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Research Article

Characteristics Of the Menstrual Cycle and A Number of Anthropometric Indicators in Female Students of The Special Medical Group with Increased Body Weight

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Abstract

This article presents the results of studies of the menstrual cycle, a number of the anthropometric indicators and specific indexes of the students of special medical group with increased body weight. Analysis of the results indicates multiple deviations from the endocrine and reproductive systems in 98.7% of the surveyed students.

Keywords: anthropometric of measures; menstrual cycle; increased body weight; reproductive health; special indexes; female students of special medical groups

Abbreviations

- **BMI** - body mass index;
- **PBI** - pelvic bone index;
- **BfI** - body fat index (by R. Bergman);
- **BMI** - Body Mass Index;
- **(M (S)** - BMI using Solovyov Index values (BMI (S);
- **RI** - Rohrer Index;
- **PBI** - pelvic bone index;
- **GDI** - the sexual/gender dimorphism index;
- **OMC** - the menstrual cycle;
- **PBI** - pelvic bone index
- **RPBWI** - relative pelvic bone width index (PBWI);
- **SPI** - shoulder-pelvic index;
- **SI** - Solovyov index;
- **RPWI** - relative pelvic width index;
- **SPI** - Shoulder-pelvic index;
- **PCOS** - polycystic ovary syndrome.
- **PW** - pelvic width;
- **SW** - shoulder width;
- **RMGI Rorer mass**-growth index;
- **BOI** - body obesity index according to Bergman.

Introduction

The last decades are characterized by the deterioration of somatic and reproductive health in many countries, the changes are especially pronounced in students. There is a tendency to an increase in gynecological morbidity among female students, in the structure of which one of the leading places is occupied by menstrual disorders [1,2,5]. In this regard, a comprehensive study of the health of female students is of particular importance, since this is a special social group with an increased risk of functional disorders of the body [2,3,9]. Changes in social and domestic conditions, a significant increase in psycho-emotional loads and stressful situations, the lack of a balanced diet, have led to a significant transformation in the frequency and structure of the anatomically altered pelvis, as well as to a significant increase in various types of menstrual cycle disorders [1,4,6,8].

When studying the available scientific literature on the subject, we did not find a sufficiently large number of studies devoted to the study of the individual anatomical variability of the female body in adolescence and first adulthood, during the completion of growth in length and the formation of various body systems, the completion of growth and ossification of the pelvis, the onset of puberty, the readiness of the body to carry out its reproductive function [2,4,8,9].

Hypothesis of the study

The hypothesis of the present study is the assumption that female university students belonging to the special medical group may experience negative changes in a number of reproductive and morphological indicators and index values when they do physical training and sports under intensive physical and psycho-emotional stresses.

Aim of the work

Purpose of the study: to identify, analyze and present anatomical and anthropological features of the body and pelvic size, study and analyze a number of indicators of somatic and reproductive health, based on individual characteristics of the menstrual cycle and values of a number of anthropometric indicators and special indices in female students of I-II courses of medical university, with increased body weight, referred to the special medical group by the results of medical examination.

Objectives of the study:

1. To determine individual anthropometric indicators, age of menarche, variants of the course of menstrual cycle and values of a number of special indices, anatomo-anthropological features of the body and pelvic dimensions.

2. Evaluate and analyze the level of a number of somatic and reproductive health indicators obtained as a result of the study, based on the survey, examination, determination of anthropometric indicators, special indices and the results of the questionnaire.

Object, material and methods of research

To conduct the study, we, during medical examination of students of I-II years of medical university, in Zaporozhye, Ukraine, identified a group of female students with increased body weight and referred to the special medical group. The special medical group consists of 93 people in the 1st course of ZSMU in the 202-2022 academic year; 112 people in the 2nd course, the total is 205 people. From them students of special medical group on I course - 78 persons, on II course - 60 persons, total - 138 persons or 7,96 % from total number of students of I - II courses, which are engaged in physical training. The number of students in the special medical group with increased body weight in the I year - 17 (18.28%) people or 21.8% of all students in this course. In the II course the number of students with high body weight is 21 people, which is 18.75% of all students in a special medical group of the III course and 35% of the total number of students in a special medical group of the II course.

