, carbohydrate and fat provide 15, 55 and 30 % energy respectively of the total body required energy (Health and Welfare Canada Nutrition Recommendation, 1990). The present study was designed to assess the nutritional status of the students by anthropometric measurements and by comparing the energy and nutrient intake with the standard reference values of energy and individual nutrient of the university students.

Materials and Methods

Location and Sample Size of the Study: The study was conducted in the campus of the NWFP, Agricultural University, Peshawar, Pakistan. The importance of the study was explained to the students of the university. Sixty (30 male and 30 female) students volunteered for the study and registered.

Anthropometry and Activity Level of the students: An ordinary measuring tape was used to measure the height whereas weight was determined by common health balance. Their body builds (frame size) was determined by the method of Bray, 1978. From their daily routine, their activity levels were determined (Krause and Mehan, 1984; Williams, 1999). The height, weight, frame sizes and activity levels were noted in the FFQs provided to the students

Collection of Data: The data was collected on FFQs, which contained the information on height, weight, body builds or frame size, activity level and daily food intake for three alternate days of the week. The registered students were asked to record everything they ate in the questionnaire provided to them for the prescribed three days (Monday, Wednesday and Friday). After a week, 22 male and 29 female students returned the FFQs. Out of 60 students eight males and one female student did not return the FFQs and were dropped out from the study.

Compilation of the Data: The observed height and weight of the students were arranged in chronological order according to

Table 1: Mean weight, reference weight and % increase or decrease over reference weight

Height (in)	Nos. of Individuals	Mean Weight (lbs.)	*Reference Weight (lbs.)	% Increase or Decrease Over Reference Weight
Male				
65	3	135 ± 5	133(121-152)	+ 15
66	4	138 ± 11	136(124-156)	+ 15
67	6	141 ± 10	140(128-161)	+ 0.7
68	6	147 ± 9	145(132-166)	+ 1.4
69	3	143 ± 5	149(136-170)	- 4.0
	22			
Female				
59	1	95	104(99-122)	- 8.7
60	2	110 ± 5	107(96-125)	+ 2.8
61	3	106 ± 10	110(99-128)	- 3.6
62	3	106 ± 13	113(102-131)	- 6.2
63	7	122 ± 17	116(105-134)	+ 5.2
64	9	125 ± 7	120(108-138)	+ 4.2
65	1	120	123(111-142)	- 2.4
66	1	130	128(114-146)	+ 1.6
67	2	130	132(118-150)	- 1.5
	29			

*Jelliffe (1966)

Table 2: Relative contribution of macro nutrients to energy intake

Sex	Observed relative energy contribution (%)			[1]Energy Requirements (kcal.)	Energy Intakes (kcal.)	% Increase or Decrease Over Reference Intake
	Protein	CHO	Fat			
Male (N=22)	11.9±1.7	44.2±4.7	44.0±5	2663±419	2605±377	-2.8
Female (N =29)	12.4±1.4	47.5±3.5	40.1±3.4	1753±133	1753±127	0.0
[2]Reference	15	55	30	-	-	-

[1]World Health Organization (1983, and 1985) and [2] Health and Welfare Canada Nutrition Recommendation, 1990.

Jelliffe, 1966. From the three days food intakes data, the average daily food intakes for the students were calculated. The nutrients namely protein, carbohydrates, fats, cholesterol, fibre, minerals (Ca, P, K, Na, Fe) and vitamins (Retinol or A, Thiamin or B_1, Riboflavin or B_2, Niacin or Nicotinic acid and Ascorbic Acid or C) in the average daily eaten food were determined by using the food composition tables (Williams, 1999; Goplan, 1981). The energy content of the daily average eaten food by the students was calculated by multiplying the daily eaten protein, carbohydrate and fats with 4, 4 and 9 respectively (Williams, 1999; Goplan, 1981). The reference intake for the individuals of various heights from the desirable body weights according to the procedure given in American Dietetic Association, 1996a. The data was compared with the available international standards for the evaluation of nutritional status (FAO/WHO, 2000, WHO, 1985, FAO, 1988, Recommended Daily Allowances,1980, McMahan and Bistrain, 1991; Health and Welfare Canada Nutrition Recommendation, 1990; The American Dietetic Association, 1996b).

