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Anthropometry and Dietary Assessment of Males and Females Students at Mu'tah University

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Abstract: The aim of this study was to survey the body measurements and dietary intake of university students. One hundred seventy eight students (96 males and 82 females) aged 20.4 to 22.6 years at Faculty of Agriculture/Mu'tah University were participated in the study. The nutrition status of students was assessed by using anthropometry and dietary methods and compared with available references. Males and females had means of weight (kg): 59.6±2.1 and 55.8±2.4 and of height (m): 1.67±0.08 and 1.61±0.07. Males and females had circumferences (cm) of arm: 28.6±1.2 and 25.3±0.8; of waist (W): 86.1±2.6 and 72.8±3.1 and of hip (H): 85.8±1.2 and 90.4±2.8. Males had significantly lower triceps, total skin folds and percent of total body fat than the females. Arm muscle circumference, arm area and arm muscle area were higher, whereas arm fat area was lower in males than in females. Males consumed higher energy (2208±85 kcal day^{-1}) and protein (43.1±4.3 g day^{-1}) than females (2035±93 kcal day^{-1} and 39.2±3.5 g day^{-1}). The Relative Energy Contribution (REC) of carbohydrates, total fat, saturated fat and monounsaturated fat in diets of males and females was higher, whereas the REC of polyunsaturated fat and protein were lower than the recommended. Males and females received lower vitamins (except E), macro minerals (except sodium) and micro minerals (except iron in males) than the recommended.

Key words: Anthropometric, nutritional status, macronutrients, micronutrients

INTRODUCTION

Adequate nutrition is the right proportion of food nutrients needed for growth, energy and maintenance. Improved nutrition status plays an important role in the well being of individuals and critical for socioeconomic development (Nemati *et al*., 2008). Malnutrition is a pathological state resulting from a deficiency or wrong proportion of essential nutrients. Malnutrition has serious implications for people and communities thus hindering the socioeconomic and human development of a nation as one of the most critical health issues because of its long lasting negative effects (Muller and Krawinkel, 2005; Akinyemi and Ibraheem, 2009; Khattak and Khan, 2009). Nutrition assessment is the system of determining conditions of nutritional health of a person, or a group of persons. Nutrition status is assessed in different ways include anthropometrics, dietary intakes, biochemical and clinical methods. All these methods can be applied to assess of nutritional status of individuals or groups.

Nowadays, anthropometric measurements are regarded as important indicators of an individual's nutritional status. The term anthropometric refers to comparative measurements of the body. Anthropometric measurements are used in nutritional assessments. The most commonly used anthropometric measurements to assess the nutritional status for adults are height, weight, Body Mass Index (BMI), waist-to-hip ratio, body protein store and percentage of body fat. These measures are then compared to reference standards to assess the risk for various diseases (Abu-Samak *et al*., 2008; Latiffah and Hanachi, 2008). Malnutrition, either undernutrition or overnutrition gives rise to detrimental alterations of body composition. Anthropometry is a convenient and reliable technique whereby changes in the status of nutrition can be evaluated easily. Many methods have been developed for the dietary assessment of individuals The 24 h dietary recall method is a widely used approach to collect dietary information because it is simple, impose little burden to the respondents and do not require high literacy in respondents (Marjan *et al*., 1999).

Based on a combination of nutrition and health indicators and risk factors, the countries of the East Mediterranean Region of the World Health Organization were divided into four categories (RCEM, 2007). Jordan came in the second category, which include moderate

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levels of overweight/obesity co-exist with moderate levels of undernutrition in specific population pockets and age groups alongside widespread micronutrient deficiencies. In Jordan, the expansion in all dimensions is tremendous and it is more so in the field of education. It has been observed that the university students are at the risk of specific nutrients deficiencies and they develop faulty food habits (Khattak *et al*., 2002; Khattak and Khan, 2009). These faulty food habits have been explained to be associated with low nutrients densities of foods consumption and may result in higher or lower intakes of nutrients. Therefore, the purpose of this study was attempted to evaluate the nutritional status of university students.

MATERIALS AND METHODS

Subjects: The study was designed to provide information on anthropometry, body composition and nutrients intakes of students and carried out between February 2007 and June 2008. One hundred seventy eight (96 male, 82 female) students enrolled in human nutrition courses and ranging in age from 20.4 to 22.6 years at Faculty of Agriculture/Mu'tah University were participated in the study. All subjects had normal health status, took no drugs other than mild analgesics, free from known metabolic disorders and had no abnormalalities of urinary pH, protein, or glucose. At the beginning, the students received instructions in practice part of nutritional status assessment course about writing their health and nutritional status data and about keeping three days food records.

