COMPARATIVE STUDY ON NUTRITIONAL STATUS AND OBESITY TRENDS OF UNIVERSITY STUDENTS

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ABSTRACT

The Nutritional status and prevalence of obesity were studied among students, who represent an important segment of the population of the Arab Republic of Egypt. The study was carried out on a random sample of 120 (60 male and 60 female) students. The age of sample ranged between (17-19) years old. Results showed that percentages of obesity and overweight in male (50%) and in female (45%). Energy and other nutrients intake of obese students in male and female are significantly higher than those for non- obese students. From the results obtained it was found that prevalence of severe deficiency among non-obese male and female was very clear. There was a relationship between obesity and food intake between meals.

Results of biochemical investigations, showed significant decrease (P <0.05) in the mean value of total serum cholesterol and triglycerides in non-obese females in comparison to non-obese males. However, there were insignificant differences as regard to other studied parameters.

INTRODUCTION

Good nutrition is essential for human health throughout life, beginning with prenatal life and extending through old age. Prevalence of obesity in Egypt is increasing not only among adults but also among adolescents and even preschool age children *(Aly, et al.,*1981)

Today obesity is considered a major public health problem, although there are limited statistics for its general prevalence and incidence in the total population (Passmore and Eastwood, 1986).

Bray and Gray, (1988) has defined obesity as a state of abnormal accumulation of neutral fat in the storage depot of the body. It is ultimately the consequence of ingesting more calories than those needed.

Obesity is the most common nutritional disorder in affluent societies. It's significance requires constant emphasis because it is associated with increased mortality and predisposes to the development of important diseases. It diminishes the efficiency and happiness of those affected (Macleod *et al.,* 1986). There is little doubt that obesity alone is associated with ischemic heart disease, (Morrison *et al.,* 1999). But it is difficult to separate the contribution of obesity from that of other risk factors such as diabetes, hypertension and hyperlipidaemia (Macleod *et al.,* 1986 and Connelly *et at.*, 1999).

Therefore, the aim of this work is to study the prevalence of obesity among university students and its relation to their nutritional state.

MATERIALS AND METHODS

This study was carried out on a random sample of 120 (60 male and 60 female) Helwan University students. The age of sample ranged between 17 and 19 years old.

Students are not cigarette smokers or suffer from any clinical disease that may cause obesity or disturbance in lipid metabolism as diabetes mellitus, hypertension or any other endocrine diseases. Data collected from each student include:

I- Anthropometric Measurements:

The anthropometric measurements used in this study included weight and height from which body mass index was calculated.

Height was taken to the nearest 0.5 cm (Lohaman *et al.*, 1988). Weight of each student was recorded to the nearest 0.5 Kg. The body weight was adjusted according to the clothes of the students. The adjustment varied from 0.5-1 Kg. (Lohaman *et al.*, 1988)**.** Body mass index (BMI) as an indicator of obesity, was calculated according to following formula:

BMI = Wt (Kg) / (Ht in meter)^2 .

The grades of obesity utilizing the BMI were as follow :

Under weight < 20 Kg/m^2

Desirable rang of BMI 20 < 25 Kgm/m^2

Grade I obesity of BMI 25 < 30 Kgm / m^2

Grade II obesity of BMI 30 < 40 Kgm/ m^2

Grade III obesity of BMI ≥ 40 Kgm/ m^2

II- Food intake:

Food intake study was conducted to obtain accurate amounts of foods and beverages consumed by students in the 24 hours preceding data collection. The field schedule was designed so as to call data for 3 days. The food composition table of the Nutrition Institute (1996) was used. The daily intake of each nutrient was compared to the recommended intake by WHO (1974).

III- Laboratory Investigations:

Fasting blood sample was taken and used for determination of hemoglobin (Drabkin, 1949), total serum cholesterol (Allain *et al.*, 1974), total serum triglycerides (Wahifield, 1974), low density lipoprotein cholesterol (LDL-c) (Friede Walde, *et al.,* 1972), high density lipoprotein cholesterol (HDL-c) (Kostner, 1977) as well as total serum protein concentrations (Gornall *et at.*, 1949).

IIII- Statistical Analysis:

The arithemetic mean and standard deviation were used to represent the quantitative data. (SAS, 1988).

RESULTS AND DISCUSSION

Obesity is one of the most common and world wide disorded of fuel metabolism. Data collected in this study were presented in tables 1 to 7.