Statistical Analysis: The mean and standard deviation for the different aforementioned variables were determined by using a statistical package (MINITAB).

Results

The students assessed for the nutritional status both male and female were having body weight for height in the range of reference weight for the observed heights. However, when the mean body weights were compared with the median reference weights, some of the male and female students were having lower body weights (Table 1).

The male students were having inadequate energy intake (lower by 2.18%) whereas the female students exactly met the reference energy intake (Table 2). However, it was reverse when the energy intake was calculated on per kg body weight basis the male students were having adequate energy and female students were having inadequate energy intake (Table 3). The mean dietary intake of protein was adequate in both male and female students on the basis of the WHO recommendation (Table 4) and based on body weight (Table 3) but inadequate on the basis of % contribution to the energy level (Table 2). The intake of dietary cholesterol and fibre was lower both for male and female students (Table 4). The dietary intake for vitamins namely, A, B_1, B_2, niacin and C was adequate for male students whereas it was inadequate for the female students with exception for vitamin C (Table 4). In minerals, the dietary intake for P was adequate both for male and female students. The dietary intake for Ca, K and Na was lower than the recommended RNIs for both sexes. The Fe intake was adequate for the male students and inadequate for the female students (Table 4).

Discussion

The mean energy, protein, carbohydrate, fibre, cholesterol, minerals and vitamins were calculated and compared with the international standards for both male and female students respectively. The adequacy of the nutrients was assessed in different ways. (1) The mean intake was compared with the reference values (WHO, 1985, FAO, 1988, Recommended Daily Allowances, 1980; McMahan and Bistrain, 1991). (2) The energy contribution by the macro-nutrients was calculated and compared accordingly with the recommended dietary intake of 15, 55 and 30 % protein, carbohydrates and fat respectively (Health and Welfare Canada Nutrition Recommendation, 1990). (3) The energy and protein intakes were compared with recommended

Table 3: Comparison of energy and protein requirements based on body weight

Sex	Nos. of Individuals	[1]Mean Weight (lbs.)	Protein Required (g)	Actual Intake (g)	Energy Required (k.cal)	Actual Intake (k.cal)
Male	22	142.1±9.2	51.7	77.6±12.4	2583	2663±377
Female	29	117.8±13.0	42.8	54.5±6.6	2142	1753±127

[1]The mean weight was converted to kg and multiplied by 40 and 0.8 for the required energy and protein respectively (The American Dietetic Association 1996a).

Table 4: Mean (±SD) Energy and Nutrients Intake of the University Students

Name of Nutrient	Actual Intake	Reference Intake	% Increase or Decrease over Reference Intake	Actual Intake	Reference Intake	% Increase or Decrease over Reference Intake
	Male (N = 22)			Female (N = 29)		
[1]Energy (kcal.)	2605±377	2663±419	-2.18	1753±127	1753±133	0.0
[1]Protein(g)	77.6±12.4	53	38.7	51±7	44.5	14.6
Carbohydrate (g)	288± 55	_	_	212±18	_	_
Fat (g)	127± 22	_	_	80± 11	_	_
[2]Cholesterol (mg)	288± 55	300	-40	208± 18	300	-31
[2]Fibre (g)	6.1±2.7	25	-75.6	5.6±1.91	25	-77.6
[3]Vitamin- A (RE)	703 ± 136	600	17	605± 245	500	21.6
[3]Vitamin-B_1 (mg)	0.94±0.5	1.2	21.66	0.83±0.32	1.1	-22.7
[3]Vitamin- B_2 (mg)	1.04 ± 0.37	1.3	20.0	1.0± 0.44	1.1	-9.0
[3]Niacin (mg)	13.24±4.39	16	17.3	10.9± 3.29	14.0	-22.1
[3]Vitamin-C (mg)	66.19± 45.14	45	47.1	67.97± 38.72	45.0	51.0
[3]Calcium (mg)	659±162	1000	-34.1	623± 217	1000	-37.7
[4]Phosphorus (mg)	947±274	800	18.4	892±323	800	11.5
[4]Potassium (mg)	919±282	3750	-75.5	1095± 337	3750	-71
[4]Sodium (mg)	376±192	2200	-82.9	353± 243	2200	-84
[3]Iron (mg)	15.1±5.1	11.0	37.3	13.8±2.8	24	-42.5

