

# Relationship Between Menarche and The Beginning of Sports

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## Abstract

The article presents the materials of a study devoted to the question of the possible relationship between the timing of the menarche and the start of active sports. The data of different authors and the opinions of researchers on the issue under study are given. The author's materials are presented on a longitudinal study on the relationship between the timing of the menarche and the dynamics of sports activities in athletes of puberty and adolescence.

**Key words:** menarche; sports; female athletes; puberty; adolescence; the formation of the menstrual cycle

## Introduction

The issues of medical and biological peculiarities of the female organism during physical training and sports are constantly topical in sports medicine. Among the issues concerning the involvement of female athletes of prepubertal, pubertal and adolescent age in high-performance sports, the most acute issue is the relationship between the timing of menarche (Me) - the first menstruation, and the beginning of intensive training in the chosen sport [1-17]. This problem is very relevant, because the determination of the relationship between the Me and the time of the beginning of sports activities in girls, and the impact of intense physical and psycho-emotional loads on the body of young female athletes, are etiopathological moments in the formation of various disorders of the ovarian menstrual cycle (OMC) [1-17].

## Aim of the work

Purpose of the article: an attempt to report the results of our own research, concerning the study of the influence of sports, the timing of menarche, the dynamics of the ovarian-menstrual cycle and its possible subsequent violations, in female athletes of pubertal and adolescent age, in different specialties and sports. Knowledge of these issues by coaches and specialists in training female athletes, with the participation in this process of sports doctors, psychologists,

pathophysiologists, will help in the prevention of disorders in female athletes at different stages of their ontogenesis [2, p. 18-22; 4, p. 15-19; 13; 16, p. 80-85].

## Analysis of recent research and publications

This problem has been studied by specialists in women's sports for a long time. But, unfortunately, among specialists, there is still no consensus on the etiology (causes) and pathogenesis of changes in the timing of Me period in female athletes [1-17]. Some authors believe that it is associated with the features of the constitution of female athletes, taken into account by coaches when selecting female athletes for different sports (V.M. Osipov, 2012), others link the delay of menarche with excessive intensity (in frequency and volume) and, respectively, with the physical and psychological components of stress affecting the body of young female athletes and their sports experience (N. D. Rouns, N.A. Georgopoulos, 2011; Y.T. Pokholenchuk, B.N. Pangelov; S.G. Vasin, 2016; K.A. Bugajewski, 2014-2018), others emphasize the loss of fat mass and increasing processes of hyperandrogenism in female athletes, with somatic and psychological changes in sexual somatotypes of female athletes (M. Jurczyk, 2010; B. Charniga, O. Solonenko, 2014; E.S. Korneeva, T.P. Zamchiy, 2015; M.G. Masalkin, Y.A. Martynov, 2016; K.G. Terzi, 2016; K.A. Bugajewski, 2014-2018).

In the context of this problem, a special place is occupied by the question: "When it is more physiological to begin to practice sports: before the onset of menarche, or after? There are studies showing the effect of changing the timing of menarche with the beginning of intensive sports activities (B.A. Nikityuk, 1984), where it was shown that female athletes of pubertal age who began sports activities after the onset of menarche, statistically no deviations in the formation and dynamics of CMC were revealed, and also associated with a delayed process and staging of puberty (V.M. Osipov, 2012). In turn, there is an opinion (E.R. Rummyantseva, T. Sokha, 2012, referring to the research of B.A. Nikityuk, 1984) states that "the early beginning of intensive muscular activity (from 7 to 9 years) creates the most sparing conditions for the female body, not preventing timely puberty, provided the training process is built adequately to the functional state of female athletes at certain stages of their development". [9, p. 19-21; 12, p. 67-75]. According to the above authors, in their study in female athletes engaged in weightlifting, both before, during and immediately after the onset of menarche, no violations of the timing of the first menstruation that appeared in the studied female athletes in the physiological terms of 12 to 14 years [9, p. 19-21; 12, p. 67-75] were revealed. The determining factor in this issue is the fact that the time of menarche onset depends on the climatic zone, body weight, including the amount of fat tissue (V. Abramov et al., 2005; V.K. Likhachev, 2007; E.A. Konovalova, 2015; K.A. Bugaevsky, 2014-2018), nature of diet, other factors, which are often combined and individual.

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opinion, it is crucial and fundamental to solve the question of the relationship between sports activities and the timing of menarche in female athletes during puberty. Also, not completely solved issue, which there is no unanimity among modern researchers of biomedical problems of women's sports and in particular the features of menarche in young female athletes, is the question of determining the timing of intensive sports - before the appearance of girls Me, in the short term after the first period, or already on the background of a formed and stable menarche and OMC.

## Material and methods

The author of this research article, to conduct the study, used the following methods: selection of the study group of young female athletes who have already started menstruating; selection and literary-critical analysis of available sources of information, both domestic and foreign, relevant to the topic of the study: method of questioning, using the author's version of the questionnaire (Bugaevsky K.A., 2011®); study and in-depth analysis of the study results; method of mathematical statistics of the obtained results.