The results of the present work showed that data on Table (1 and 2) gives an overall picture of the dietary intake of both non- obese and obese male and female students. Results showed that percentages of obesity and over weight in male (50%) and in female (45%). The results show that energy and other nutrient intake of obese students are significantly higher than those for non- obese students.

These results are similar to those reported by Sarhan (1982) who found that the mean caloric intake of obese students was 3230 calories when compared with 2489 calories of non-obese students. (Sobhy *et al.,* 1997) reported also that daily energy and nutrient intakes of non-obese female students are significantly lower than obese female students.

Studying the nutritional status of students in the faculty of Home Economics, Helwan University, Younes and Hemeda (1989) found that the mean energy intake of female students was 2309 kcal and 1954 kcal in male students. It was also found that the mean intake of calcium, iron, thiamin, riboflavin and ascorbic acid were (509.9, 23.0, 1.6, 2.7 and 74.3) mg, in male respectively but in female the mean intake was (595.3, 17.9, 1.5, 2.4 and 61.1) mg, respectively.

Tharwat *et al.* (1994) studied the nutritional status on male students of Al- Azhar University and reported that the amounts of protein consumed were higher than the RDA but the total daily energy intake was equal to that of the RDA. The average daily amount of ascorbic acid represented 118% of the RDA. The mean total iron intake reached about four times the amount suggested by the RDA. The amount of calcium intake represented nearly 100% of the RDA.

Data presented in tables (3 and 4) classified energy and other nutrients intake of non-obese and obese male and female into four categories, severe deficiency (<60%), moderate intake (60< 90%), normal intake (90 ≤110%) and over intake (> 110%).

The results in table (3) reflect that severe deficiency intake of carbohydrate (26.0, 27.27%), fat (23.33 , 24.24%) and retinol (26.67, 39.39%), in male and female, respectively. But in female there were marked deficiency intakes in iron (27.27%) and thiamin (12.12%). This table showed that severe and moderate deficiency are more prevalence among female than male especially in iron. On the other hand adequacy in calcium, thiamin, riboflavin and ascorbic acid was found in male, while riboflavin and ascorbic acid were adequate in female students.

The results obtained agree with Sobhy *et al.* (1997) who found inadequate intake of thiamin (32.8%), iron (22.1%) and calcium (18.3%) in non-obese female students.

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Table (4) shows that most obese students take more than their requirements. Male students which had more than 110% of the requirement of RDA of protein (100.0 %), iron (100.0 %) thiamin (73.33%), retinol (80.0%) , calcium (86.67%) and niacin (76.67%). Also female students received more than110% of their RDA requirement in protein (100.0%), riboflavin (100.0%), thiamin (88.88%), niacin (81.48%) and ascorbic acid (81.48%).On the other hand the intake of retinol, ascorbic acid, calcium and iron were found to be deficient in some obese subjects.

These results are in accordance with those of Sobhy *et al.* (1997) who reported that most obese students take more than their energy requirements. In addition, 82.6% of students had more than 110% of their RDA of protein. On the other hand the same research reported that mineral intake (calcium and iron) were found to be deficiency in some obese students. In addition, vitamins, such as thiamin, riboflavin and niacin were also deficient.

Table (5) shows comparison between energy intake per day as percent of the R.D.A. in non-obese and obese students. All obese students were consuming more than 75% of R.D.A, and 80.70% of obese students were consuming more than 100% of R.D.A.

Table (6) reported that obesity among students was associated with food intake between meals. Eating between meals was a more frequent behaviour among the obese (50-88%) than the non-obese (19.05%). On the other hand 19.30 % of obese students not consumed snakes compared to (33.33%) of non-obese. These results agree with that of Amine and Samy (1996). Other results showed that females who ate afternoon snaks were more likely to be obese than females who skipped these events. Musaiger and Radwan (1995).

Comparison between the mean values of the different laboratory investigations done (hemoglobin, total serum protein, and lipid profile) are shown in table (7).

There was insignificant difference between the mean values of blood Hb, total serum cholesterol, triglycerides, HDLc , LDL-c and total protein in both male and female obese and non obese subjects. No significant differences were reported between male and female obese groups. There was insignificant difference between male and female non obese students except serum total cholesterol and triglycerides as there was significant decrease ($P < 0.05$) in the mean value of total cholesterol and triglycerides in non-obese females in comparison to non obese males. This could be attributed to the effect of oestrogens on blood level of lipids in females.

The normal Hb and total protein could be attributed to the sufficient intake of iron and protein diet.

Our results are contradictory to that of Morrisson *et al.* (1999), and Freedman *et al.* (1999), who proved the presence of an elevated levels of serum total cholesterol, triglycerides and LDL-c with decreased value of HDl-c in overweight students.