Anthropometry: The following measurements were recorded to each student: Body weight was measured without shoes and in light clothing by using common health balance to the nearest 0.1 kg. Height was measured to the bare footed standing subjects to the nearest of 0.5 cm by using an ordinary measuring tape. Body Mass Index (BMI) was calculated as weight (kg)/height (m^2) and categorized according to Ferro-Luzzi *et al*. (1992). Body builds (frame size) was determined by the method of Bray (1978). Arm circumference was measured on the left arm using a no stretchable tape placed firmly round the mid hanging freely arm. Waist circumference was measured at half way between umbilicus and xiphoid and reading was taken at the end of expiration. Hip circumference was measured at the level of the great trochanters. Skinfolds thickness (triceps, biceps, subscapular, supraeriliac) were measured on the left side of the body to the nearest 0.5 mm with a calibrated medical caliper. Percentage of total body fat (TBF %) was calculated by the equation of Siri (1956) as follows:

$$TBF\% = (4.95/D) - 4.5*100$$

where, D is the density which equal to 1.1610-(0.0632X) for males and 1.1581-(0.0720X) for females, X is the log of sum of skinfold thickness at four mentioned sites (Durnin and Womersley, 1974). Total body fat (kg) was obtained by multiplying TBF% by body weight and dividing by 100. Lean Body Mass (LBM) was calculated by subtracting TBF (kg) from body weight. Arm Muscle Circumference (AMC), Arm Area (AA), Arm Muscle Area (AMA) and Arm Fat Area (AFA) were measured according to Frisancho (1981, 1984). AMA and AFA references were Frisancho (1990).

Energy and dietary intakes: It was obtained from repeated 24 h diet recall. The students recorded their food intake for three consecutive days, two weeks days (Monday and Wednesday) and one week end day (Friday). The average daily intakes of energy, carbohydrates, proteins, total fats, Saturated Fatty Acids (SFA), Monounsaturated Fatty Acids (MUFA), Polyunsaturated Fatty Acids (PUFA), cholesterol, fiber, vitamins (A, D, E, C, thiamine, riboflavin, niacin, pyridoxine, pantothenic, biotin, folate, B_{12}) and minerals (calcium, potassium, phosphorus, sodium, iron, iodine) were determined (Pellett and Shadarevian, 1970; Poul and Southgate, 1978). Energy intake was calculated by multiplying the daily eaten carbohydrates, protein and fat (g) by 4, 4 and 9, respectively. Nutrients intakes were compared with Dietary References Intake (DRI, 1998) values (Food and Nutrition Board, 1997, 2000; Institute of Medicine, 1998, 2002). Requirements of energy and protein were calculated on the base of DRI and on the base of: 40 kcal kg^{-1} b.wt. for males and females and 0.9 g protein kg^{-1} b.wt. of males and 0.8 protein kg^{-1} b.wt. of females (ADA, 1996). Weights used in the present study were actual weight, ideal weight (Jelliffe, 1966) and weight/ height and weight/age (Frisancho, 1990). Statistical analysis was performed using Systat 8.0 (SPSS Inc., Chicago, IL, USA) to compute the means and Standard Deviations (SD). Student t-test was done in two directions at a significance level of 0.05 and any difference between two means was considered statistically significant if p value <0.05.

RESULTS

The means of weight, height, BMI of males and females are shown in Table 1. Males had significantly higher means of weight (59.6 kg) and height (1.67 m) than the females (55.8 kg and 1.61 m). Data show that the males had no significant lower BMI (21.4) than the females (21.7). However, both sexes had less weight than the ideal weight. It is -15.8 for males and -14.5 for females.

