

# Young Women with Increased Body Weight: Studying the Features of Their Ovarial-Menstrual Cycle and Some Anthropometric Values

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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

### Aim of study

The purpose of this study is to: identify the anatomical and anthropological features of the body and the size of the pelvis, study and analyze a number of indicators of somatic and reproductive health, based on the individual characteristics of the menstrual cycle and the values of a number of anthropometric indicators and special indices among I-II year students of a medical university with increased body weight.

### Research objectives:

1. Determine individual anthropometric indicators, age of menarche, variants of the menstrual cycle and the values of a number of special indices, anatomical and anthropological features of the body and pelvic size.
2. Assess and analyze the level of a number of indicators of somatic and reproductive health obtained as a result of the study, based on data from a survey, examination, determination of anthropometric indicators, special indices and the results of a survey.

### Hypothesis of the study

In the process of preparing and conducting this study, as well as at the beginning of the process of writing this research article, its author had the following working hypothesis, the essence of which was the high probability and possibility of detection in young female students. Those who took an active part in the author's study of disorders of their ovarian cycle, such as hypomenstrual syndrome, as well as significant anthropological and a number of morphofunctional index values, with a shift in these changes towards inverse morphotypes/somatotypes - mesomorphy and even possible andromorphy, i.e., to the possible formation of a process of masculinization in them.

**Kew Words:** vocational guidance; imaging; medical radiophysics

## Introduction

Recent decades have been characterized by a deterioration in the somatic and reproductive health of the population of many countries, with especially pronounced changes among students. Among female students, there is a tendency to increase gynecological morbidity, in the structure of which one of the leading places is occupied by menstrual cycle 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 living

conditions, a significant increase in psycho-emotional stress and stressful situations, and a lack of balanced nutrition have led to a significant transformation in the frequency and structure of the anatomically altered pelvis, as well as a significant increase in various types of menstrual disorders [1,4,6,8]. When we studied the available scientific literature on this issue, we did not find a sufficiently large number of studies devoted to the study of individual anatomical variability of the female body in adolescence and early adulthood, during the period of completion of growth

in length and the formation of various body systems, completion of growth and ossification of the pelvis, and the onset of puberty. maturity, readiness of the body to perform its reproductive function [2,4,8,9].

### Abbreviation

- **BMI** - (body mass index);
- **PBI** - (pelvic bone index);
- **BOI** - (body obesity index according to R. Bergman);
- **BMI (C)** - using Solovyov index values;
- **RI** - Rohrer index;
- **RPWI** - relative pelvic width index;
- **BPI** - brachio-pelvic index;
- **SI** - Solovyov index;
- **OMC** - ovarian-menstrual cycle;
- **POS** - polycystic ovary syndrome.

### Material and methods

To conduct the study, during a medical examination of first- and second-year medical university students, we identified a group of female students with increased body weight. In the first year this group consists of 93 people, in the second year – 112 people, in total – 205 people. Of these, there are 78 first-year students, 60 second-year students, a total of 138 people, or 7.96% of the total number of first- and second-year students involved in physical education. The number of female students of a special medical group with increased body weight in the first year is 17 (18.28%) people, or 21.8% of all female students in this course. In the second year, the number of female students with increased body weight is 21, which is 18.75% of all first-year students and 35% of the total number of second-year students. 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 characteristics of a number of anthropometric indicators (height, weight, pelvic dimensions, shoulder width, waist circumference, hip circumference, pelvic dimensions) and associated values of special indices - BMI (body mass index), PBI (pelvic bone index), BOI (body obesity index according to R. Bergman), etc. [4,7,8,10].