[1]World Health Organization (1983 and 1985); [2]American Dietetic Association (1996b); FAO/WHO (2000) and Food and Nutrition Board, National Academy of Sciences-National Research Council RDA (1980)

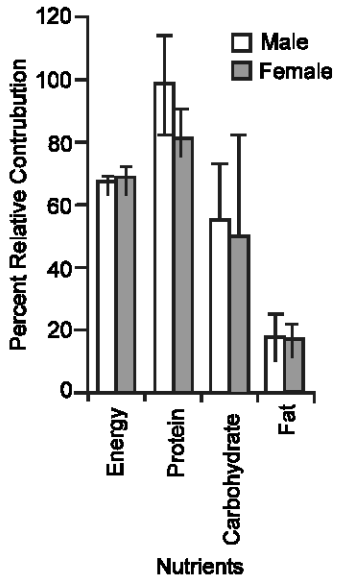

Fig. 1: Mean ± SD percent energy, protein, cholesterol and fiber intake in the diet of the recommended dietary intakes for the university students. The values are the mean ± SD percent intakes of 22 male and 29 female students of the university hostels.

energy and protein intakes/kg body weight of the university students (American Dietetic Association, 1996b). The total energy consumption was more in the female students than in the male students were. Out of 51 students 27 (53%) claim to have had more energy than their RNIs. Among these students 23 (79%) were female and only four male (18%). When the numbers of the male students were expressed in terms of percentages, 13 % had higher energy intake than their RNIs, 5% hardly met their RNIs and 82 % had lower energy intake than their respective RNIs. The percent mean ± SD is shown in the Fig. 1. In the female students 21 % had lower than their respective RNIs 17% met their RNIs whereas 62% had higher intake than their RNIs for energy. However the mean percentage energy intake was higher in the female students when compared with reference energy intake (Fig.1). Apart from this, the intake of the dietary cholesterol and fibre was lower than the recommended level of the RNIs (American Dietetic Association, 1996b).

Based on the WHO/FAO recommendations, both the male and female students consumed highest amount of protein per day when compared with the RDA of the same age and body size, the mean % intake of the RDA for protein was 147 and 103 % for male and female respectively. When the students were individually assessed for the adequacy of protein intake on the basis of RDA for protein per day, only one out of 51 student had lower protein intake in the female students (WHO, 1985; McMahan and Bistrain, 1991). On the other hand when these students were assessed for the adequacy of protein, carbohydrates, fats and energy values in their diets, they were all having inadequate protein according to the recommendation of 15 % protein, 55 % carbohydrates and 30 % fat (Health and Welfare Canada Nutrition Recommendation, 1990). The lower intake on the basis of the relative contribution of macronutrients to the energy among the students, who did not meet the RNIs, was

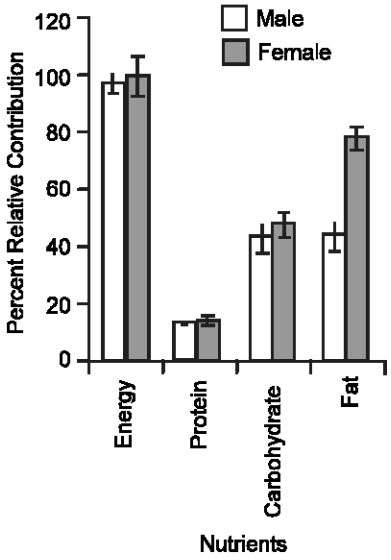

Fig. 2: Relative contribution of protein, carbohydrate and fat of recommended energy intakes of the university students. The values are the mean ± SD of 22 male and 29 female hostel students