In our study, we focused on identifying pathological changes and disorders both from the reproductive system in female students with increased body weight, and in determining the features of a number of anthropometric indicators (height, weight, pelvic bone dimensions, shoulder width, waist circumference, hip circumference, pelvic dimensions) and related values of special indices - BMI (body mass index), PBI (pelvic bone index), BfI (body fat index by R. Bergman), etc. [4,7,8,10].

Organization of the study

A total of 38 overweight female I-II college students aged 18-23 years (mean age 19.7±2.16 years) took part in the study. In order to assess the state of menstrual function of female students we determined the time of menarche and the individual characteristics of the course and formation of their menstrual cycle. The author's questionnaire which included questions concerning individual features of the menstrual cycle and a special table including a number of anthropometric indicators and values of special indices reflecting changes in the state of reproductive health of the examined female students of the 1st- 2nd courses of the medical university which were classified by medical examination into a special medical group were specially developed for the study. After completion of the study, we made the necessary calculations, carried out their statistical processing and analyzed the results obtained. Processing of the obtained material was performed on a personal computer using a package of applied programs Statistica 5.0. Results with $p<0.05$ were considered statistically significant.

The correlation of individual anthropometric indices was assessed by us using a number of specific indices. Weight-for-height ratios were assessed using Body Mass Index (BMI), Body Mass Index, BMI using Solovyov Index values (BMI (S), and Rohrer Index (RI) indices [4,5,7,9].

The following anthropometric measurements were also performed: standing body length, body weight, shoulder width, Solovyov index, external dimensions of the bone pelvis (d. spinarum, d. cristarum, d. trochanterica, s. externa) [3,4,8], pelvic bone index (PBI) according to the method of Kovtyuk N.I. (2002) [6], relative pelvic bone width index (PBWI), shoulder-pelvic index (SPI) [7,8], body obesity index (BOBI) according to Bergman [10].

The morphotype of adolescent and first reproductive age girls was determined by clinical anthropometry [4,7,9]. Body mass index (BMI) was determined by the formula: BMI = body weight (kg)/height(m^2). Typical values were BMI≥25 kg/m^2 - hypersthenic morphotype, BMI 25,0-29,9 - overweight (obesity), BMI - 30,0 - 34,9 - class I obesity, BMI 35,0-39,9 - class I obesity [6,8].

When determining BMI with the Solovyov index values, we used the following formula: BMI = QM / ISh2, where BMI - body mass index, M - weight in kg, h - height in meters, IS - Solovyov index, Q - constant coefficient (for women - 16). The values of BMI (C) have the same parameters as those used in determining BMI according to the classical method [4,6,8].

Rohrer mass-growth index (RI), which determines body density, depends on linear dimensions and body weight, was calculated according to the formula: W/H3 kg/cm3, where W is body weight (kg), H is body height (m) [4,7,9].

PBI (pelvic bone index) was calculated by the formula: ICT = a x c/IS, where, a - transverse size of the pelvis (distantia trochanterica), cm, c - external conjugate (conjugata externa), cm, SI - Solovyov index, cm [6,8].

The relative pelvic width index (RPTI) was calculated as the ratio of pelvic width to body length multiplied by 100. Stenopilia (narrow pelvis) corresponds to an index value of up to 15.9, metriopilia ("medium" pelvis) to 16.0-17.9, and euripilia ("wide" pelvis) to 18.0 or more [4,6,8].

Shoulder-pelvic index (SPI) was determined according to the formula: SPI = PW - pelvic width (cm) x 100/ SW (shoulder width) (cm) [4,7,9].

In our study, we used a new index, the Body Obesity Index, proposed in 2011 by the American scientist Richard Bergman [10]. Its calculation is presented as the following formula: BOI = hip circumference (cm) / height (m) x √ height (m) - 18.