### Organization of the study

A total of 38 first- and second-year female students with increased body weight, aged 18-23 years (average age  $19.7 \pm 2.16$  years), took part in the study. In order to assess the state of the menstrual function of female students, we determined the time of menarche and the individual characteristics of the course and development of their menstrual cycle. To conduct the study, an author's questionnaire was specially developed, including questions regarding the individual characteristics of the menstrual cycle and a special table, including a number of anthropometric indicators and the values of special indices reflecting changes in the state of reproductive health of the studied female students of the first and second years of the medical university. After completing the study, we made the necessary calculations, carried out their statistical processing and analyzed the results. The obtained material was processed on a personal computer using the Statistica 5.0 application package. Results with  $p < 0.05$  were considered statistically significant. We assessed the ratio of individual anthropometric indicators using a number of special indices. Weight-height ratios were assessed using BMI, BMI using Solovyov index values (BMI (C)), and Rohrer index (RI) [4,5,7,9].

The following anthropometric measurements were also carried out: standing body length, body weight, shoulder width, Solovyov index, external dimensions of the bony pelvis (d. spinarum, d. cristarum, d. trochanterica, c. externa) [3,4,8], index pelvic bones (PBI) according to the method of Kovtyuk N.I (2002) [6], relative pelvic width index (RPWI), brachio-pelvic

index (BPI) [7,8], body obesity index (BRI) according to Bergman [10]. The morphotype of girls of adolescence and first reproductive age was determined by clinical anthropometry [4,7,9]. Body mass index (BMI) was determined using the formula:  $BMI = \text{body weight (kg)} / \text{height (m)}^2$ . BMI values  $\geq 25 \text{ kg/m}^2$  were taken as normative indicators - hypersthenic morphotype, BMI 25.0-29.9 - overweight (pre-obesity), BMI - 30.0 - 34.9 - first degree obesity, BMI value 35.0 – 39.9 as obesity degree II [6,8]. When determining BMI taking into account the values of the Solovyov index, we used the following formula:  $BMI = QM / IS^2$ , where BMI is the body mass index, M is weight in kg, h is height in meters, IS is the Solovyov index, Q is a constant coefficient (for women - 16). In this case, the values of BMI indicators (C) have the same parameters as when determining BMI using the classical method [4,6,8]. The Rohrer weight-height index (RI), which determines body density and depends on the linear dimensions and body weight, was calculated using the formula:  $W/H^3 \text{ kg/cm}^3$ , where W is body weight (kg), H is body height (m) [4,7,9]. PBI (pelvic bone index) was calculated using the formula:  $PBI = a \times b/IS$ , where a is the transverse size of the pelvis (distantia trochanterica), cm, c is the external conjugata (conjugata externa), cm, IS is the Solovyov index, cm [6,8].

The relative pelvic width index (RPWI) was calculated as the ratio of the width of the pelvis to the length of the body, multiplied by 100. Stenopieliia (narrow pelvis) corresponds to index values up to 15.9, metriopyelia ("middle" pelvis) – 16.0-17.9, eurypyelia ("wide" pelvis) – 18.0 or more [4,6,8]. The brachio-pelvic index (PPI) was determined by the formula:  $RPWI = PW \text{ (pelvic width (cm))} \times 100 / SW \text{ (shoulder width (cm))}$  [4,7,9]. In our study, we used a new index proposed in 2011 by the American scientist Richard Bergman [10]. Its calculation is presented in the form of the following formula:  $HTI = \text{hip circumference (cm)} / \text{height (m)} \times \sqrt{\text{height (m)}}$  – 18. According to his calculations, the norm is considered to be a body obesity index (BOI) value ranging from 8 to 20. An indicator 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 and discussion

