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Nutrient Intake and Eating Disorder Symptoms in Cypriot Adolescents

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Abstract - Problem eating behaviors are frequent amongst adolescents despite not reaching the severity of a diagnosable eating disorder. The current research aimed to assess the quality of nutrient intake of Cypriot adolescents and to determine whether differences exist between those adolescents at risk for the development of an eating disorder and those not at risk. In a representative sample of adolescents 10-18 years of age in schools, trained professionals carried out anthropometric examinations. The 13-18 year olds completed the Eating Attitudes Test-26 or the Eating Disorder Inventory-3 and 3-day diet records, during the academic year 2009-2010. It was found that females consume less calories, macronutrients and minerals calcium, iron and sodium in comparison to males. Fiber, calcium, vitamin A was found to be below 2/3 Dietary Reference Intake in a large number of males and females, 37% of females consume insufficient iron. Adolescents at risk for the development of an ED indeed have maladaptive eating patterns with gender differences existing in nutritional consumption practices and food preferences. Health education in Cypriot schools emphasizing adequate and appropriate food, fruit and vegetable consumption is greatly warranted.

Keywords - Nutrient Intake, Eating Attitudes Test-26 (EAT-26), Eating Disorder Inventory-3 (EDI-3), Eating Disorders (ED), Adolescents

1. Introduction

Eating disorders are considered the third most common chronic illness among adolescents (Misra et al., 2006) and include: eating disorders not otherwise specified (EDNOS), binge eating disorder (BED), bulimia nervosa (BN) and anorexia nervosa (AN). Research on patients already diagnosed with an eating disorder have shown that they can be severely malnourished despite being of normal weight with deficiencies in a number of specific nutrients including calcium, iron, vitamins A and C (Coker, 2007).

The majority of adolescents do not demonstrate eating disorders; however problem eating behaviors to the level of severity of a diagnosable eating disorder are more frequent in adolescent populations (Leon, Perry, Mangelsdorf & Tell, 1989). A substantial number of adolescents consider themselves to be overweight and have been on diets to reduce their weight using diet pills, laxatives, self-induced vomiting and binge-eating (Leon et al., 1989; Croll, Neumark-Sztainer, Story & Ireland, 2002). Dieting has been found to be extremely important in the development of eating disorders (Patton, Selzer, Coffey, Carlin & Wolfe, 1999; Position of the American Dietetic Association, 2006); the undernutrition or malnutrition even being a cause of instead of a side effect of eating disorders (Coker, 2007). Unfortunately dieting is becoming increasingly common amongst adolescents, with weight loss efforts resulting in unbalanced nutrition both in quantity and quality (Samuelson, 2004; Boschi et al., 2003).

The purpose of the present research was to investigate the macronutrient and micronutrient intake of the male and female Cypriot adolescent population. To explore whether those adolescents at risk for the development of eating disorders as exhibited by their scoring on eating disorder questionnaires have better or worse nutritional patterns than those adolescents who have normal scores.

2. Subjects and Methods

2.1. Sample

The present study is part of a large cross-sectional survey conducted in Cyprus in 2010. The research was directed toward the investigation of the eating attitudes and behaviors of the Cypriot adolescent population using a nationally representative sample.

A representative sample of students was selected with the help of the statistical service of the Ministry of Finance in

Cyprus. The selection was based on the distribution of the total population with respect to district and area of living. A multistage sampling procedure was used. Classes per grade of elementary and secondary schools in each district were assigned numbers from which classes were randomly selected.

A total of 22 classes from 22 different elementary schools and 135 classes from 45 different secondary schools were included. A total of 1745 students took part in the study, 721 males (mean age 14.9, SD 1.7) and 1024 females (mean age 15.2, SD 1.8).

Informed consent was received from students' parents allowing them to take part in the study. Anthropometric characteristics of weight, height, waist circumference were measured by trained professionals. Students aged thirteen and above (867 females and 596 males) were subsequently given one of two questionnaires to complete, the Eating Attitudes Test (EAT-26) (Garner et al., 1982) and the Eating Disorder Inventory-3 (EDI-3) (Garner et al., 2004) in schools (both questionnaires were reproduced with permission). 60% of participants were given the EDI-3 and 40% the EAT-26.Students at a given school filled questionnaires simultaneously under the supervision of a trained professional. Adolescents were then given instructions to complete 3-day diet records at home for two continuous weekdays and one weekend day, either a Saturday or Sunday, which were collected from schools one week later. Participation in the study was voluntary and students were ensured the confidentiality of their answers.

Participants who neglected to mention their gender and age were excluded altogether from the statistical analyses. In addition, the analyses included only those students with complete scale items on the questionnaires.

2.2. Measures

The Eating Attitudes Test (EAT-26) is a self-report questionnaire of 26 items assessing the range of symptoms of anorexia and bulimia nervosa. Previous validations of the EAT-26 have found good reliability scores ranging from .79 to .94 (Sira & Pawlak, 2010). In this study the alpha coefficient was found to be .77. The EAT-26 items form 3 subscales: (a) Dieting, (b) Bulimia and food preoccupation, and (c) Oral control, (Garner et al., 1982).