Table 1: Means of weight (kg), height (m) and body mass index (BMI, kg m^{-2}) of males and females students

Subjects	No. of individuals	Actual weight (A)	Height	BMI	Reference weight (B)	% of + or-of A above B
Males	18	53.1±2.3	1.60±0.04	20.7±0.8	66.2	-19.8
	21	55.2±1.8	1.63±0.03	20.3±0.7	68.0	-18.8
	13	58.0±2.5	1.66±0.08	21.0±0.5	70.8	-18.1
	20	61.9±3.1	1.69±0.03	21.7±1.1	73.5	-15.8
	7	64.3±2.4	1.72±0.06	21.7±0.6	76.1	-15.5
	5	66.7±3.5	1.75±0.03	21.8±0.5	78.3	-14.8
	7	68.6±3.2	1.77±0.06	21.9±1.2	80.3	-14.5
	5	70.8±3.7	1.81±0.05	21.6±1.3	82.6	-14.3
Total	96	59.6±2.1^a	1.67±0.08^a	21.4±0.9	70.8	-15.8
Females	15	50.7±2.1	1.55±0.05	21.4±0.6	63.0	-19.5
	17	52.3±2.3	1.57±0.05	21.2±1.1	63.8	-18.0
	11	54.8±1.9	1.60±0.06	21.4±1.3	65.3	-16.1
	19	57.9±2.4	1.63±0.04	21.9±0.8	66.9	-13.5
	17	60.9±2.2	1.66±0.08	22.1±0.9	68.2	-10.7
	3	63.4±3.2	1.69±0.02	22.2±0.7	69.5	-8.8
Total	82	55.8±2.4^b	1.61±0.07^b	21.7±1.1	65.3	-14.5

Data are Mean±SD. Different superscripts for the same parameter are significantly different at $p<0.05$. Ref reference weight (Jelliffe, 1966)

Table 2: Body Mass Index (BMI) (kg m^{-2}) and body frames (Height(cm)/wrist circumference (cm)) of males and females students

	Males		Females	
Parameters	No.	%	No.	%
BMI Categories*				
Underweight (<18.5)	5	5.2^b	6	7.3^a
Normal weight (18.5-24.9)	87	90.6	62	87.8
Over weight (>25)	4	4.2^b	4	4.9^a
Body Frames**				
Small	5	5.2^a	3	3.7^b
Medium	86	89.6	76	92.7
Large	5	5.2^a	3	3.7^b

Data are means±SD. Different superscripts for the same parameter are significantly different at $p<0.05$. *: Ferro-Luzzi *et al.* (1992). **: Height (cm)/wrist circumference (cm), Bray (1978)

Data in Table 2 show the categories of BMI and body frame sizes of participants. It showed that the percents of underweight and overweight of males (5.2 and 4.2) are significantly lower than those of females (7.3 and 4.9). Table 2 also shows that the males had significantly higher percent of small and large (5.2 each) body size than the females (3.7 each).

The results show that the circumferences (cm) of arm (28.6) and waist (W) (86.1) of males were significantly higher than those of females (25.3 and 72.8); whereas hip (H) circumference of males was significantly lower than that of females (Table 3). Males had higher W/H ratio (1.0) than that of females (0.8). Males had significantly lower skin folds (38.3 mm) and TBF (16.5%) than the females (47.3 mm and 26.8%). On the contrary, males had significantly higher percent of LBM (83.5%) than the females (73.2%). Table 3 also shows that the AMC, AA and AMA were significantly higher in males than in females, whereas AFA was vice versa. However, both sexes had lower AMA and AFA than the recommended for matched age. This shortfall in AMA was higher in males (-17.6%) than in females (-4.8%). On the contrary, the shortage in AFA was higher in females (-34.9%) than in males (-20.7%).

Table 3: Anthropometric measurements, body composition and nutritional status indicators of males and females students

Parameters	Males	Females
Body weight (kg)		
Actual (a)	59.6±2.1^a	55.8±2.4^b
Reference(ideal wt)[1]	64.8	56.5
Reference (wt/ht)[2]	70.8	65.3
Reference (wt/age)[3]	74.0	59.7
% of + or-of (a)over		
Reference[1]	-8.0^b	-1.2
Reference[2]	-15.8^b	-14.5
Reference[3]	-19.5^b	-6.5
Average	-14.4	-7.4
Circumferences (cm)		
Waist (W)	86.1±2.6^a	72.3±3.1^b
Hip (H)	85.8±2.4^b	90.4±2.8^a
W/H ratio	1.0±0.07^a	0.8±0.02^b
Arm	28.6±1.8^a	25.3±0.8^b
Skin folds (mm)		
Triceps	9.8±0.4^b	14.2±0.7^a
Biceps	7.6±0.4^b	9.1±0.8^a
Subscapular	10.7±0.5^b	12.2±1.1^a
Suprailiac	10.2±0.4^b	11.8±0.7^a
Total	38.3±2.1^b	47.3±1.8^a
T BF (%)	16.5±0.8^b	26.8±1.2^a
L B M (kg)	49.8±1.7^a	40.8±2.1^b
AMC(cm)	25.2±1.5^a	20.9±1.8^b
AA (cm^2)	65.1±2.1^a	50.9±2.5^b
AMA (cm^2)	41.8±1.9^a	28.0±1.1^b
AFA (cm^2)	13.4±0.4^b	16.4±0.6^a
*AMA reference (cm^2)	50.7	29.4
*AFA reference (cm^2)	16.9	25.2
% of + or-of:		
AMA over reference	-17.6^b	-4.8^a
AFA over reference	-20.7^a	-34.9^b

