

Dietary intake and body composition of female students in relation with their dieting practices and residential status

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Abstract

Purpose: To examine association of residential conditions and past dieting with current dietary intake and body composition of female pharmacy students.

Participants and methods: The 24-hour recall method was used to evaluate dietary intake of 47 female students. Height, weight and four skinfold thickness were measured to assess body composition. In addition, survey included lifestyle questionnaire to obtain information on type of residence place in time of academic year and about diets continued at least by two weeks. The Mann Whitney U-test and correlation analysis were used.

Results: Current energy and nutrient intake were related to dieting history. Female students with dieting history and living with their parents had significantly lower ($p \leq 0.05$) intake of energy (61.9% RDI), carbohydrate (67.5% RDI), fat (58.7% RDI), phosphorus (111.7% RDI), magnesium (73.4% RDI) and thiamin (72.3% RDI) than those that have never dieted. A significant association ($p \leq 0.05$) between past dieting and current body composition was also found. Compared to students who had never used diets and reside with their parents, students with past dieting behavior indicated significantly greater ($p \leq 0.05$) indices as BMI and % FM.

Conclusions: The high prevalence of non-rationale dieting among young women and dietary inadequacy associated with unhealthy nutritional behavior suggested that more appropri-

ate and systematic educational intervention is needed in this population.

Key words: weight-related behaviors, risky eating patterns, young woman, anthropometric characteristics.

Introduction

Young females are often extremely concerned of weight and body shape. Body weight is both physical and psychological importance to young women and has been very strong associated with self-evaluation [1-3]. Most research suggests that this concern of body is dramatically influenced by mass media which has been implicated in the formation of unrealistically thin body ideals [4]. Moreover, society equates thinness with beauty and attractiveness in women [5]. It is not surprising that feelings of fatness, body dissatisfaction and dieting are common in young women [6,7]. Dieting has also been associated with depression and low self-esteem [3]. Prevalence of obesity steadily increasing in many countries over the world among adult and young people as well, suggesting that a lot of individuals are not successful at reaching their weight loss goals. According to a recent survey 2-26% young people in Poland are obese depending on age, gender and region of living [8,9]. The very similar situation is observed all over the world [10,11]. The results of many studies have shown that people with a history of dieting were more prone to weight gain than people who had never been on a diet [12,13].

Dieting may lead to inadequate nutrient intake which in the long-term can result in hypotension, osteoporosis and irregular menstruation [14,15]. Most studies have shown that dieting behaviors are often unhealthy, especially among young women, who often diet aggressively in pursuit of ideal body shape. These behaviors may include self-induced vomiting, use of laxatives, fad dieting, skipping meals, smoking cigarettes and using over-the-counter supplements marketed for diet-

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ing [4,8,16,17]. However, some weight-control behaviors are appropriate, even desirable. There may be positive implications if young women consume more fruit, vegetables, whole grain and avoid excessive fat intake and increase exercise [18-20].

Transition to college or university can be frequently a time for initiation and/or continuation of dieting [21]. There are unique experience of female students that may promote dieting, including fear of gaining weight, increased independence, changes of daily schedule, friend and/or peer influence (idealization of "popular" women as thin and pretty) and living away from home [21,22]. This is a time when parents generally have little control or influence on eating behavior of their children [21]. Previous studies have shown very high prevalence of dieting among female students. Dieting is so common that Polivy and Herman suggested that this is "normal" eating for women [23]. Student residence during academic year has also been reported to affect food choices, nutrient intake, dietary practices and activity patterns [24,25].

The purpose of this study was to determine frequency of past dieting in connection with students residence during academic year and examine associations between past diet use and current dietary intake and body composition among female pharmacy students in Bydgoszcz.

Participants and methods

The studied population included 73 fourth-year female students from Faculty of Pharmacy of Collegium Medicum in Bydgoszcz (Poland). All students provided written consent for their participation in the study before data collection. Data were collected during the winter semester of 2005 academic year. Twenty-six female students were excluded from analyses because of missing data, so the final sample size was 47 students. The mean age of students was 22.8 ± 2.4 years. The results are presented as the mean value with standard deviation ($\bar{x} \pm SD$). Research was conducted according to protocols complied with requirements of the Bioethics Committee in Poland and was supported by an internal research grant from Collegium Medicum in Bydgoszcz.