The EDI-3 is a self-report questionnaire of 91 items measuring the psychological domains relevant to the understanding and treatment of eating disorders, aimed at individuals 13 years of age and above. Items are organized into 12 primary scales: three eating disorder specific scales and nine general psychological scales, relevant but not specific to eating disorders (Garner et al., 2004). Only the 3 eating disorder specific scales were used in this research which includes: (a) Drive for thinness (DT) (b) Bulimia (B) and (c) Body dissatisfaction (BD). Raw scores for each scale are calculated and cut-off points are created according to EDI-3 interpretive guidelines. Reliability scores for the Eating Disorder Risk scales are found to be in the high .80s to low .90s across normative groups. In this study Cronbach's alpha coefficient for the DT, B and BD scales was .76, .62 and .86 respectively.

Three-day diet record sheets required individuals to write down for 2 consecutive weekdays and either a Saturday or Sunday, what exactly they ate, drank and how much. The record sheets contained specific instructions and concrete examples on how it should be completed.

All anthropometric measures were taken using SECA measuring instruments, in the morning, wearing light clothing, by trained professionals.

2.3. Statistical Analysis

All statistical analyses were carried out using SPSS 18.0 statistical software. Since, BMI, nutrition and eating disorder risk differ amongst boys and girls, separate analyses were conducted for each gender. For all analyses $\alpha < 0.05$ was taken as statistically significant difference between groups.

Nutrient analysis of the 3-day diet records for the calculation of dietary intakes was done using the dietary software 'Greek Diet'. The software was initially created in 1990 by the Preventive Medicine and Nutrition Clinic of the University of Crete, it was upgraded in 1998 using the USDA Nutrient Database for Standard Reference (Kafatos, Verhagen, Moschandreas, Apostolaki & Westerop, 2000). Despite the similarities between Greek and Cypriot cuisine, certain Cypriot food items were added to the software which are not a part of Greece's gastronomy.

The recommended dietary allowance (RDA/DRI) method was used to determine the nutritional intake of adolescents, with two thirds or less of the RDA used as the criterion for inadequate nutritional intake (Institute of Medicine, Food and Nutrition Board, 1997; 2000; 2002[a]; 2002[b]). Independent sample t-tests were performed to assess differences between males and females on anthropometric measures, eating attitudes and behaviors and nutrient intake. Where the data violated normality assumptions the Mann-Whitney test was used. Adolescents' scores on the EAT-26 and the EDI-3 subscales of DT, B and BD were divided into normal and pathological scores in accordance with the EDI-3 interpretive guidelines (Garner, 2004). Independent sample t-tests were carried out comparing the nutrient intake of participants with normal and pathological scoring on the questionnaire scales. Lastly, adolescents were divided into three categorical groups (underweight, normal weight, overweight/obese) according to their BMI, using the International Obesity Task Force (IOTF) cut-offs. Independent sample t-tests were used to compare the nutrient intake of those in each BMI category with normal and pathological scores on the two questionnaires.

3. Results

Descriptive statistics on BMI, weight, height and scoring on the EAT-26 and EDI-3 are presented in Table 1 for each gender separately. Weight and height and thus the BMI of

male participants are greater than those of female participants. On both eating disorder questionnaires no statistical significance was found between males and females on scoring on the Bulimia subscales. On all other subscales including EAT-26 total scores, female adolescents have higher scores compared to males.

Table 1. Anthropometric Characteristics of Participants and Scoring on EAT-26 and EDI-3 Subscales

	MALES			FEMALES		
	N	Mean	SD	N	Mean	SD
BMI*	676	22.16	4.2	896	21.34	3.8
Weight*	677	62.33	15.4	896	54.54	11.1
Height*	676	166.80	10.1	896	159.58	6.7
EAT-26 (total score)*	112	13.16	8.1	237	17.62	9.1
EDI-3 DT*	276	6.75	5.8	483	11.25	7.8
B	278	4.20	4.9	497	4.58	5.1
BD*	267	10.72	7.9	478	14.64	10.1

* p< 0.001

Table 2. Nutrient Intake of Male and Female Adolescents

	MALES N = 237		FEMALES N = 538	
	Mean	SD	Mean	SD
Calories*	2111.76	441.1	1786.92	404.8
Protein*	94.25	24.1	73.71	20.7
Carbohydrate*	225.85	59.5	206.14	56.8
Fiber	14.79	6.1	14.06	5.9
Total fat*	91.70	22.7	74.04	20.5
SFA*	28.03	8.8	23.79	8.2
MSFA*	32.95	9.8	27.75	8.9
PSFA*	11.80	4.2	9.55	3.8
Cholesterol *	336.85	135.7	262.58	118.4
Calcium*	992.11	346.8	870.28	301.7
Iron*	12.58	3.4	10.39	2.8
Potassium	2455.36	702.1	2151.51	672.6
Sodium*	2843.11	827.3	2291.52	659.8
Vitamin A	941.67	584.8	866.79	775.52
Vitamin C	94.10	65.8	91.20	64.0