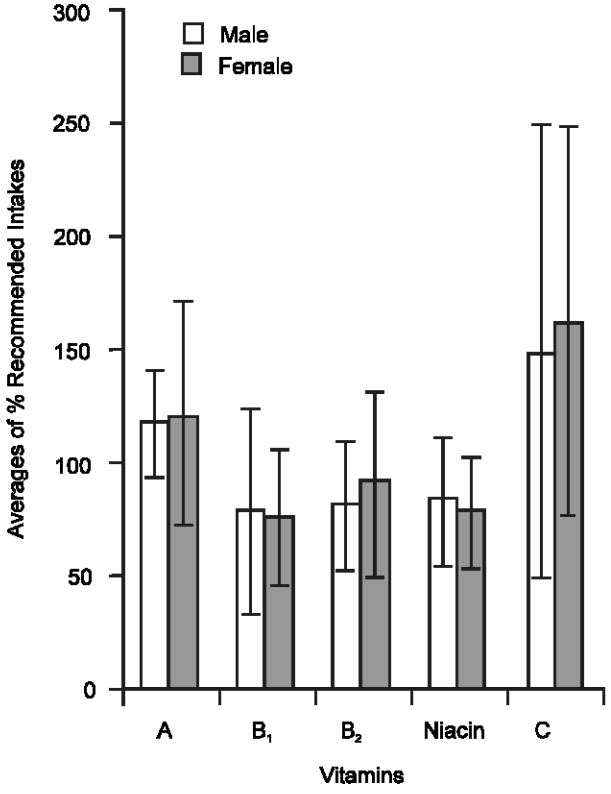

Fig. 3: Mean ± SD vitamins (A, B, phosphorous, potassium, sodium and iron) intake in the diet of the recommended dietary intakes for the university students. The values are the mean ± SD percent intakes of 22 male and 29 female students of the university hostels

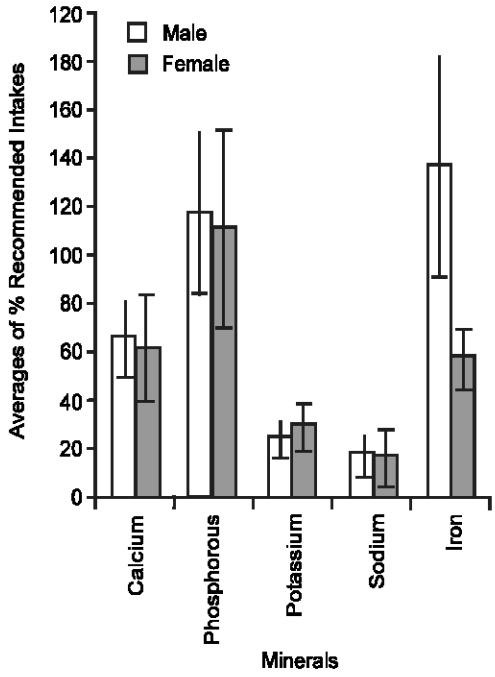

Fig. 4: Mean ± SD minerals (calcium, phosphorous, potassium, sodium and iron) intake in the diet of the recommended dietary intakes for the university students. The values are the mean ± SD percent intakes of 22 male and 29 female students of the university hostels.

reflected either by lower intake of protein or carbohydrates both in male and female students. The intake of fat seems to be adequate among all the students in both sexes. The RNI was not only met by all of the students, infect, it was higher than the recommended RNI for fat. The students having met their RNI for energy consumption were having more fat in their diets instead of protein or carbohydrate. The percentages mean ± SD of the RNIs is indicated in the Fig. 1 and 2 respectively.

Both sexes had adequate intake of vitamin A and C whereas the intake for other vitamins such as B_1, B_2, and niacin was lower than their RNIs. The % means ± SD of the RNIs for vitamins are indicated in the Fig. 3.