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Table (7): Mean values and standard deviation for the blood hemoglobin, cholesterol, triglusrides, HDL-c and LDL-c concentration of both male and female students.

Laboratory investigation	Normal value	Males mean ± SD		Females Mean ± SD	
		Obese	Non obese	Obese	Non obese
Hemoglobin	14-17 gm/100ml	15.9±2.01	15.2±1.42	13.2±2.32	12.8±2.91
Cholesterol	120-200 mg/dl	264.4±25.39	220.2±12.55	200.3±18.32	179.8±11.32*
Trigluseride	50-155 mg/dl	119.8±7.82	129.1±8.31	110.2±12.10	98.3±10.36*
HDL-c	35-58 mg/dl	43.2±2.45	49.3±7.66	44.4±8.23	41.9±5.22
LDL-c	66-176 mg/dl	179.7±25.42	143.8±8.23	133.9±9.31	120.3±6.43
Total Protein	6-8 mg/dl	6.5±1.23	7.2±2.03	7.1±2.51	6.7±1.11

* significant difference between male and female non obese subjects at

Finally, we could suggest that since overweight is associated with various risk factors even among young children, it is possible that successful prevention and treatment of obesity in childhood could reduce the adult incidence of cardiovascular disease.

This could be achieved by providing the students with more education on causes, management and counseling of obese patients.

Physical education teachers could also play major role in treating childhood obesity beside the role of mothers who must be given an educational program as regard balanced diet and good nutrition.

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دراسة مقارنة للحالة الغذائية ومدى انتشار السمنة بين طلبة وطالبات الجامعة

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يمثل معدل انتشار السمنة بين طلاب وطالبات الجامعة مشكلة من أهم المشاكل التى يجب أن تؤخذ فى الاعتبار لذا تهدف هذه الدراسة إلى التعرف على حجم تلك المشكلة ومدى انتشارها بين طلاب وطالبات الجامعة المصرية.

وقد أجريت هذه الدراسة على عينة عشوائية من 60 طالباً و 60 طالبة من الكليات المختلفة لجامعة حلوان تتراوح أعمارهم من 17-19 سنة . وقد تم أخذ المقاييس الجسمية والحصول على البيانات الغذائية عن طريق استرجاع 24 ساعة.

وقد تبين من النتائج انتشار السمنة وزيادة الوزن فى الذكور (50%) عن الإناث (45%) كما تبين من النتائج أن المأخوذ من الطاقة والعناصر الغذائية يزداد بنسبة معنوية مع الزيادة فى الوزن.

كما وجد انتشار النقص الغذائى بين الطلاب الذين يعانون من النحافة. وأن هناك علاقة بين السمنة وبين تناول الوجبات الخفيفة بين الوجبات الرئيسية.

كما تبين من التحاليل المعملية أن هناك نقص ذو قيمة إحصائية في مستوى الكولستيرول الكلي والدهون الثلاثية في مجموعة الطالبات غير المصابات بالسمنة عند مقارنتها بمثيلتها في الطلبة . ولم تكن هناك أي فروق ذات قيمة إحصائية بالنسبة لنتائج باقي التحاليل سواء في المجموعات المصابة بالسمنة أو المجموعات الأخرى الغير مصابين بالسمنة .

وقد أوصت الدراسة بالتأكيد على أهمية التثقيف الغذائي وممارسة الرياضة في المدارس والمعاهد والجامعات.

Table (1): Mean and standard deviation of energy and other nutrient intake among male obese and non- obese students

		Male			
	Non obese (N=30)	WHO %	obese (N=30)	WHO %	P-Value
Energy (Kcal)	2942.75±972.51	95.85	3904.58±1203.61	127.18	0.0001
Protein (total) gm	102.79±32.14	189.30	130.98±39.22	241.21	0.0001
Animal	44.63±18.48	-	61.27±22.16	-	0.0001
Plant	58.06±20.11	-	69.73±25.90	-	0.0001
Fat (total) gm	89.51±36.52	87.75	127.65±77.51	125.14	0.0001
Animal	52.42±25.61	-	78.27 ±40.30	-	0.0001
Plant	37.08±30.12	-	49.38 ±24.31	-	0.0001
Carbohydrate (gm)	401.66±145.40	74.79	512.87±205.02	95.5	0.0001
Calcium (mg)	805.87±349.48	134.31	934.55±483.06	155.75	0.0001
Iron (mg)	37.48±34.05	535.42	38.98±35.15	556.85	0.0001
Thiamin (mg)	1.73±0.77	144.16	1.81±0.53	150.83	0.0001
Riboflavin (mg)	3.66±1.71	203.33	4.41±1.70	245.00	0.0001
Niacin (mg)	24.74±11.49	121.87	32.25±12.93	158.86	0.0001
Retinol (mg)	1160.51±907.59	154.73	2196.46±1743.63	292.86	0.0001
Ascorbic acid (mg)	98.08±75.42	326.93	110.09±71.80	366.96	0.0001