* p< 0.001

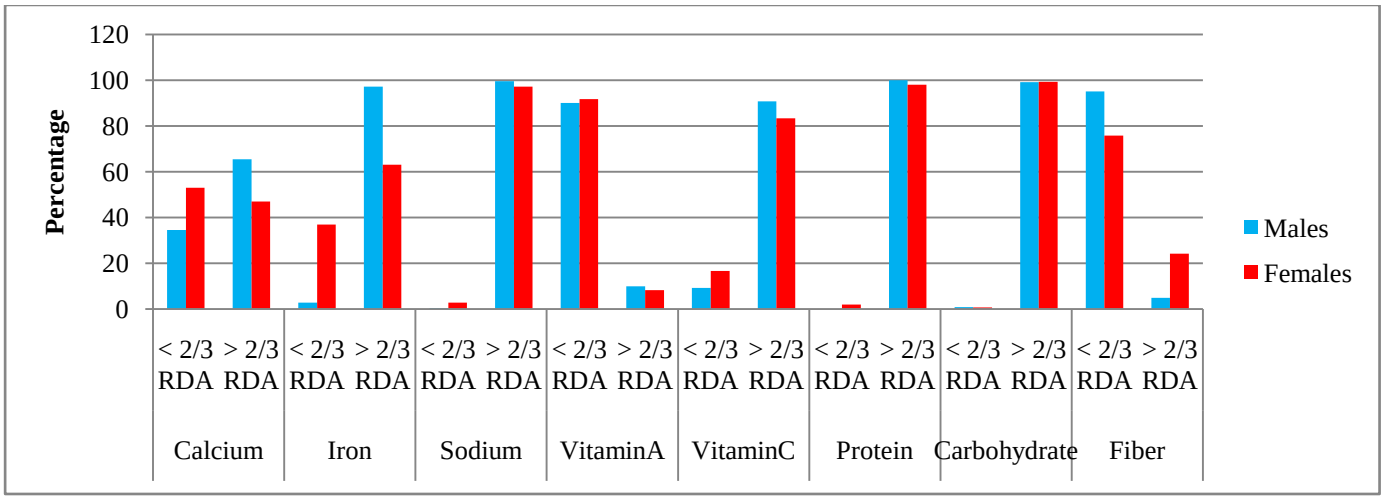

Fig. 1. The percentage of adolescents meeting DRI criteria for selected micro- and macronutrients

The macronutrient and micronutrient intake of males and females are shown in Table 2. The results of the independent sample t-test indicate that females consume less calories overall when compared to males, they ingest less macro-and

micro-nutrients with the exception of fiber and vitamins A and C. Figure 1 presents the percentage of male and female adolescents meeting the 2/3 Dietary Reference Intakes (DRI) criterion for selected micro- and macronutrients. The fiber, calcium, iron and vitamin A intakes were below 2/3 DRI in a great proportion of female adolescents; whereas fiber, calcium and vitamin A were below requirements in a large percentage of males.

Independent sample t-tests were carried for each gender separately comparing the nutrient intake of adolescents with normal and pathological scoring on the EAT-26 questionnaire and the EDI-3 subscales (Table 3). Females with pathological scores on the DT subscale consume significantly less calories, protein, total fat, cholesterol and potassium. No differences were found between groups on the B subscale. Those with pathological scores on the BD subscale consume fewer calories, proteins, carbohydrates, total fat, and iron. Alternately those with pathological scores on the EAT-26 consume more carbohydrates, iron and vitamin A. Males with pathological scores on the DT subscale consume less calcium and iron. Similar to females no significant differences were found between those with normal and pathological scores on the B subscale. However, males with pathological scores on the BD subscale consume fewer carbohydrates and iron. Lastly, those with pathological scores on the EAT-26 consume less total fat, SFA and cholesterol.

Table 3. Independent Sample t-test Comparing Nutrient Intake of Participants with Normal and Pathological Scores on the EAT-26 and EDI-3 Subscales