The weekday related dietary intake of subjects was determined by 24-hour recall method according to guidelines of the National Food and Nutrition Institute (Warsaw, Poland) [26]. Detailed description of all supplement, food and beverage with cooking method and brand names consumed during 24 hours before the face-to-face interview were recorded. In addition, to enhance accuracy of the procedure, recalled food items were compared by meal type and estimation of portion size by use of household measure and "Atlas of photographs of food products and dishes" [27]. The microcomputer DOS operated "Dietetyk" software with a currently upgraded database containing Polish food tables [28] was used to calculate of average energy and nutrient intake of participants. Cholesterol and food fiber intake was compared with WHO recommendation (300 mg and 25 g respectively) [30]. The results were compared with the Polish nutritional norm at the safe level (RDI) for adult in age of 19 – 26 years and moderate physical activity [29]. Moderate physical activity was chosen because it was the most common

activity level among female students (85 % of participants). Physical activity level was assessed using a questionnaire and was rated as active (female students who everyday intensive physical activity /min. 20 minutes per day/), moderate active (female students who declared 3 times per week intensive physical activity /min. 20 minutes per day/) and sedentary (female students who indicate no physical activity).

Measurements of height, weight and four skinfolds thickness (triceps, biceps, subscapular and suprailiac) values were used for calculation of body mass index (BMI, kg/m^2) and percentage of fat mass (% FM, %) [31]. These antropometric data were determined using, respectively, height scale (RADWAG, Poland), digital electronic weighing scale (RADWAG, Poland) and electronic skinfold caliper (SKYNDEX I, USA). Three consecutive measurements of skinfolds thickness were performed and mean values were reported (see *Tab. 1*). The Durnin and Womersley [32] formula was applied to calculate total body fat. Shoes and top coverings (coat and jacket) were removed preceding body composition measurements.

Information regarding past dieting which was continued permanently at least by two consecutive weeks in any time in the past and data concerning residence type during the academic year was obtained using the home designed, pilot tested and validated purpose designed lifestyle questionnaire. The participants were classified into two categories according their type of residence place during academic year: 1) residing with family and 2) residing in dormitory or rented flat.

The relationship between type of residence and past diets was verified using the Mann Whitney U-test and correlation analysis with the significance level $p \leq 0.05$. The statistical analyses were carried out by the software STATISTICA PL v. 6.1 (Stat-Soft, Inc., Tulsa, OK, USA).

Results

Among the total of 47 female students, 47% resided in family home with their parents and 53% lived in dormitory or rented flat during academic year (*Tab. 1*). It was observed that 28% female students residing in dormitory or rented flat have been on diet which was ever continued at least two consecutive weeks in the past. On the contrary, among students living in family home dieting was more common, i.e. dieting history was reported by 50% of them. More than 60% of total participants indicated that they wanted to lose weight. A sizable percentage of students indicated misperception in their body weight status, 21% described themselves as overweight when, in fact, only about 6% of students were actually overweight (data not shown).

BMI, percentage body fat mass (% FM), and biceps skinfold thickness were significantly greater for those who had tried dieting and lived in family home (*Tab. 1*).

In general, energy and basic nutrient (protein, total fat and carbohydrate) as well as majority of vitamins and minerals intake was related to dieting history, regardless of students residence (*Tab. 2* and *3*). An inadequate intake of many nutrients in reference to norm at the safe level (RDI) was found in whole studied group of students. Generally, it was observed that stu-

Table 1. Anthropometric characteristics (mean ±SD) of pharmacy female students in relation to residential status and declared past dieting