Data are Mean±SD. Different superscripts for the same parameter are significantly different at $p<0.05$. *: references (Frisancho, 1990) TBF: Total body fat. LBM: Lean body mass. AMC, AA, AMA and AFA are arm muscle circumference, arm area, arm muscle area (bone-free) and arm fat area, respectively

The energy (Kcal) and protein (g) requirements for males and females are shown in Table 4. Males received significantly higher energy (2208) and protein (43.1) than the females (2035 and 39.2). However, both sexes consumed less energy and protein than recommended. The deficiency in calculated energy was -19.4% for males

Table 4: Energy and protein requirements of males and females based on Dietary Reference Intake (DRI) * and calculation**

		Reference intake (RI)		% of + or-of AI over RI	
Parameters	Actual intake (AI)	DRI	Calculated	DRI	Calculated
Energy (Kcal)					
Males	2208±85[a]	3043	2384	-27.4	-7.4
Female	2035±93[b]	2387	2232	-14.7	-8.8
Protein (g)					
Male	43.1±4.3[a]	56.0	53.6[a]	-23.0[b]	-19.6[b]
Females	39.2±3.5[b]	46.0	44.6[b]	-14.8[a]	-11.7[a]

Data are Mean±SD. Different superscripts for the same parameter are significantly different at $p<0.05$. *: Institute of Medicine (2002). **: Calculated on the base of actual body weight (59.6 kg for males and 55.8 kg for females)

Table 5: Macronutrients intake and their relative energy contribution (REC %) in diets of males and females students

	Intake (g)		REC (%) A			% of + or-of A above R	
Nutrients	Males	Females	Males	Females	Reference REC (%)*	Males	Females
Carbohydrates	324.6±15.5[a]	292.5±16.7[b]	58.8	57.5	55	+6.9	+4.5
Protein	43.1±4.3[a]	39.2±3.5[b]	7.8	7.7	15	-48.0	-48.7
Total fats	79.5±6.3	78.7±5.8	32.4	34.8	30	+8.0	+16.0
SFA	37.8±4.5[a]	34.6±3.7[b]	15.4	15.3	10	+54.0	+53.0
MUFA	25.3±2.1	26.0±1.8	10.3	11.5	10	+3.0[b]	+15.0[a]
PUFA	16.4±1.3[b]	18.1±1.5[a]	6.7	8.0	10	-30.0[a]	-20.0[b]
Total Energy Intake(Kcal)	2208.0±85[a]	2035.0±93[b]					

Data are means±SD. Different superscripts for the same parameter are significantly different at $p<0.05$. A: actual. *: HWCN (1990) recommendation. SFA, MUFA and PUFA are saturated, mono unsaturated and poly unsaturated fatty acids

Table 6: Cholesterol, fiber and micronutrients intakes of males and females students