FEMALES	Drive for Thinness		Bulimia		Body Dissatisfaction		EAT-26	
	Normal Mean (SD) N= 212	Pathological Mean (SD) N=79	Normal Mean (SD) N=195	Pathological Mean (SD) N=105	Normal Mean (SD) N=214	Pathological Mean (SD) N=79	Normal Mean (SD) N=85	Pathological Mean (SD) N=42
Calories	1824,5 (407,7)	1687,3 (385,2)**	1790,4 (390,1)	1815,6 (435,2)	1837,9 (418,2)	1686,3 (370,4)**	1741,3 (393,3)	1878,6 (404,9)
Protein	75,3 (19,5)	68,8 (20,9)**	73,9 (19,4)	74,2 (21,6)	75,5 (20,2)	68,3 (18,9)**	72,6 (21,8)	77,4 (22,8)
Carbohydrate	210,7 (59,6)	196,9 (48,9)	206,3 (55,9)	212,9 (60,3)	213,6 (60,9)	197,0 (46,2)**	196,6 (52,9)	217,4 (56,9)*
Fiber	14,4 (6,2)	13,6 (5,6)	14,1 (5,8)	14,5 (6,6)	14,6 (6,3)	13,3 (5,3)	13,6 (5,5)	15,2 (6,6)
Total fat	75,7 (19,9)	68,7 (19,7) **	74,4 (19,1)	73,8 (21,8)	75,8 (20,3)	68,8 (19,7)**	73,7 (20,6)	77,5 (21,9)
Cholesterol	270,4 (111,4)	233,9 (117,1)**	263,5 (110,9)	253,8 (116,2)	264,9 (111,2)	238,2 (108,1)	262,8 (119,6)	281,0 (124,2)
Calcium	893,2 (288,3)	829,2 (291,4)	884,4 (272,6)	869,7 (304,5)	883,6 (283,5)	853,9 (295,6)	857,8 (309,7)	865,5 (330,9)
Iron	10,5 (2,7)	9,9 (2,4)	10,6 (2,7)	10,2 (2,7)	10,7 (2,8)	9,7 (2,5)*	10,0 (2,8)	11,3 (3,0)**
Potassium	2173,6 (662,5)	1986,4 (679,4)*	2103,6 (613,9)	2190,5 (763,9)	2171,0 (671,8)	2029,2 (676,8)	2200,3 (702,6)	2320,7 (678,0)
Sodium	2343,7 (646,4)	2208,1 (594,9)	2311,1 (641,9)	2352,5 (634,5)	2319,5 (631,8)	2309,3 (662,6)	2286,3 (659,3)	2271,7 (721,9)
Vitamin A	819,8 (529,4)	810,9 (497,9)	815,8 (537,7)	846,6 (485,0)	839,7 (557,5)	799,4 (422,8)	751,8 (429,7)	1060,6 (658,3)**
Vitamin C	88,4 (55,1)	84,4 (65,6)	85,7 (57,2)	94,0 (64,9)	89,2 (57,4)	87,9 (67,7)	105,3 (78,9)	113,4 (73,9)
MALES	N=128	N=7	N=86	N=51	N=123	N=11	N=37	N=8
Calories	2089,1 (433,7)	1962,5 (518,3)	2083,4 (432,1)	2062,2 (449,5)	2096,2 (439,6)	1922,7 (417,7)	2245,2 (436,9)	1941,9 (334,6)
Protein	93,6 (24,7)	83,9 (26,1)	94,9 (25,9)	88,3 (21,5)	93,9 (24,8)	85,9 (25,7)	101,5 (22,1)	88,4 (15,0)
Carbohydrate	225,3 (60,0)	204,2 (62,5)	223,3 (59,2)	225,2 (61,9)	226,3 (58,9)	186,5 (63,3) *	229,6 (61,3)	208,8 (42,7)
Fiber	14,9 (6,3)	11,6 (4,9)	14,4 (6,1)	14,7 (6,2)	14,9 (6,3)	11,3 (3,4)	14,5 (4,1)	15,4 (5,1)
Total fat	89,9 (22,9)	88,9 (19,4)	89,4 (22,6)	89,6 (23,5)	89,9 (22,9)	93,3 (19,6)	101,4 (20,4)	82,3 (20,8)*
Cholesterol	329,9 (133,7)	372,9 (153,9)	337,9 (147,4)	322,6 (111,0)	329,5 (133,4)	345,4 (114,5)	374,9 (130,2)	274,9 (92,9)*
Calcium	990,6 (336,6)	719,7 (333,9)*	985,8 (329,1)	974,6 (372,7)	995,6 (348,1)	805,7 (254,1)	1046,4 (361,2)	928,9 (378,6)
Iron	12,6 (3,6)	9,6 (3,2)*	12,4 (3,2)	12,3 (4,3)	12,6 (3,7)	10,3 (2,4)*	13,1 (2,9)	12,5 (2,5)
Potassium	2388,0 (695,9)	2248,5 (678,7)	2396,8 (720,5)	2353,7 (672,0)	2414,6 (718,4)	2202,3 (298,9)	2771,2 (619,2)	2518,5 (849,5)
Sodium	2798,4 (818,8)	2467,6 (757,9)	2812,7 (795,4)	2714,2 (842,5)	2809,6 (809,2)	2368,7 (795,5)	2920,3 (784,6)	2535,1 (726,9)
Vitamin A	883,2 (506,7)	789,6 (639,1)	876,1 (558,8)	863,1 (411,9)	890,3 (514,6)	803,9 (572,6)	1153,1 (759,1)	954,7 (567,0)
Vitamin C	89,7 (60,5)	84,2 (31,5)	86,6 (57,8)	92,5 (60,9)	88,9 (59,4)	80,5 (48,7)	103,2 (55,0)	132,8 (158,1)

* $p<0.05$ ** $p<0.01$

The final statistical analysis conducted required dividing participants into categorical groups according to their BMI; the categories being underweight, normal weight and overweight/obese. For each group, independent sample t-tests were used to compare the nutrient intake of those with normal and pathological scoring on the EAT-26 and EDI-3 subscales. The analysis could not be carried out for the Underweight category as due to the sample size there were too few participants with pathological scores and complete three day diet records to allow for comparison.

