The protein participation in daily diet and nutritional status of medical students in Kraków

Kolarzyk E, Ostachowska-Gąsior A, Skop A

Department of Hygiene and Ecology, Jagiellonian University College of Medicine, Kraków, Poland

Abstract

Purpose: The assessment of protein participation in daily diet together with anthropometric estimation of nutritional status.

Material and methods: There were examined 150 students of Medical Faculty of Jagiellonian University. BMI and MAMC (Mid Arm Muscle Circumference) were examined in order to estimate the nutritional status. Quality of daily diet was estimated by the analysis of daily nutritional ratio (DNR).

Results: Underweight was more often observed among women (14.3% vs 5.8%), and overweight and obesity among men (13.4% vs 5.1%). Too low MAMC value was more often observed in the group of men (25% vs 2.4%). Correct MAMC value was represented by most women (86%) and with one exception they were also correct among female with underweight. Not acceptable diet showed 62.5% of male students and 46.8% of female students representing all BMI ranges. The low protein consumption frequency in every day diet showed 25% students with MAMC <5 percentile.

Conclusions: The confirmed disturbances in nutrition among examined students did not find statistically important reflection in protein nutritional status represented by MAMC value. It may confirm short time of duration of nutritional disturbances (potential shortages – no physical symptoms) and may be connected with the lack of quantity estimation of nutrition.

ADDRESS FOR CORRESPONDENCE:
Emilia Kolarzyk
Department of Hygiene and Ecology,
Jagiellonian University College of Medicine,
7 Kopernika Str., 31-034 Krakow, Poland
Tel/Fax: +48 12 4223720
e-mail: mykolarz@cyf-kr.edu.pl.

Introduction

Nutritional habits of schoolchildren and students are the topic of many examinations performed in many scientific centres [1-7]. A big number of works connected with this topic is a precise evidence for the importance and complexity of the problem. The conclusions coming from the observations and examinations are distressing and they indicate that the nutrition (the quantity and the quality) of examined students is incorrect [2,3,6-9]. The increasing disturbances in nutrition mode of young people for some years are: the smaller energetic value of daily nutritional ratio, general decrease in proteins intake and increased intake of animal fats. Too low energetic value of the diet is observed mainly in the female group. The decrease in general proteins intake is accompanied by the increase of animal proteins intake together with low vitamin group B intake. On the other hand too big intake of fats in place of carbohydrates is followed by obesity and many health disturbances [1-3,6,7,9,10]. The results of insufficient energy, nutritional ingredients, vitamins and minerals intake in the reference to the needs of the organism are present especially at the time of increased needs. The increased needs for nutritional ingredients among young healthy people accompany the period of growth and maturity and all other physiological periods requiring positive nitric balance. The measurement of mid arm muscle circumference (MAMC) is one of determinants of protein nutritional status used in anthropometric estimation of nutritional condition. The MAMC below recommended values for specified age, sex and physiological status confirm insufficient protein-energy nutrition and in healthy people reflect the nutritional habits and physical condition. The estimation of protein nutrition of the body seems to be precisely important when incorrect nutritional tendencies showed above are taken into consideration. This is why the initial classification of nutritional status only on the

Table 1. **The quality analysis of daily nutritional ratio (DNR)**

The estimation of DNR	The number of meals	The composition
Satisfactory	4-5	Animal proteins 3x daily and more Vegetables and fruit 2 times and more
Less than satisfactory	3 with additional meals (1-2 additional meals)	Animal proteins 3x daily and more Vegetables and fruit 2 times and more (including vegetable soup and additional meals)
Unsatisfactory	3 and below	Animal protein 2 times daily Vegetables and fruit 1 time daily or not at all

Table 2. **Percentile distribution of MAMC values in dependence on BMI values in accordance with gender of examined persons**

BMI value	Men			Women		
	Percentile distribution of MAMC values					
	<5c [%]	5-95c [%]	>95c [%]	<5c [%]	5-95c [%]	>95c [%]
< 18.5 kg/m²	3.8	1.9	-	1.2	13.0	-
18.5-24.9 kg/m²	17.4	63.5	-	1.2	70.0	9.2
≥25 kg/m²	3.8	9.6	-	-	3.0	2.4
All the group [%]	25*	75	-	2.4	86.0	11.6

* the differences between men and women p<0.001

basis of BMI may occur insufficient. In this way the parallel use of some methods for assessment of nutritional status is essential. The analysis of daily nutritional ratio (DNR) allows to pick out the nutritional disturbances before physical symptoms are present and allows to introduce prophylaxis.

The purpose of the study was to make a quality estimation of nutrition precisely taking into consideration the participation of proteins in the daily diet together with defining the real protein-energy nutritional status with the use of the anthropometric measurements.

Material and methods

The examinations were performed among 150 (98 women and 52 men) students of the fourth year of medicine of Collegium Medicum of Jagiellonian University in Cracow. The age of examined persons was 22.2±1.0 year. The level of physical activity of all students was similar (the data from recall). In order to estimate nutritional status the body mass, the height, the arm circumference and the thickness of the triceps skinfold were measured. On the basis of them the BMI and MAMC (Mid Arm Muscle Circumference) were counted. The values of MAMC were qualified according to percentile tables. The values between 5 and 95 percentile were considered as proper [11,12]. The examined persons were divided into 3 groups depending on the BMI values:

I group – underweight students (BMI<18.5 kg/m²); II group – students with correct BMI (18.5-24.9 kg/m²); III group – overweight and little obese students (25-31.2 kg/m²).