In the male students only P and Fe intake was higher than the RNIs whereas the intake for Ca, and Na was lower than their RNIs. The mean % intake of the recommended level for Ca, P, K, Na and Fe was 65.9, 118.3, 24.5, 17.1 and 136.4 % respectively. The percent mean ± SD intake for their RNIs for mineral is shown in Fig. 4. Similarly, the minerals assessed in the females diets, only P appeared to be adequate and the % intake of the RNI was 111.5%. However, the overall intake of the minerals and vitamins was lower in the female students. The consumption for minerals for example Ca, K, Na and Fe was 62.3, 29.2, 16.1, and 57.5 % respectively. The added salt was not considered in the calculation since it was not recorded. Therefore, the intake for salt might be adequate if it would have been recorded. The % means ± SD of the RNIs for minerals are indicated in the Fig. 4. The present study indicates that the students were at the risk of specific nutrients due to faulty intakes.

References

American Dietetic Association, 1996a. Nutrition assessment of adults. In: Manual of Clinical Dietetics, 5th Ed. Developed by the Chicago Dieteic Association and The South Suburban Dietetic Association, pp.3-23.

American Dietetic Association,1996b. Recommended Daily Intakes (RDI). In: Manual of Clinical Dietetics, 5th Ed. Developed by the Chicago Dieteic Association and The South Suburban Dietetic Association, pp:763.

Bray, G.A.,1978. Definition, measurement and classification of the syndromes of obesity. Int. J. Obesity, 2 : 1-14.

David, H., E. Somer, A. Hull, M. Edell, H. Robert, J.R. Garrison, L. Granger, A.M. McLaren, W. Higenaga and J. Swarth, 1994: In: Cholesterol and Nutrition: Health Media of Nutrition Series. CBS Publishers and Distributors, 1-73.

FAO, 1988. Requirements of vitamin A, iron, Folate and vitamin$_{12}$. Report of joint FAO/WHO Expert Consultation, FAO Rome.

FAO/ WHO, 2000. Joint FAO/WHO Expert Consultation on Human Vitamins and Minerals Requirements. (Preliminary Report on Recommended Nutrients Intakes, Revised in 2000).

Goplan, C., B.V.R. Sastri and S.C. Balasubramanian, 1981. Nutritive value of Indian Foods. National Institute of Nutrition, Hyderabad-7(A.P.), Indian Council of Medical Research. P.O.Box No. 4508. Assari Nagar, New Delhi-16.

Gurr, M., 1984. Role of fats in food and nutrition. London and New York, Elsevier Applied Science Publishers.

Health and Welfare Canada Nutrition Recommendation, 1990. Ottawa, Supply and Service Canada

Jelliffe, D.B., 1966. The assessment of nutritional status of the community. WHO Monograph Series No. 53. World Health Organization, 1211, Geneva 27, Switzerland.

Jenkins, D.J.A., T.M.S. Wolever, A.R. Leeds, M.A. Gassul, P. J. Haisman, D.V. Goh, G.L. Metz and K.G. Alberti, 1978. Dietary fibre; fibre analogous and glucose tolerance importance of viscosity. Br. Med. J. 1: 1392-1394.

Krause, M.V. and L.K. Mahan, 1984. Physical activity. In: Food, Nutrition and Diet Therapy. 7th Ed. W.D. Saunders Company Philadelphia, pp:17

McMahan, M. and B.R. Bistrain, 1991. Anthropometric assessment of nutritional status in hospitalised patients. In: Himes, J.H. Ed. Anthropometric assessment of nutritional status. New York, NY: Jhon Willey and Sons Inc. 1991, pp: 365 – 381.

Recommended daily allowances, 1980. In: 9th revised Ed., National Academy Press, Washington, D.C.

WHO, 1979. Health aspects of food and nutrition, 3rd Ed., WHO, Box 2932, Manila, Philippines.

WHO, 1985. Energy and protein requirements. Technical Report Series No. 724, WHO, Geneva.

WHO, 1983. Measuring change in nutritional status. WHO, Geneva.

Williams, S.R., 1999. Energy balance and weight management. In: Essential of Nutrition and Diet Therapy. 7th Ed. Mosby, Inc. 11830 Westline Industrial Derive. St. Louis, Missouri 63146, pp: 85-106.