Table 4. Comparison of Nutrient Intake of Normal Weight and Overweight/Obese Adolescents with Normal and Pathological Scores on the EAT-26 and EDI-3 Subscales Using Independent Sample t-test

NORMAL WEIGHT	Drive for Thinness		Bulimia		Body Dissatisfaction		EAT-26	
	Normal Mean (SD) N= 155	Pathological Mean (SD) N=38	Normal Mean (SD) N=128	Pathological Mean (SD) N= 68	Normal Mean (SD) N=164	Pathological Mean (SD) N=30	Normal Mean (SD) N=54	Pathological Mean (SD) N=23
Calories	1883,8 (388,9)	1712,1 (487,8)*	1835,9 (410,2)	1900,8 (424,3)	1887,8 (408,4)	1638,6 (393,4)**	1887,2 (490,2)	1927,3 (358,1)
Protein	78,3 (21,0)	67,9 (23,9)**	76,0 (22,3)	77,8 (21,8)	78,8 (21,6)	63,2 (19,8)**	79,1 (25,6)	78,7 (20,9)
Carbohydrate	215,7 (54,5)	201,8 (56,5)	211,1 (55,7)	220,7 (54,0)	216,3 (55,7)	194,2 (43,3)*	210,1 (62,1)	225,5 (55,6)
Fiber	14,4 (5,6)	13,7 (6,4)	14,1 (5,4)	14,7 (6,3)	14,5 (5,7)	12,9 (5,9)	13,6 (5,1)	15,0 (5,5)
Total fat	78,8 (20,9)	70,7 (25,3)*	76,6 (21,8)	78,6 (22,6)	78,6 (21,8)	68,6 (22,2)*	81,6 (23,7)	77,9 (21,4)
Cholesterol	273,8 (112,8)	251,4 (155,3)	267,9 (118,9)	268,6 (128,4)	276,2 (113,1)	218,9 (137,8)*	286,1 (145,2)	277,5 (122,4)
Calcium	916,1 (310,2)	761,9 (304,5)**	889,5 (292,1)	886,7 (342,4)	908,2 (304,5)	728,9 (319,1)**	904,3 (357,0)	945,9 (326,9)
Iron	11,2 (3,4)	9,6 (2,6)**	10,9 (2,9)	11,0 (4,0)	11,2 (3,4)	9,1 (2,3)**	10,4 (2,9)	11,8 (2,6)*
Potassium	2201,8 (634,8)	1854,9 (718,1)**	2128,3 (645,3)	2167,2 (706,7)	2181,6 (651,7)	1847,3 (664,7)*	2260,1 (734,4)	2451,5 (670,6)
Sodium	2454,4 (721,0)	2121,8 (643,1)**	2404,1 (718,9)	2401,6 (711,8)	2427,1 (715,5)	2185,9 (675,2)	2451,8 (759,7)	2300,1 (682,1)
Vitamin A	776,0 (432,7)	741,1 (522,1)	749,0 (439,7)	813,8 (463,0)	789,3 (457,6)	660,6 (403,2)	795,7 (424,9)	1111,0(705,0)*
Vitamin C	90,2 (49,9)	76,8 (66,8)	90,6 (54,8)	82,1 (52,4)	87,8 (49,3)	82,7 (72,9)	99,8 (68,5)	132,9 (107,8)
OVERWEIGHT/ OBESE	N=48	N=22	N=40	N=31	N=40	N=27	N=17	N=11
Calories	1827,1 (445,9)	1730,9 (335,3)	1765,2 (420,8)	1858,8 (409,7)	1864,9 (444,3)	1742,9 (386,2)	1657,7 (391,9)	1796,4 (592,5)
Protein	81,3 (27,2)	73,7 (21,6)	78,1 (25,4)	79,9 (24,7)	82,2 (28,9)	74,7 (21,5)	75,8 (25,2)	75,7 (28,8)
Carbohydrate	199,8 (59,7)	190,4 (41,6)	190,4 (52,6)	206,4 (56,8)	203,7 (55,7)	192,1 (53,1)	174,3 (39,9)	201,9 (63,3)
Fiber	13,6 (5,2)	13,8 (4,6)	12,6 (5,2)	14,1 (4,2)	14,1 (5,6)	13,2 (3,8)	13,5 (5,2)	15,1 (5,4)
Total fat	78,2 (23,4)	73,5 (18,1)	76,4 (22,4)	78,8 (21,6)	79,6 (22,6)	74,6 (22,6)	72,2 (24,9)	77,7 (29,2)
Cholesterol	305,7 (123,7)	249,8 (100,6)	304,7 (130,6)	271,2 (98,2)	299,9 (129,3)	260,7 (97,4)	275,1 (121,4)	268,9 (119,9)
Calcium	959,0 (317,9)	761,6 (282,3)*	899,9 (290,2)	918,1 (361,6)	947,3 (361,6)	848,7 (260,3)	738,2 (293,7)	785,4 (379,5)
Iron	11,1 (3,4)	9,7 (2,1)	10,8 (3,3)	10,5 (2,9)	11,6 (3,2)	9,7 (2,7)*	9,4 (2,9)	10,9 (4,1)
Potassium	2142,5 (694,3)	2093,8 (594,6)	1992,2 (595,2)	2311,2(736,2)*	2226,5 (768,7)	2066,5 (522,2)	1994,5 (368,8)	2107,0 (824,3)
Sodium	2554,2 (710,2)	2354,3 (597,6)	2460,4 (656,0)	2539,3 (711,3)	2590,4 (650,1)	2339,6 (701,9)	2152,6 (696,7)	2379,1 (883,4)
Vitamin A	865,6 (510,1)	684,6 (440,1)	788,8 (495,6)	852,7 (483,9)	865,9 (563,0)	792,1 (428,3)	553,1 (251,7)	905,4 (514,7)*
Vitamin C	83,0 (61,7)	84,5 (46,8)	64,5 (39,1)	108,1 (65,8)**	88,5 (63,4)	79,9 (48,5)	110,1 (98,9)	79,3 (53,8)