According to his calculations, a value of the body obesity index (BOI) ranging from 8 to 20 is considered normal. A value of less than 8 is underweight, more than 20 is overweight. If the value exceeds 25, then we are talking about different degrees of obesity [10].

Results of the study and discussion

The examined girls had no reliable differences in age, but differed in length and body weight ($p<0,05$). When analyzing the results, the following indicators were obtained: 38 (18,54%) female students of special medical group I and II courses have body weight more than 85-90 kg. In determining the values of BMI, it was found that in the whole surveyed group (n=38), the index was 28,78±1,59 kg/m^2 ($p<0,01$). In the 1st course, the average body weight index was 97,36±6,78 kg, BMI - 28,56±1,81 kg/m^2, which corresponds to excessive body weight. During the second course these indices were as follows: the mean value of body weight was 100,58±3,73 kg, BMI - 28,96±1,40 kg/m^2, which also corresponded to excessive body weight. At the same time, 3 (17,65%) female students of the 1st year and 4 (19,05%) female students of the 2nd year (18,42% of all female students with excessive body weight) had BMI values in the range of 30,0 - 34,9 kg/m^2, which corresponds to the 1st degree of obesity [2,7,10].

The values of the Solovyov's index (IS) were 17.68±1.23 cm in the whole group under study (n=38). In the first-year female students its value was 17.18±1.0 cm, while the norm was 14-16 cm [4,7,8]. For the first-year female

students this index corresponded to the following values - 18,1±1,26 cm ($p<0,01$).

At comparative determination of BMI value (S) in view of Solovyov's index values the following parameters were obtained: in all surveyed group (n=38), it was equal to -26,16±1,34 kg/m² ($p<0,01$). Its value was 26,60±1,15 kg/m² at 1st course, 25,79±1,4 kg/m² at 2nd course ($p<0,01$). These indicators correspond to the increased body weight, as in the classical variant of BMI determination [7,9].

The value of SPI (shoulder-pelvic index) in female I and II-year students were 64,3±0,12 cm ($p<0,01$). Its value was 59,3±0,8 cm for the first-year female students, and 68,8 cm±0,17 cm for the second-year female students. The parameters of shoulder width (SW) and pelvic width (PW) in the group under study have the following values: in the whole group, SW and PW are 42,5±3,2 cm and 33,71±1,71 cm correspondingly ($p<0,01$). In the 1st course these values are 42,12±3,21 cm and 33,06±1,75 cm, in the 2nd course - 42,81±3,24 cm and 34,24±1,51 cm. The obtained data allow us to speak about the ratios of hindlimb to hindlimb that are not characteristic for women. The prevalence of hindlimb over hindlimb is characteristic for masculine (andromorphic), but not for feminine (gynecomorphic) type of build [2,4,8].

The value of PBI (pelvic bone index) in female I and II-year students were 43,77±2,84 cm ($p<0,01$). The value of this index corresponded to 43,64±3,34 cm for the 1st course, and 43,88±2,45 cm for the 2nd course. All three indexes ($p<0,01$) indicate a high enough level of bone maturity of the pelvis in all 1st- 2nd year female students [6,8].

The values of the relative pelvic width index (RPWI) in the whole group were 19,69±0,92 cm ($p<0,01$). The index corresponded to the value of 19,49±0,90 cm for the first-year female students and 19,85±0,92 cm for the second-year female students. The values of the index for the whole sample and for female students of two courses correspond to the values of eurypielia (large pelvis), with a predominant increase of the three transverse dimensions of the bone pelvis [4,8].

In determining the values of the body obesity index according to R. Bergman's method [10], we obtained the following results: in all female students of the 2nd year the BOI was 28.92±3.9 ($p<0.01$), which indicates an increase in body weight corresponding to obesity. The value of this index corresponds to 30,95±4,73, and the value of the index corresponds to 27,28±1,98, which also corresponds to obesity among female students of the 1st course.

The values of Rorer mass-growth index (RMGI) in the whole group (n=38) were 19,2±1,08 kg/cm3 ($p<0,01$). For the first-year female students the RDI was 18,97±1,37 kg/cm3, for the second-year female students - 19,38±0,75 kg/cm3, which indicates an increased index of physical development [7,9].