Table (2): Mean and standard deviation of energy and other nutrient intake among Female obese and non- obese students

	Female				
	Non obese (N=33)	WHO %	obese (N=27)	WHO %	P-Value
Energy (Kcal)	2049.76±627.09	88.73	2928.49±925.36	126.76	0.0001
Protein (total) gm	73.51±19.98	171.35	100.61±28.94	234.52	0.0001
Animal	35.05±12.88	-	48.39±19.63	-	0.0001
Plant	38.46±12.98	-	52.21±16.57	-	0.0001
Fat (total) gm	66.16±25.33	85.92	91.46±34.34	118.77	0.0001
Animal	31.51±14.40	-	52.21±21.80	-	0.0001
Plant	34.64±29.75	-	39.25±17.06	-	0.0001
Carbohydrate (gm)	269.24±87.87	66.64	415.72±172.04	102.90	0.0001
Calcium (mg)	585.83±199.56	97.63	768.68± 382.71	128.11	0.0001
Iron (mg)	21.81±19.48	103.85	45.10±35.97	214.76	0.0001
Thiamin (mg)	1.30±0.83	144.44	1.49±0.56	165.55	0.0001
Riboflavin (mg)	3.23±3.51	230.71	3.76±1.78	268.57	0.0001
Niacin (mg)	17.94±7.11	118.02	24.44±11.52	160.78	0.0001
Retinol (mg)	844.94±699.32	112.65	1461.51±1189.64	194.86	0.0001
Ascorbic acid (mg)	79.90±56.55	262.66	111.98±126.80	373.26	0.0001

Table (3): **Frequency and percent distribution of students according to energy and other nutrient as percent of RDA among non-obese students.**

Energy and other nutrients	Severe deficiency <60%						Moderate intake 60<90						Normal intake 90≤110%						Over intake 110 %					
	Male		Female		Total		Male		Female		Total		Male		Female		Total		Male		Female		Total	
	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%
Energy (Kcal)	3	10.0	4	12.12	7	11.11	9	30.0	15	45.45	24	34.92	8	26.67	5	15.15	13	20.63	10	33.33	9	27.27	19	30.15
Protein (Gm)	1	3.33	0	0.0	1	1.58	1	3.33	1	3.63	2	3.17	1	3.33	1	3.03	2	3.17	27	90.0	31	93.93	58	92.06
Fat (Gm)	7	23.33	8	24.24	15	23.80	8	26.67	12	36.36	20	31.74	8	26.67	6	18.18	14	22.22	7	23.33	7	21.21	14	22.22
Carbohydrate (Gm)	8	26.0	9	27.27	17	26.98	11	36.67	16	48.48	27	42.85	8	26.67	8	24.24	16	48.48	3	10.0	0	00.0	3	4.76
Calcium (Mg)	2	6.67	1	3.03	3	4.76	4	13.33	8	24.24	12	19.04	3	10.0	9	27.27	12	19.04	21	70.0	15	45.45	36	57.14
Iron (Mg)	0	0.0	9	27.27	9	14.28	0	0.00	6	18.18	6	9.52	1	3.33	8	24.24	9	14.28	29	96.67	10	3030	39	61.90
Thiamin (Mg)	0	0.0	4	12.12	4	6.34	7	23.33	8	24.24	15	23.80	5	16.67	4	12.12	9	14.28	18	60.0	17	51.51	35	55.55
Riboflavin (Mg)	0	0.0	1	3.03	1	1.58	2	6.67	4	12.12	6	19.52	5	16.67	5	15.15	10	15.87	23	76.67	23	69.69	46	73.01
Niacin (Mg)	3	10.0	3	9.09	6	9.52	5	16.67	7	21.21	12	19.04	6	20.0	5	15.15	11	17.46	16	53.33	18	54.54	34	53..96
Retinol (Mg)	8	26.67	13	39.39	21	33.33	3	10.0	4	12.12	7	11.11	2	6.67	4	12.12	6	9.52	17	56.67	12	36.36	29	46.03
Ascorbic Acid (Mg)	2	6.67	2	6.06	4	6.34	2	6.67	5	15.15	7	11.11	1	3.33	2	6.06	3	4.76	25	83.33	24	72.72	49	77.77