* $p<0.05$ ** $p<0.01$

The results in Table 4 reveal that for those in the normal weight category no differences exist in dietary intake between those with normal and pathological scores on the B scale of the EDI-3. Those with pathological scores on the DT subscale consume fewer calories, protein, total fat, and the micronutrients calcium, iron, potassium and sodium. Similar results are found for those with pathological scores on the BD subscale; they consume fewer calories, carbohydrates, protein, fat, cholesterol, calcium, iron and potassium. Only differences in micronutrients iron and vitamin A were found between those with normal and pathological scores on the EAT-26. Participants in the Overweight/Obese category with normal and pathological scores did not have any differences in the intake of macronutrients. However, differences were found in micronutrient intake. Those with pathological scoring on the EAT-26 consume more vitamin A. Those with pathological scores on the DT scale consume less calcium; on the B scale participants with pathological scores consume more potassium and vitamin C. Pathological scorers on the BD scale consume less iron.

4. Discussion

The results of the present study further our knowledge on the dietary intake of male and female Cypriot adolescents. More importantly, they show that adolescents considered to be at risk for the development of an eating disorder (as manifested by their scoring on eating disorder questionnaires) differ in their macronutrient and micronutrient intake. Different dietary patterns are observed between males and females with high scores on the EAT-26 and EDI-3 subscales. In addition, normal weight adolescents at risk for the development of eating disorders do in fact have a different nutritional pattern in comparison to those not considered to be at risk.

Epidemiological research has consistently shown that females are at greater risk for the development of eating disorders in comparison to males (Hoek, 2006; Striegel-Moore, Rosselli, Perrin, De Bar, Wilson, May &

Kraemer, 2009). It was therefore expected that female adolescents would have higher scores on the EAT-26 and EDI-3 subscales. No differences were found however between males and females on the Bulimia subscales of both questionnaires; both subscales inquire after periods of binge-eating (Garner et al., 1982; 2004). There is evidence to suggest that the prevalence of binge-eating is comparable in men and women, with subthreshold binge eating disorder being more frequent in men as opposed to women (Hudson, Hiripi, Pope & Kessler, 2007).

The findings from other studies show that the energy and nutrient intake of male adolescents are higher than those of female adolescents (Lambert et al., 2004; Decarli et al., 2000; Hassapidou & Fotiadou, 2001; Garipagaolglu et al., 2008); similarly in this research, calorie and all other nutrient intakes with the exception of fiber, vitamins A and C of males were found to be significantly higher than those of females. The consumption of macronutrients protein and carbohydrate were found to be in line with recommended percentages whereas 80% of the adolescents studied consumed below the advised fiber intake. A similar pattern however was not found for the consumption of micronutrients.

Almost 50% of adolescents consume below the recommended daily calcium intake, a finding that has been confirmed in other research (Decarli et al., 2000; Garipagaolglu et al., 2008; Cruz, 2000), this is unfortunate as calcium needs are greater during adolescents due to the increase in skeletal growth (Stang & Story, 2005) in addition it could constitute a risk factor for osteoporosis at a later stage in life. In total 28% of Cypriot adolescents do not meet adequate iron requirements. This phenomenon is not so evident for males, as 37% of females have insufficient iron consumption in comparison to 3% in males. Female iron requirements are higher than those of males especially during adolescence due to the physiological processes that occur during this time (Gibsen, Heath & Ferguson, 2002). It has generally been found that sodium intakes of adolescents usually surpass recommended levels (Stang & Story, 2005), almost 98% of adolescents in Cyprus consume above the suggested 2/3 DRI; the mean intake exceeds the suggested consumption. The majority of adolescents studied had adequate dietary intakes of vitamin C as opposed to the 91% with inadequate intakes of vitamin A, a finding consistent with previous research on the dietary habits of adolescents (Garipagaolglu et al., 2008; Stang & Story, 2005).

One of the questions this research posed was whether a link can be observed between the risk for the development of eating disorders and the actual nutritional consumption of adolescents. It must be noted that where the nutritional patterns of persons at risk for the development of bulimia are concerned, caution must be applied. Firstly because research has shown that binge eating is common in individuals who do not meet all criteria for a formal diagnosis (Garner, 2004). Secondly, bulimics undergo cyclical patterns of dietary restraint (i.e. under-consumption of food) and binge eating (i.e. overconsumption) (Kales, 1990). The three day diet records collected in this investigation would not distinguish between these two periods and was not one of the aims of this research.

Females with above normal scoring on the EAT-26 were found to consume more iron, vitamin A and carbohydrates. Adolescent males with pathological scores consumed less fat and cholesterol in comparison to those with normal scores. These findings are contrary to others, for example, Egyptian adolescents with eating disorders; females were found to have a negative relation with calcium intake while boys positive relations to animal fat, calcium, vitamins A and C (Monir et al., 2010). Although the two studies use different methodologies and questionnaires which is perhaps why contrasting findings appeared the fact that in both, male and female adolescents differed which gives additional evidence to suggest that strong gender differences exist in nutritional consumption practices and food preferences.