Parameter	Type of residence					
	Family home N=22 (47%)			Dormitory/rented flat N=25 (53%)		
	Past dieting					
	YES, N=11(50%)	NO, N=11(50%)	r	YES, N=7 (28%)	NO, N=18 (72%)	r
Height, cm	163.6 ± 6.9	170.8 ± 8.5	0.46*	165.4 ± 5.3	165.4 ± 6.0	-0.02
Weight, kg	61.6 ± 10.7	58.6 ± 10.3	-0.28	58.3 ± 5.8	55.4 ± 5.9	-0.34
BMI, kg/m ²	22.9 ± 3.1a	19.9 ± 1.6a	-0.56*	21.3 ± 1.7	20.2 ± 1.9	-0.38
% FM	28.3 ± 4.1a	24.8 ± 3.0a	-0.53*	26.5 ± 2.0	26.2 ± 3.1	-0.06
TSF, Triceps skinfold, mm	19.3 ± 5.8	14.3 ± 2.9	-0.51*	15.3 ± 2.1	15.3 ± 4.2	-0.08
BSF, Biceps skinfold, mm	15.9 ± 4.9a	10.5 ± 3.2a	-0.57*	14.3 ± 4.5	13.5 ± 4.2	-0.19
SS, Subscapular skinfold, mm	13.2 ± 3.7	10.8 ± 2.4	-0.36	11.7 ± 2.8	12.3 ± 3.2	0.06
SI, Suprailiac skinfold, mm	9.7 ± 3.0	8.2 ± 3.6	-0.23	9.2 ± 2.1	10.3 ± 3.1	0.19

Notes: SD – standard deviation; a – statistically significant differences ($p \leq 0.05$); r – correlation coefficients; * – statistically significant correlation coefficients ($p \leq 0.05$)

Table 2. Macronutrient intake (mean ±SD) of pharmacy female students classified according to residential status and declared past dieting

Parameter	Type of residence									
	Family home N=22 (47%)					Dormitory/rented flat N=25 (53%)				
	Past dieting declared									
	YES, N=11(50%)		NO, N=11(50%)		r	YES, N=7 (28%)		NO, N=18 (72%)		r
	intake	% RDI	intake	% RDI		intake	% RDI	intake	% RDI	
Energy, (kcal)	1357±365a	61.9±16.7	2061±595a	94.6±271	0.60*	1483±400	67.4±18.7	1700±463	77.5±21.4	0.20
Protein, (g)	52.9±19.9	66.2±25.0	70.5±28.5	88.2±35.7	0.40	48.0±13.4	60.1±16.7	59.7±157	74.7±19.6	0.32
Carbohydrate, (g)	193.9±46.1a	67.5±16.0	267.4±81.0a	93.0±28.2	0.50*	197.4±59.3	68.7±20.6	209.6±72.7	72.9±25.3	0.07
Food fiber, (g)	15.9±5.6	—	19.9±9.1	—	0.27	17.9±12.2	—	19.1±5.5	—	0.04
Fat, (g)	41.1±21.3a	58.7±30.4	78.8±39.6a	112.6±56.6	0.52*	55.7±23.4	79.6±33.5	69.3±25.6	98.9±36.6	0.26
Cholesterol, (mg)	164.2±106.3	—	215.4±93.9	—	0.27	142.8±77.1	—	213.0±94.7	—	0.33
% energy from protein	15.9±5.6	—	13.6±3.0	—	-0.25	13.1±2.4	—	14.2±2.0	—	0.23
% energy from fat	25.9±8.0	—	33.9±10.2	—	0.41	33.2±10.2	—	36.8±8.4	—	0.20
% energy from carbohydrate	58.3±8.3	—	52.5±9.7	—	-0.31	53.7±10.6	—	48.9±8.7	—	-0.25

Notes: SD – standard deviation; a – statistically significant differences ($p \leq 0.05$); r – correlation coefficients between “Intake” data; * – statistically significant correlation coefficients ($p \leq 0.05$)

dents with dieting history had poorer dietary intake than they who never used diet. In case of young women living in family home the estimated mean daily energy intake was statistically significantly lower (61.9% RDI) for students who used diet in the past in comparison to students without dieting history (94.6% RDI) (see *Tab. 2*). It was noticed that – irrespective of residential status – students with dieting history indicated significantly increased percentage of energy provided by fat, accompanied by reduced contribution of carbohydrate related energy intake (*Tab. 2*). In group living with their parents it was noticed that female students who have used diet which was continued at last two successive weeks in any time in the past had significantly lower intake of carbohydrate (67.5% RDI), fat (58.7% RDI), phosphorus (111.7% RDI), magnesium (73.4% RDI) and vitamin B1 (72.3% RDI) (compare *Tab. 2* and *3*). Similar relationship was found for students living in dormitory and/or rented flat. However, irrespective of residence status, for students who ever have been on a diet in the past only intake of phosphorus and vitamin A was excessive or complied with the nutritional recommendation (*Tab. 3*).