Table (4): **Frequency and percent distribution of students according to energy and other nutrient as percent of RDA among obese students.**

Energy and other nutrients	Severe deficiency <60%						Moderate intake 60<90						Normal intake 90≤110%						Over intake 110 %					
	Male		Female		Total		Male		Female		Total		Male		Female		Total		Male		Female		Total	
	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%
Energy (Kcal)	0	0.00	0	0.00	0	0.00	8	26.67	4	14.81	12	21.05	8	26.67	6	22.22	14	24.56	14	46.67	17	62.96	31	54.38
Protein (Gm)	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	30	100.0	27	100.0	57	100.0
Fat (Gm)	1	3.33	0	0.00	1	1.75	7	23.33	7	25.92	14	24.56	8	26.67	4	14.81	12	21.05	14	46.67	16	59.25	30	52.63
Carbohydrate (Gm)	6	20.0	3	11.11	9	15.78	14	46.67	8	29.62	22	38.59	5	16.67	7	25.92	12	21.05	5	16.67	9	33.33	14	24.56
Calcium (Mg)	0	0.00	3	11.11	3	5.26	2	6.67	5	18.51	7	12.28	2	6.67	0	0.00	2	3.50	26	86.67	19	7037	45	78.94
Iron (Mg)	0	0.00	2	7.40	2	3.50	0	0.00	5	18.51	5	8.77	0	0.00	3	11.11	3	5.26	30	100.0	17	62.96	47	82.45
Thiamin (Mg)	0	0.00	0	0.00	0	0.00	1	3.33	3	11.11	4	7.01	7	23.33	0	0.00	7	12.28	22	73.33	24	88.88	46	80.70
Riboflavin (Mg)	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	3.33	0	0.00	1	1.75	29	96.67	27	100.0	56	98.24
Niacin (Mg)	0	0.00	0	0.00	0	0.00	1	3.33	3	11.11	4	7.01	6	20.0	2	7.40	8	14.03	23	76.67	22	81.48	45	78.94
Retinol (Mg)	5	16.67	7	25.92	12	21.05	1	3.33	3	11.11	4	7.01	0	0.00	0	0.00	0	0.00	24	80.0	17	62.96	41	71.92
Ascorbic Acid (Mg)	1	3.33	0	0.00	1	1.75	0	0.00	5	18.51	5	8.77	1	3.33	0	0.00	1	1.75	28	93.33	22	81.48	50	87.71

Table (5): comparison between energy intake per day as percent of the WHO in non- obese and obese students.

Energy intake per day (%) WHO	Male *				Female **				Total ***			
	None obese		obese		None obese		obese		None obese		Obese	
	No	%	No	%	No	%	No	%	No	%	No	%
< 50	3	10.00	0	0.00	1	3.03	0	0.00	4	6.35	0	0.00
50 < 75	5	16.67	0	0.00	9	27.27	0	0.00	14	22.22	0	0.00
75 < 100	9	30.00	7	23.33	11	33.33	4	14.81	20	31.75	11	19.30
100 < 150	12	40.00	19	63.33	11	33.33	15	55.56	23	36.51	34	59.65
≥ 150	1	3.33	4	13.33	1	3.03	8	29.63	2	3.17	12	21.05
Total	30	47.62	30	52.63	33	52.38	27	47.37	63	100.00	57	100.00

* $X^2 = 9.586$ P-Value = 0.048   ** $X^2 = 7.219$ P-Value = 0.125   *** $X^2 = 15.470$ P-Value = 0.004

Table (6): comparison between number and percent of students according to their consumption of snacks among obese and non-obese students.

Snacks	Male *				Female **				Total ***			
	None obese		obese		None obese		Obese		None obese		Obese	
	No	%	No	%	No	%	No	%	No	%	No	%
Yes	9	30.00	15	50.00	3	9.09	14	51.85	12	19.05	29	50.88
No	6	20.00	5	16.66	15	45.45	6	22.22	21	33.33	11	19.30
Somtime	15	50.00	10	33.33	15	45.45	7	25.93	30	47.62	17	29.82
Total	30	47.62	30	52.63	33	52.38	27	47.37	63	100.00	57	100.00

* $X^2 = 0.300$ P-Value = 0.861   ** $X^2 = 11.163$ P-Value = 0.004   *** $X^2 = 4.460$ P-Value = 0.108