That drive for thinness and food consumption are without a doubt correlated has been found in past studies, with adolescent girls consuming less high fat foods (Leon et al., 1989; French, Perry, Leon & Fulkerson, 1994). Cypriot female adolescents with pathological scores on DT scales likewise ingest less total fat, SFA and MSFA but they also consume less calories, protein and cholesterol. Unfortunately males with pathological scores consume fewer essential micronutrients calcium and iron. Very similar results have been found for males and females with normal and pathological scores on the BD scale. Girls who are discontent with their shape and size consume fewer calories, macronutrients and iron whereas boys consume fewer carbohydrates and iron. Such differences are likely to arise because of differences between the types of foods male and female adolescents choose to eat; with females preferring healthier foods (French et al., 1994). This may in fact be linked back to the stereotypes of "masculine vs. feminine foods" (Leon & Finn, 1984).

Body weight is crucial in the assessment of eating disorders as it forms the context for realizing personal distress concerning weight and shape (Garner et al., 2004). For this reason, participants were divided into their BMI categories according to their weight. Normal weight adolescents who score above normal on the EAT-26 consume higher amounts of iron and vitamin A in their diets. As the EAT-26 does not yield a specific diagnosis of an eating disorder but is useful as an overall measure of eating concerns (Garner & Garfinkel, 1997), it is likely that these individuals engage in methods of weight control. Adolescents using moderate weight control methods employ more health promoting eating and exercise behaviors such as consuming more fruits and vegetables (which are rich in vitamin A) (Story et al., 1998), therefore it can be argued that this is the reason behind the increased vitamin A consumption of pathological normal weight scorers. Research has also found that girls with AN have higher dietary intakes of vitamins A, C, K and B in comparison to controls however in addition they consume far fewer calories and fats(Misra et al., 2006). Adolescents with high scores on

the DT scale and BD scale follow similar patterns of nutritional intake to each other; they consume fewer calories, proteins and fat and thus less minerals calcium and iron. Since the EDI-3 is more sensitive as a tool, these adolescents may follow more extreme weight control methods.

No differences were found between overweight/obese adolescents with normal and pathological scores in their macronutrient intake. Worth noting are the two instances where vitamins A and C were higher in "above normal" scorers on the EAT-26 and B scale respectively, which is perhaps indicative of increased fruit and vegetable consumption in their attempts to eat more healthily and lose weight.

Overall, this research highlights several important findings concerning Cypriot adolescents. Firstly, the micronutrients crucial for development and growth especially in this age group were found to be below adequate requirements in a large proportion of adolescents. Secondly, adolescents considered 'at risk' for the development of eating disorders show worse nutritional patterns, gender differences do exist and must be taken into consideration.

Due to the limited literature in existence on Cypriot adolescents' eating attitudes, behaviors and nutrition this investigation needed to be carried out. Further work should focus on dieting behaviors in this age group, nutritional assessment where BN is concerned should distinguish between dietary restraint and binge-eating periods. Furthermore, physical activity should have been assessed so as more could be said on calorie intake. The results however of this research make clear that Cypriot adolescents must be educated on the importance of healthy eating and exercise.

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References

Boschi, V., Siervo, M., D' Órsi, P., Margiotta, N., Trapanese, E., Basile, F., Nasti, G., Papa, A., Bellini, O., & Falconi, C. (2003). Body composition, eating behaviour, food-body concerns and eating disorders in adolescent girls. Ann Nutr Metab, 47, 284-293.

Coker Ross, C. (2007).The importance of nutrition as the best medicine for eating disorders. Explore, 3(2), 153-157.

Croll, J., Neumark-Sztainer, D., Story, M., & Ireland, M. (2002). Prevalence and risk and protective factors related to disordered eating behaviours among adolescents: relationship to gender and ethnicity. *Journal of Adolescent Health, 31* (2), 166-175.

Cruz, J. A. (2000). Dietary habits and nutritional status in adolescents over Europe - Southern Europe. *European Journal of Clinical Nutrition, 54* (1), 529-535.

Decarli, B., Cavadini, C., Grin, J., Blondel-Lubrano, A., Narring, F., & Michaud, P. A. (2000). Food and nutrient intakes in a group of 11-16 year old Swiss teenagers. *International Journal for Vitamin and Nutrition Research*, 70, 139-147.

French, S. A., Perry, C. L., Leon, G. R., & Fulkerson, J. A. (1994). Food preferences, eating patterns and physical activity among adolescents: correlates of eating disorder symptoms. *Journal of Adolescent Health, 15*, 286-294.

Garipagaolglu, M., Oner, N., Vatansever, U., Inan, M., Kucukugurluoglu, Y., & Turan, C. (2008). Dietary intakes of adolescents living in Edirne, Turkey. *Journal of the American College of Nutrition, 27*(3), 394-400.

Garner, D. M. et al. (1982). The Eating Attitudes Test: psychometric features and clinical correlates. *Psychological Medicine, 12*, 871-878.

Garner, D. M. (2004). Eating disorder inventory-3: Referral form manual. Lutz, Fl: Psychological Assessment Resources (pp. 1-31).

Garner, D. M., & Garfinkel, P. E. (1997). Handbook of treatment for eating disorders. The Guilford Press, New York (pp. 39-40)

Gibsen, R. S., Heath, A. L. M., & Ferguson, E. L. (2002). Risk of suboptimal iron and zinc nutriture among adolescent girls in Australia and New Zealand: causes, consequences, and solutions. *Asia Pacific Journal of Clinical Nutrition, 11* (S),543-552.