It is important to underline the high percentage of female students with inadequate intakes of calcium, copper and iron

(see *Tab. 3*). We noticed that – regardless of dieting history – among the female students living without parents intake of calcium and iron was under two-thirds (<66.7%) of Polish RDI norm in case of more than 50% of mentioned subjects. Similar inadequate intake of copper was observed in more than 85% of these students. However, among the subgroup of female students living with their parents and used diet in the past near 73, 91, and 100 percent of them consumed, respectively, iron, calcium and copper below of the 66.7% of Polish RDI's (data not shown).

It was interesting that dietary intake of students with dieting history and residing with parents was poorer than students who have been on diet in the past but living away from family home. The reduced intake of energy, fiber, calcium, magnesium, zinc and vitamin B1 was observed for female students with dieting history and residing in family home (*Tab. 2* and *3*).

Discussion

The present study explored associations between past dieting which was continued at least two successive weeks in any

Table 3. Micronutrient intake (mean ±SD) of pharmacy female students classified according to residential status and declared past dieting

Parameter	Type of residence											
	Family home N=22 (47%)				Past dieting declared				Dormitory/rented flat N=25 (53%)			
	YES, N=11(50%)		NO, N=11(50%)		YES, N=7 (28%)		NO, N=18 (72%)		YES, N=7 (28%)		NO, N=18 (72%)	
	intake	% RDI	r	intake	% RDI	intake	% RDI	intake	% RDI	intake	% RDI	r
Calcium, (mg)	439.7±176.3	41.4±17.0	0.35	569.6±176.6	53.6±17.5	572.8±257.8	59.8±36.7	759.4±332.4	69.0±30.2	759.4±332.4	69.0±30.2	0.25
Phosphorus, (mg)	870±319a	111.7±43.2	0.39	1194±405a	153.1±54.4	1008±340	134.0±53.2	1122±320	140.3±40.0	1122±320	140.3±40.0	0.13
Magnesium, (mg)	205.4±59.9a	73.4±21.4	0.51*	281.3±83.4a	100.5±22.8	251.2±138.1	89.7±49.3	249.3±72.4	89.0±25.8	249.3±72.4	89.0±25.8	-0.04
Iron, (mg)	8.4±2.8	59.9±20.2	0.36	10.3±2.7	73.3±19.6	8.3±3.5	59.6±25.2	9.4±2.5	66.8±17.7	9.4±2.5	66.8±17.7	0.15
Zinc, (mg)	6.7±2.4	66.7±23.9	0.40	8.6±2.4	85.7±24.1	7.6±2.8	75.9±28.8	8.3±1.9	83.1±19.0	8.3±1.9	83.1±19.0	0.15
Copper, (mg)	0.9±0.3	41.5±12.9	0.42	1.3±0.5	57.3±23.1	0.9±0.4	38.7±19.0	1.1±0.3	46.5±14.6	1.1±0.3	46.5±14.6	0.20
Vitamin A, (IU)	630±319	105.1±53.2	0.24	916±890	152.8±148.4	765±944	127.5±157.4	894±735	149.1±122.5	894±735	149.1±122.5	0.06
Thiamin, (mg)	0.63±0.22a	72.3±24.6	0.72*	1.21±0.40 a	138.3±45.5	0.71±0.28	81.7±31.9	0.84±0.22	96.1±24.9	0.84±0.22	96.1±24.9	0.24
Ryboflavin, (mg)	1.11±0.55	69.5±34.3	0.31	1.46±0.57	91.2±35.6	1.07±0.45	67.2±27.9	1.39±0.38	87.2±23.8	1.39±0.38	87.2±23.8	0.36
Niacin, (mg)	12.2±7.2	64.2±37.6	0.34	21.1±15.1	111.4±79.6	8.5±3.8	44.6±20.1	11.7±5.2	61.6±27.3	11.7±5.2	61.6±27.3	0.28
Vitamin C, (mg)	44.9±28.7	74.8±47.8	0.30	70.7±53.0	122.3±91.8	32.6±30.5a	54.3±50.8	74.6±41.3a	124.4±68.8	74.6±41.3a	124.4±68.8	0.46*