	Actual Intake (A)		Reference Intake (R)		% of + or-of A over R	
Nutrients intake day^{-1}	Males	Females	Males	Females	Males	Females
1Cholesterol (mg)	264.0±9.0	271.0±11.0	331.0	305.0	-20.2	-11.1
1Fiber (g)	23.9±1.5	16.7±1.2	38.0	29.0	-37.1	-42.4
Vitamins						
2A (RE)	689.0±13.7[b]	552.0±11.5[a]	900.0	700.0	-23.4	-21.2
3D (IU)	143.0±3.6	146.0±2.5	200.0	200.0	-28.5	-27
4E (mg)	15.3±0.4[b]	16.2±0.7[a]	15.0	15.0	+2.0[b]	+8.7[a]
5C (mg)	61.0±2.1[a]	54.7±1.8[b]	90.0	75.0	-32.2	-27.2
5Thiamin (mg)	0.85±0.1[a]	0.77±0.06[b]	1.2	1.1	-29.2	-30
5Riboflavin (mg)	0.90±0.05[b]	0.96±0.04[a]	1.3	1.1	-30.8[b]	-12.7[a]
5Niacin (mg)	12.7±0.9[a]	11.5±1.1[b]	16.0	14.0	-20.6	-17.9
5Pyridoxine (mg)	1.2±0.02[a]	1.1±0.04[b]	1.3	1.3	-7.7[a]	-15.4[b]
5Pantothenate mg)	3.6±0.1[a]	3.1±0.2[b]	5.0	5.0	-28.0[a]	-38.0[b]
5Biotin (μg)	25.4±1.7	24.8±1.8	30.0	30.0	-15.4	-17.4
5Folate (μg)	334.0±7.5	320.0±8.2	400.0	400.0	-16.5[a]	-20.0[b]
5B12 (μg)	1.7±0.1[a]	1.6±0.2[b]	2.4	2.4	-29.2[a]	-33.3[b]
Minerals						
3Calcium (mg)	686.0±14.8	727.0±17	1000.0	1000.0	-31.4[b]	-27.3[a]
6Potassium (mg)	1540.0±3.8	1600.0±3.4	2000.0	2000.0	-23	-20
3phosphorus mg)	592.0±12.3	603.0±1	700.0	700.0	-15.4	-13.9
6Sodium (mg)	712.0±18.5	691.0±1	500.0	500.0	42.4	38.2
2Iron (mg)	14.3±0.8	14.0±1	8.0	18.0	+78.8[a]	-22.2[b]
2Iodine (μg)	106.0±2.1	102.0±1.8	150.0	150.0	-29.3[a]	-32.0[b]

Data are Mean±SD. Different superscripts for the same parameter are significantly different at $p<0.05$. Intake References were for 1: ADA (1996), for 2, 3, 4 and 5: FNB (1997, 2000) and for 6: NRC (1989)

and -14.1% for females and in protein was -27.3 and -16.6% for males and females, respectively.

Data in Table 5 show that males had higher intake of carbohydrates, total fats and protein than the females. The relative energy contribution REC% of carbohydrates, total fat, Saturated Fatty Acids (SFA) and Monounsaturated Fatty Acids (MUF) in diets of students were more than the recommended. On the contrary, the REC% of Polyunsaturated Fatty Acids (PUF) and protein were less than the recommended.

Males and females received lower cholesterol, fiber, vitamins (except E) and minerals (except sodium in both and iron in males) than the recommended (Table 6). The deficiency of vitamins intake was ranged from -7.7% for B_6 to -32.2% for vitamin C in males diet and from -12.7% for riboflavin to -38.0% for pantothenic acid in females diet. Inadequate intake was also observed in dietary macro and micro-minerals. The deficit of macro-minerals intake was ranged from -15.4 and -13.9% for phosphorous to -31.4 and -27.3% for calcium in diets of males and females, respectively. Males and females consumed inadequate dietary iodine (-29.3% of males and -32.0% of females). With regard to iron consumption, data showed that males received more (+78.8%) whereas females received less (-22.1%) than the recommended.

DISCUSSION

Using weight, height and BMI indices, the males and females of this study were shorter and thinner than the standard (Table 1). Males had higher body weight and height than the females. This may be due to that the males could be continued faster grow than the females (Patricia-Ogechi *et al*., 2007). Low dietary intake (Table 5) supported these results and similar trends were noted by Nwokoro-Smart *et al*. (2006) and Patricia-Ogechi *et al*. (2007). Results in Table 1 and 2 showed that 90.6% of males and 87.8% of females had normal weight. These results correspond to light thinness on the BMI reference data (Ijarotimi *et al*., 2003) and did not reflect an obese group of university students. Current results were in accordance with results obtained by Nwokoro-Smart *et al*. (2006). However, BMI results are in disagreements with findings of Al-Assaf and Al-Numair (2007), that they mentioned the prevalence of obesity in Saudi adults, that may be due to the differences in life style and incomes between the participants. W/H ratio is generally dependent on age and sometimes on BMI. In general, subjects with a high W/H ratio are fatter compared with subjects with a low W/H ratio and probably have gained more weight in adult life. High W/H ratio is associated with intra-abdominal fat which highly lipolytic and drains into the portal vein. Increased concentrations of free fatty acids may be one of the factors leading to hyperinsulinemia, hypertriglyceridemia and reduced high density lipoprotein-cholesterol levels (Patricia-Ogechi *et al*., 2007). In general, low W/H and body fat measurements indicate to thinness of present studied subjects.