The examined girls did not have significant differences in age, but differed in body length and weight ( $p < 0.05$ ). When analyzing the results obtained, the following indicators were obtained: 38 (18.54%) female students of the special medical group of the 1st and 2nd courses have a body weight of more than 85-90 kg. When determining BMI values, it was found that in the entire examined group ( $n=38$ ), the indicator was  $28.78 \pm 1.59 \text{ kg/m}^2$  ( $p < 0.01$ ). In the first year, the average body weight was  $97.36 \pm 6.78 \text{ kg}$ , BMI –  $28.56 \pm 1.81 \text{ kg/m}^2$ , which corresponds to excess body weight. In the second year, these indicators were as follows: average body weight –  $100.58 \pm 3.73 \text{ kg}$ , BMI –  $28.96 \pm 1.40 \text{ kg/m}^2$ , which also corresponds to excess body weight. At the same time, in 3 (17.65%) first-year students and 4 (19.05%) second-year students (18.42% of all students with increased body weight), BMI indicators were in the range of 30.0 – 34.9  $\text{kg/m}^2$ , which corresponds to the first degree of obesity [2,7,10]. The values of the Solovyov index (SI) in the entire study group ( $n=38$ ) were  $17.68 \pm 1.23 \text{ cm}$ . Among first-year students, its value was  $17.18 \pm 1.0 \text{ cm}$ , with the norm being 14-16 cm [4, 7,8]. For second-year female students, this indicator corresponded to the following values –  $18.1 \pm 1.26 \text{ cm}$  ( $p < 0.01$ ).

When comparatively determining the value of BMI (C), taking into account the values of the Solovyov index, the following indicators were obtained: in the entire examined group ( $n=38$ ), it was equal to  $-26.16 \pm 1.34 \text{ kg/m}^2$  ( $p < 0.01$ ). Among first-year female students its value was  $26.60 \pm 1.15 \text{ kg/m}^2$ , in second-year female students it was  $25.79 \pm 1.4 \text{ kg/m}^2$  ( $p < 0.01$ ). These are indicators corresponding to increased body weight, as in the classic version of determining BMI [7,9]. The value of PTI (brachial-pelvic index) among first- and second-year students was  $64.3 \pm 0.12 \text{ cm}$  ( $p < 0.01$ ). For first-year

female students its value was  $59.3 \pm 0.8$  cm, for second-year female students it was  $68.8 \text{ cm} \pm 0.17$  cm. The indicators of shoulder width (SW) and pelvic width (PW) in the study group have the following values: in the entire in the SW group and PW are  $42.5 \pm 3.2$  cm and  $33.71 \pm 1.71$  cm, respectively ( $p < 0.01$ ). In the first year these indicators are  $42.12 \pm 3.21$  cm and  $33.06 \pm 1.75$  cm, in the second year -  $42.81 \pm 3.24$  cm and  $34.24 \pm 1.51$  cm. The data obtained allow us talk about the ratios of shoulder width and pelvic width that are not typical for women. The predominance of shoulder width over the width of the pelvis is characteristic of a masculine (andromorphic) rather than a feminine (gynecomorphic) body type [2,4,8]. The Rohrer weight-height index (RI) in the entire group ( $n=38$ ) was  $19.2 \pm 1.08$  kg/cm<sup>3</sup> ( $p < 0.01$ ). For first-year female students, IR was  $18.97 \pm 1.37$  kg/cm<sup>3</sup>, for second-year female students it was  $19.38 \pm 0.75$  kg/cm<sup>3</sup>, which indicates increased rates of physical development [7,9].