Notes: SD – standard deviation; a – statistically significant differences (p≤0.05); r – correlation coefficients between "Intake" data; * – statistically significant correlation coefficients (p ≤ 0.05)

time in the past and current dietary intake. This study found that female students with history of dieting and living with their parents indicated significantly lower energy and nutrient intake. Similarly, Gibbson et al. [15] reported that intake of energy and micronutrient (thiamin, riboflavin, niacin, calcium, iron, zinc) was significantly related with past dieting practice among female high school students from Australia. It was also revealed by Neumark-Sztainer et al. [33] that female adolescent using weight-control behaviors had much lower intakes of energy and micronutrient than non-dieters. Mulvihill et al. [14] and Neumark-Sztainer et al. [34] also reported that total energy intake was inversely related to dietary restriction for female adolescent and woman from, respectively, Great Britain and USA. But these researchers did not find an association with dieting behaviors and reduced micronutrient intake. The possible impact on health should be taken into account as the particular concern of our study was very low intake of calcium, iron and copper in female students who have been on a diet in the past. Moreover, it is important to underline that, regardless of their dieting status, intake of these nutrients, as similarly observed in other countries, tends to be less than dietary recommendation for young women [14,34,35].

Female students with dieting history consumed less fat and more carbohydrate as percentage of total energy, irrespective of their residence type during academic year. Our results were similar with those of Neumark-Sztainer et al. [34], who observed that female dieters had lower intake of energy provided by fat and higher by carbohydrate than non-dieters. Calderon et al. [7] and Malinauskas et al. [22] found that students who had dieting history often eat low fat or fat free foods. Despite the seemingly healthy dietary habits, dieting may be a predictor of weight gain. It was observed here that students with dieting history had higher BMI, percentage of body fat. Thus, our findings are consistent with those of Provencher et al. [36], who reported that female and male past dieters had higher current BMI than non-dieters. Field et al. [37] observed a relationship between dieting and weight gain. These researches reported that in adolescent females during 3 years of follow-up that dieters gained more weight than non-dieters, even if dieters had lower intake of total energy and percentage of energy from fat. It was also observed by Pasman et al. [38], who reported that female frequent dieters showed significantly more weight regain than less frequent dieters. The one of mechanism through which dieting may lead to overweight is that dieting may be associated with an increase in metabolic efficiency, therefore dieters over time may require fewer energy to maintain their weight [37].

Limitations of this study include small sample size, restricting participants to females only, and the use of 24-hour dietary recall approach. In most of published results considering young woman dieting a dietary intake was estimated using a 4- or 7-day food record or from a food frequency questionnaires [14,15,33-35]. This means that adequate evaluation of reproducibility and validity of mentioned methods [39,40] to demonstrate their performance and utility in monitoring of specific dietary changes related with past dieting in young woman is still the challenge. It should be also noted that results of this preliminary study may not be amenable for generalization, because we have lack of information about possible differences

in eating patterns between students and non-students as well as between pharmacy students and other students. However, beside of these uncertainties, our findings indicate reliable consistency in main conclusions with results of other research considering dieting related behaviors of young woman [14,15,33].

Conclusions

The non-controlled, non-rationale, short-period dieting seems to favor evidences of the long-term or permanent nutritional and health disturbances in female students, irrespective of their residential status. These findings from present study suggested that nutrition education intervention is needed. Especially, future interventions to promote healthy weight management through young women should discourage their reliance on extreme and potentially dangerous weight control methods. Health professional should also be involved in developing and implementing nutritional programs to promote healthful methods to manage weight and maintain adequate nutrient intake as well as regular physical activity among young women. The results of this study provided several ideas that could be considered for intervention to healthful weight management among female students:

- involvement of parents in modeling healthful behavior for their children,
- encourage young women to adapt healthy eating behaviors without focusing on weight loss,
- engage parents, teachers and health professional to provide support to young women when they discuss weight concerns,
- educate female students regarding potential health implications of unhealthful weight management,
- continued recognition of reasons of weight concern and practical help for young women to develop an identity that goes beyond that physical appearance.

Recognizing the restrained value of 24-hour dietary recall method in evaluation of more subtle discrepancies between self-reported and recommended dietary intake of some nutrients [39-42] further extension of present studies is planned to verify and validate findings presented here.

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