Regarding the body fat and fat free mass, four skin folds were measured. Data in Table 3 show that males had lower arm skin folds than the females. Males had higher LBM and lower TBF than females. This may be due to the fact that males build more muscle mass, larger skeleton and deposit less fat than females (Heald and Gong, 1999). On the contrary, the higher TBF in females may be attributed to their tend to lay down more subcutaneous fat layer than males during the growth spurt at puberty (Patricia-Ogechi *et al*., 2007). Current results (Table 1, 2) showed that the BMI was strongly correlated with TBF and LBM and confirmed findings of Onimawo *et al*. (2004) and Patricia-Ogechi *et al*. (2007), that the BMI and TBF are better predictors of obesity than body weight alone, as well as suitable measure of adiposity.

Measurements of muscle and fat areas provide information on total body and regional muscle and fat mass. Muscle area measurement is a good indication of LBM and protein reserve. This is important in evaluating the possible protein-energy malnutrition. Fat area measurement is a reflection of subcutaneous fat and used to provide information on the amount and rate of change in body energy stores (Frisancho, 1990). In present study the AMA and AFA were used as indices for protein and fat stores, respectively. Results in Table 3 show that the males had higher AMA and lower AFA than females. This may be attributed to male who tend to build more muscle mass and deposit less fat than females (Osisanya *et al*., 2002; Patricia-Ogechi *et al*., 2007). Studied students had lower AMA and AFA compared with the references (Frisancho, 1990). Males at higher risk of protein store and lower risk of fat store than females. From the presented results in Table 4, it could be noticed that all students have had lower intake of energy and protein than the recommended. Males consumed lower energy (75.1%) and protein (72%) than the females (85.9 and 83.3%). These results are in agreement with findings of Khattak *et al*. (2002). The REC% of protein in diets of participants was less than the recommended (about 8%). This could be attributed to their low protein intake and reflected in high contribution of fat and carbohydrates in energy intake. These inadequacies of protein intake and high intake of carbohydrates and fat of all students could be due to their lifestyle or irregular in their meals (Tamim *et al*., 2004).

Concerning the students received low dietary cholesterol and fiber on the base of ADA (1996) recommendations. The results showed that the males consumed lower cholesterol and higher fiber than the females. These differences between both sexes may be due to high intake of eggs and milk which raised the female's cholesterol intake and to the low intake of bread (bran) by females which resulted in low fiber intake compared with males. Males received lower vitamin A, D while both sexes received higher vitamin E compared to the recommended. This may be due to high male intake of liver and meats. Males consumed (6.3 mg) vitamin C over that of females, but they met lower (67.6%) than the females (72.5%) of this vitamin requirements. This could be attributed to the higher recommended number for males (90 mg) than that of females (75 mg) (Food and Nutrition Board, 2000). Males received more thiamin, B_6, folate, B_{12}, biotin and pantothenic acid than the females from the recommended. On the contrary, males consumed lower riboflavin and niacin than the females from the recommended. It is concluded that males consumed more bread, liver and meats and lower milk and its products and oil than females. These reflected in high intake of some vitamins (thiamin, niacin, B_6, folic acid, B_{12}, biotin and pantothenic acid) whereas low intake of riboflavin and vitamin E compared with those intakes of females (Food and Nutrition Board, 2000).

Results indicated that males and females consumed inadequate macro and micro minerals than the recommended (except sodium for both sexes and iron for males). Males received lower calcium and phosphorous than the females from the recommended (FNB, 1997). On the contrary, males consumed higher iron and iodine than the females from the requirements. The results showed that the food items and variety were reflected in analysis of student's diet. Female students consumed more milk and dairy products, fruits, chocolate and cola beverages than males which resulted in high intake of calcium, potassium and phosphorous. Meanwhile, males received higher meat, fish (especially canned fish, sardines and tuna) than the females which reflected in their high intake of iron and iodine. Both sexes received higher sodium. However, sodium intake was within the safe level (1100-3000 mg day^{-1}).

If mentioned requirements for vitamins and minerals were fit on the current study participants, data imply that the students of this study at risk of development of deficiency diseases. However, the comparison of current results with others is impossible as a result of lack dietary or biochemical assessment data as mentioned by Al-Assaf and Al-Numair (2007).

In conclusion, the nutritional status and macro and micro-nutrients intake of university students is poor. The low anthropometric values obtained from this study suggest that there is need for improvement in the nutritional status of these students.

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