Table 3. **The characteristics of daily nutritional ratio (DNR) in the aspect of BMI values in accordance with gender of examined students**

BMI values	Men			Women		
	The estimation of DNR					
	Satisfactory [%]	Less than satisfactory [%]	Unsatisfactory [%]	Satisfactory [%]	Less than satisfactory [%]	Unsatisfactory [%]
<18.5 kg/m²	33.3	-	66.7	30.7	23.1	46.2
18.5-24.9 kg/m²	20	10	70	34.7	19.5	45.8
≥25 kg/m²	80	20	-	40	-	60
All the group [%]	27.1	10.4	62.5	34.3	18.9	46.7

Table 4. **The characteristics of daily nutritional ratio (DNR) to percentile distribution of MAMC in accordance with gender**

Percentile MAMC	Men			Women		
	The estimation of DNR					
	Satisfactory [%]	Less than satisfactory [%]	Unsatisfactory [%]	Satisfactory [%]	Less than satisfactory [%]	Unsatisfactory [%]
<5c	33.3	8.3	58.4	50	50	-
5-95c	25	11.1	63.9	35.1	19.5	45.4
>95c	-	-	-	27.3	9.1	63.6
The total group [%]	27.1	10.4	62.5	34.4	18.9	46.7

Table 5. **The characteristics of animal proteins consumption frequency in every day menu in the aspect of percentile distribution of MAMC in accordance with gender of examined persons**

Percentile distribution of MAMC	Men			Women		
	Animal proteins consumption frequency in every day menu					
	>3 x a day [%]	3 x a day [%]	≥2 x a day [%]	>3 x a day [%]	3 x a day [%]	2 x a day [%]
<5c	41.7	33.3	25	50	50	-
5-95c	27.8	25	47.2	27.3	35	37.7
>95c	-	-	-	-	63.6	36.4
The total group [%]	31.3	27.1	41.6	24.4	38.9	36.7

Because BMI>29.9 kg/m² was stated in 3 persons (2 men and 1 women) they were estimated together with the group of overweight students. The analysis of MAMC and quality estimation of nutrition was done in the above mentioned groups. In order to estimate nutrition mode 24-hour recall was used [13]. The data coming from 24-hour recall to analysis of daily nutritional ratio was performed (in accordance with the rules showed in the *Tab. 1*).

The statistical analysis was done with the use of STATISTICA 6.0 PL. The Chi² test was used to estimate the presence of differences between the groups of male and female students. The correlation of ranges by Spearman was used to estimate the dependences between BMI and MAMC values.

Results

The correct values of BMI were stated in 80% of female and male students. The underweight was more often present in the female group (14.3% vs 5.8%), but overweight and obesity more often in male group (13.4% vs 5.1%). The expected muscle mass counted on the basis of MAMC is presented in the *Tab. 2*. Too low values of MAMC (<5c) more often were observed in the group of men (25% vs 2.4%). We want to point out that MAMC was correct in 13% of female students showing BMI values <18.5 kg/m² what means that there is no threaten of protein malnutrition in these people in spite of too low BMI value.

The conducted analysis of correlation of the ranges by Spearman in the group of men and women shows that the increase of BMI value is parallel with the increase of MAMC (p<0.001). The quality estimation of nutrition of medical students in Cracow in reference to nutritional status parameters is presented in the *Tab. 3,4,5*. 80% of male students and 40% of female students with satisfactory estimation of daily menu showed BMI values characteristic for overnutrition (*Tab. 3*, *Tab. 4*).

The analysis of the number of meals eaten every day showed that 77.1% of men and 73.3% of women used to eat more than 4 meals a day. 21% of students used to eat 3 meals a day. Less than 3 meals a day were eaten by 2.1% of men and 5.5% of women. There were no significant differences stated when the number of meals per day and percentile distribution of MAMC were taking into consideration in both groups.

Only 31.3% of men and 24.4% of women used to eat food proteins more than 3 times a day. The value of MAMC<5c was stated in 41.7% of men and in 50% of women eating proteins more than 3 times a day and in 33.3% of men and 50% of women eating proteins 3 times a day. The female students with MAMC>95c used to eat proteins 3 times a day (63.6%) and 3 times or less a day (36.4%) (*Tab. 5*).

Discussion

In presented work overweight and obesity were more often observed in male students (13.4%) and underweight in female students (14.3%). The similar data come from other authors too [3,4,5]. Overweight stated on the basis of BMI in men could not be identified with bigger muscle mass estimated by MAMC. No one man showed MAMC values >95c. Muscle mass below the recommended values (MAMC<5c) concerned men with a proper value of BMI (17.4%) and overweight men (3.8%). That means that they show too low muscle mass and probably too high fat mass. It confirms incorrect protein-energy nutrition. The value of MAMC<5c more frequently was observed in men group (25%) than in women group (2.4%). It shows that in spite of overweight observed in this group the shortages in muscle

mass were more often observed among men. MAMC below recommended values was stated only in one female student (14.3% of girls showed undernutrition). According to presented data low values of BMI in women do not confirm protein malnutrition and MAMC<5c in men shows muscle mass shortages in spite of BMI>25 kg/m². The MAMC values reflect the nutrition mode and physical condition of a particular person [11,12]. Animal proteins consumption in every day diet was particularly taken into consideration. Not satisfactory estimation received 62.5% of male students and 46.7% of female students. Low consumption of proteins (≤2 times a day) was stated in 41.6% of men and in 36.7% of women. The similar data concerning low consumption of proteins were observed by other authors too [2-4,6-8].

Our results confirm, that when we only take into account the frequency of particular products consumption we have a view on nutritional habits but we can not make terminal conclusion about protein-energy nutritional status. Nevertheless it is important to know nutritional habits of particular social or age groups because thanks to it we can eliminate potential disturbances before they will be reflected in the nutritional status.

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