The value of PBI (pelvic bone index) among first- and second-year students was  $43.77 \pm 2.84$  cm ( $p < 0.01$ ). In the first-year students, the value of this indicator corresponded to  $43.64 \pm 3.34$  cm, and in the second year -  $43.88 \pm 2.45$  cm. All three indicators ( $p < 0.01$ ) indicate a fairly high level of pelvic bone maturity in all first- and second-year students [6,8]. The relative pelvic width index (RPWI) values in the entire group were  $19.69 \pm 0.92$  cm ( $p < 0.01$ ). For first-year girls this index corresponded to a value of  $19.49 \pm 0.90$  cm, for second-year students it was  $19.85 \pm 0.92$  cm. The values of the index for the entire sample and for two-year students corresponded to the values of eurypyelia (large pelvis), with a predominant an increase in three transverse dimensions of the bone pelvis [4,8]. When determining the values of the body obesity index according to the method of R. Bergman [10], we obtained the following results: for all 2nd year students, the BOI was  $28.92 \pm 3.9$  ( $p < 0.01$ ), which indicates an increase in weight body corresponding to obesity. For first-year female students, the value of this index corresponds to  $30.95 \pm 4.73$ , and for second-year female students, the index value corresponds to  $27.28 \pm 1.98$ , which also corresponds to obesity. When assessing the time of onset of menarche, for all examined female students of the study group ( $n=38$ ), it was found that it was  $13.7 \pm 0.16$  years, which corresponds to the average Ukrainian indicators [1,3]. For first-year female students, the age of menarche was  $13.6 \pm 0.7$  years, and for second-year female students it was  $13.8 \pm 0.6$  years. However, upon closer examination of the results obtained, it was found that the onset of the menstrual cycle in 4 students (10.53%) occurred at the age of 11-12 years, in 32 girls (84.21%) - at the age of 13-14 years, with 14 to 15 years old - 2 students (5.26%). All 100% of first- and second-year students had various types of menstrual irregularities. In 12 (31.58%) of them, secondary amenorrhea was recorded, 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 proymenorrhea, in combination with manifestations of algomenorrhea [1,2,5].

The average duration of the menstrual cycle among female students is below the physiological norm of 21-35 days, namely  $16.6 \pm 1.36$  days (proyomenorrhea, or frequent menstruation) [1,2,5]. The number of girls with a menstrual cycle lasting less than 3 days (oligomenorrhea) in the first year was 11 students, or 64.71%, in the second year - 16 students, or 76.2%. When determining the time for establishing stability of the ovarian-menstrual cycle (OMC) in the entire group, it is  $1.4 \pm 0.47$  years, which corresponds to acceptable physiological time characteristics [1,2,5]. 35 girls (92.11%) report severe premenstrual syndrome. Only 3 female students, or 7.89%, noted its complete absence. It was found that the duration of menstrual bleeding in the entire group was  $2.4 \pm 0.4$  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 early adulthood,

oligomenorrhea prevails in the structure of menstrual irregularities in 65-70% of overweight patients [1,2,5].

Additionally, based on the results of the survey, it was found that manifestations of hyperandrogenism (growth of dark, coarse hair in areas uncharacteristic for women, acne, seborrhea) were noted in 22 female students (57.9%). According to the anamnesis and questionnaire data, 12 (31.58%) female students have been registered with an endocrinologist and gynecologist for Stein-Leventhal syndrome for 4-6 years, 19 (50%) female students have impaired glucose tolerance and prediabetes. 4 (10.53%) are registered with an endocrinologist for type I diabetes mellitus, and 3 (7.9%) are observed by a gynecologist for POS (polycystic ovary syndrome). Based on the results of measurements of the bone pelvis, first- and second-year students of a special medical group were divided into 3 groups: 1) with "normal" sizes - 2 students (5.26%); 2) "large" pelvis - 26 (68.42%) [4,8]; 3) "mixed pelvic shape" was identified in 10 female students (26.32%) [6,8]. Thus, among the examined female students, those who have "mixed" and "large" pelvis prevail - 36 female students, or 94.74%. The data obtained coincide with the data of N.I. Kovtyuk and other researchers on this issue [4,6,8]. Recently, when conducting similar studies, non-standard, so-called "mixed" forms of a narrow pelvis are 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. Disorders of the menstrual cycle that arose during puberty in obese patients retain their structure and hormonal characteristics during reproductive age, while disturbances in carbohydrate and fat metabolism worsen with age.
3. Therapy aimed at reducing body weight and correcting metabolic disorders is the first stage in restoring menstrual function in obese patients, and should begin in adolescence.
4. In adolescents and women of the first reproductive age with obesity, oligomenorrhea prevails in the structure of menstrual cycle disorders; with age, the frequency of metrorrhagia due to oligomenorrhea increases.

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