When estimating the time of menarche, all examined female students in the special medical group (n=38) found that it was 13.7 ± 0.16 years, which corresponds to the average statistical indicators in Ukraine [1,3]. The age of menarche was 13.6±0.7 years for female students of the first year, and 13.8±0.6 years for female students of the second year. However, a more detailed consideration of the obtained results showed that the beginning of the menstrual cycle in 4 female students (10,53%) came at the age of 11-12 years, in 32 girls (84,21%) - at the age of 13-14 years, from 14 to 15 years - in 2 female students (5,26%).

All 100% of the female I and II-year students had different types of menstrual cycle disorders. Twelve (31.58%) of them had secondary amenorrhea, with the absence of menstrual bleeding for more than 6 months [1,2,5]. In 26 (68.42%) female students hypomenstrual syndrome was recorded, with manifestations of hypo-oligo- and pro-yomenorrhea, combined with manifestations of algodysmenorrhea [1,2,5].

The average duration of the menstrual cycle in female students is below the limits of the physiological norm of 21-35 days, namely, 16,6±1,36 days (projomenorrhea, or frequent menstruations) [1,2,5]. The number of girls with the duration of menstrual cycle less than 3 days (oligomenorrhea) in the first course was 11 female students, or 64,71%, in the second course - 16 female students, or 76,2%. In determining the time of establishing the stability of the menstrual cycle in the whole group was 1.4±0.47 years, which corresponds to the permissible physiological time characteristics [1,2,5].

35 girls (92.11%) reported a pronounced premenstrual syndrome. Only 3 students, or 7.89% noted its complete absence. It was found that the duration of menstrual bleeding in the whole group is 2.4±0.4 days, which corresponds to the manifestation of oligomenorrhea [1,2,5]. Our data confirm the opinion of other researchers, who indicate that in adolescence and first adulthood, oligomenorrhea prevails in the structure of menstrual cycle disorders in 65-70% of overweight patients [1,2,5].

In addition, according to the results of the questionnaire, the manifestations of hyperandrogenism (growth of dark, stiff hair in uncharacteristic for women areas, acne, seborrhea) were found in 22 female students (57.9%). According to medical history and questionnaire data 12 (31,58%) female students were registered for 4-6 years by endocrinologist and gynecologist for Stein-Leventhal syndrome. 19 (50%) female students had violation of glucose tolerance and pre-diabetic phenomena, four (10,53%) are under medical supervision of an endocrinologist with diabetes mellitus type I, and three (7,9%) are under observation by a gynecologist for PCOS (polycystic ovary syndrome).

According to the results of measurements of bone pelvis students of I-II courses of special medical group, were divided into 3 groups: 1) with "normal" dimensions - 2 female students (5.26%); 2) "large" pelvis-26 (68.42%) [4,8]; 3) "mixed pelvis shape" was determined in 10 female students (26.32%) [6,8].

Thus, among the female students surveyed, those with a "mixed" and "large" pelvis prevail - 36 female students, or 94.74%. The obtained data coincide with those of Kovtyuk N. I. and other researchers of this issue [4,6,8]. Recently, in similar studies, non-standard, so-called "mixed" forms of narrow pelvis are quite often determined [4,6,8].

Conclusions

1. 98.7% of the examined female students have a complex combined pathology with changes in the menstrual cycle, pelvic size and anthropometric parameters.
2. Menstrual cycle disorders that occurred in pubertal patients with obesity retain their structure and hormonal characteristics in reproductive age, while carbohydrate and fat metabolism disorders aggravate with age.
(3) Therapy aimed at reducing body weight and correcting metabolic disorders is the first step in restoring menstrual function in obese patients and should begin as early as adolescence.
4. Oligomenorrhagia predominates in the structure of menstrual cycle disorders in adolescents and women of the first reproductive age with obesity; the frequency of metrorrhagia against oligomenorrhagia increases with age.

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