Hassapidou, M. N., & Fotiadou, E. (2001). Dietary intakes and food habits of adolescents in Northern Greece. *International Journal of Food Sciences and Nutrition, 52*, 109-116.

Hoek, H. W. (2006). Incidence, prevalence and mortality of anorexia and other eating disorders. Current Opinion in Psychiatry, 19, 389-394.

Hudson, J. I., Hiripi, E., Pope, H. G., & Kessler, R. C. (2007). The prevalence and correlates of eating disorders in the National Comorbidity Survey Replication. *Biological Psychiatry, 61*, 348-358.

Institute of Medicine, Food and Nutrition Board: "Dietary Reference Intakes for Calcium, Phosphorus, Magnesium, Vitamin D and Fluoride." Washington, DC: National Academy Press, 1997. (pp. 38-48).

Institute of Medicine, Food and Nutrition Board: "Dietary Reference Intakes for Vitamin C, Vitamin E, Selenium, and Carotenoids." Washington, DC: National Academy Press, 2000. (pp. 58-70).

Institute of Medicine, Food and Nutrition Board: "Dietary Reference Intakes for Vitamin A, Vitamin K, Arsenic, Boron, Chromium, Copper, Iodine, Iron, Manganese, Molybdenum, Nickel, Silicon, Vanadium and Zinc." Washington, DC: National Academy Press, 2002. (pp. 82-160, 355-370).

Institute of Medicine, Food and Nutrition Board: "Dietary Reference Intakes: Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein and Amino Acids." Washington, DC: National Academy Press, 2002. (pp. 1320-1330).

Kafatos, A., Verhagen, H., Moschandreas, J., Apostolaki, I., & Van Westerop, J. J. (2000). Mediterranean diet of Crete: foods and nutrient content. *Journal of the American Dietetic Association, 100* (12), 1487-1493.

Kales, E. F. (1990). Macronutrient analysis of binge eating in bulimia. *Physiology and Behavior, 48*, 837-840.

Lambert, J., Agostoni, C., Elmadfa, I., Hulshof, K., Krause, E., Livingstone, B., Socha, P., Pannemans, D., & Samartin, S. (2004). Dietary intake and nutritional status of children and adolescents in Europe. *British Journal of Nutrition, 92*(S): 147-211.

Leon, G. R., & Finn, S. (1984). Sex role stereotypes and the development of eating disorders. In Widom CS (Ed.). Sex Roles and Psychopathology. Plenum Press, New York; 1984. (pp. 317-337).

Leon, G. R., Perry, C. L., Mangelsdorf, C., &Tell, G. J. (1989). Adolescent nutritional and psychological patterns and risk for the development of an eating disorder. *Journal of Youth and Adolescence, 18*(3), 273-282.

Misra, M., Tsai, P., Anderson, E. J., Hubbard, J., Gallagher, K., Soyka, L. A., Miller. K., Herzog, D. B., & Klibanski, A. (2006). Nutrient intake in community-dwelling adolescent girls with anorexia nervosa and in healthy adolescents. *American Journal of Clinical Nutrition, 84*, 698-706.

Monir, Z. M., Khalifa, A. G., Hassaballa, F., Tawfeek, S., Abdelmonem, M., Shady, M. A., & Mansour, M. (2010). Eating behaviour and problems in Egyptian adolescents; Relation to dietary intake. *Journal of American Science, 6*(12), 1145-1159.

Patton, G. C., Selzer, R., Coffey, C., Carlin, J. B., & Wolfe, R. (1999). Onset of adolescent eating disorders: population based cohort study over three years. *British Medical Journal*, 318, 765-768.

Position of the American Dietetic Association: Nutrition intervention in the treatment of anorexia nervosa, bulimia nervosa and other eating disorders. (2006). *Journal of the American Dietetic Association, 106*(12), 2073-2082.

Samuelson, G. (2004). Dietary habits and nutritional status in adolescents over Europe. An overview of current studies in the Nordic countries. *European Journal of Clinical Nutrition, 54*(1), 21-28.

Sira, N., & Pawlak, R. (2010). Prevalence of overweight and obesity, and dieting attitudes among Caucasian and African American college students in Eastern North Carolina: A cross-sectional survey. Nutritional Research and Practice, 4(1), 36-42.

Stang, J., & Story, M. eds. (2005). Guidelines for adolescent nutrition services. Minneapolis, MN: Center for Leadership, Education and Training in Maternal and Child Nutrition, Division of Epidemiology and Community Health, School of Public Health, University of Minnesota (pp.21-32).

Story, M., Neumark-Sztainer, D., Sherwood, N., Stang, J., & Murray, D. (1998). Dieting status and its relationship to eating and physical activity behviours in a representative sample of US adolescents. *Journal of the American Dietetic Association, 98*(10), 1127-1135.

Striegel-Moore, R. H., Rosselli, F., Perrin, N., De Bar, L., Wilson, G. T., May, A., & Kraemer, H. C. (2009). Gender differences in the prevalence of eating disorder symptoms. *International Journal of Eating Disorders, 42*(5), 471-474.