All of the young female athletes who took part in the study conducted by the author of this article gave their voluntary consent, in accordance with the moral and ethical requirements of the Helsinki Conference on Research Involving Human Subjects.

## Result and discussion

To clarify the question of the relationship between the time of onset of Me in female athletes of pubertal and adolescent age, and the influence on the formation of BMC and its dynamics, the beginning of sports, we, during 2021-2022, conducted a study, involving female athletes of different sports. A total of 256 female athletes took part in the study. Of them: pubertal age - 106 female athletes, junior age - 150 female athletes. We obtained the following data on the formation and dynamics of OMC in female athletes of pubertal age, different sport specializations, which are presented in Table 1 - at  $p \leq 0.05$ .

**Table 1:** Menstrual cycle dynamics in the group of female athletes of pubertal age.

Timing of menarche	Time of establishment of the menstrual cycle	Duration of menstrual cycle	Duration of menstrual bleeding
<b>Women's boxing (n=17)</b>			
13,86±0,67 years	1,78±0,54 years	38,83±1,85 days	2,39±0,74 days
<b>Kickboxing (n=23)</b>			
12,46±0,56 years	1,88±0,74 года	29,77±0,54 days	3,13±0,33 days
<b>Dance sport (n=15)</b>			
13,62±0,23 years	1,4±0,47 years	37,26±1,12 days	2,44±0,34 days
<b>Canoeing (n=19)</b>			
13,62±0,23 years	1,4±0,47 years	37,26±1,12 days	2,44±0,34 days
<b>Kyokushinkai Karate (n=18)</b>			
13,92±0,47 years	1,93±0,47 years	49,14±0,75 days	2,77±0,53 days
<b>Pankration (n=14)</b>			
13,83±0,87 years	1,87±0,86 years	39,43±1,75 days	2,47±0,63 days

It has been established that the age at menarche is 1-1,5 years longer in female athletes of pubertal age who are engaged in female boxing, dance sport, kayaking and canoeing, karate kyokushinkai and pankration than in female nonathletes in the Ukrainian population, which is 12,56±0,87 years [1, p. 423-425; 2, p. 18-22; 10, p. 42-45]. Timing of menarche, which is 1-1.5 years in the norm, is exceeded in adolescent female athletes in all sports, except canoeing. All female athletes, except girls engaged in kickboxing, have pathological changes of menstrual cycle, the type of hypomenstrual syndrome,

with violations of the duration of menstruation in the direction of rare menstruations and reducing the number of days of menstrual bleeding (MB) - phenomena oligo-opsomnorea [2, p. 18-22; 3, pp. 114-116; 5, pp. 76-83; 7; 10, pp. 42-45; 11, pp. 89-96; 14, pp. 193-196; 15, pp. 20-22; 16, pp. 80-85; 17, pp. 104-116]. The data concerning the peculiarities of dynamics and formation in female athletes of adolescence, 10 different sport specializations are presented in Table 2. - at  $p \leq 0.05$ .

**Table 2:** Dynamics of the menstrual cycle in the group of junior female athletes.

Timing of menarche	Time of establishment of the menstrual cycle	Duration of menstrual cycle	Duration of menstrual bleeding
<b>Tennis (n=12)</b>			
13,94±0,66 years	2,14±0,47 years	43,47±0,8 3 days	2,21±0,25 days
<b>Kickboxing (n=24)</b>			
12,96±0,47 years	2,25±0,19 years	37,82±0,63 days	2,24±0,19 days
<b>Dance sport (n=15)</b>			
12,17±0,57 years	1,6±0,35 years	27,14±0,53 days	5,36±0,14 days
<b>Women's boxing (n=13)</b>			
13,92±0,65 years	1,87±0,23 years	40,33±0,46 days	2,47±0,53 days
<b>Weightlifting (n=11)</b>			
12,26±0,63 years	1,76±0,53 years	38,14±0,53 days	2,21±0,24 days
<b>Powerlifting (n=16)</b>			
12,13±0,17 years	1,71±0,42 years	37,34±0,52 days	2,23±0,14 days
<b>Canoeing (n=21)</b>			
13,89±0,77 years	1,89±0,54 years	48,46±0,67 days	2,07±0,23 days
<b>Kyokushinkai Karate (n=19)</b>			
13,75±0,78 years	1,78±0,56 years	47,04±0,22 days	2,67±0,39 days
<b>Triathlon (n=7)</b>			
12,65±1,34 years	1,77±0,74 years	43,56±0,37 days	2,72±0,47 days
<b>Pankration (n=12)</b>			
13,77±0,56 years	1,74±0,51 years	41,21±0,38 days	2,35±0,72 days

When analyzing the results of the formation and dynamics of BMC in young female athletes, we found that the timing of menarche, higher than in the population in girls - non-athletes in sports such as: tennis, kickboxing, women's boxing, canoeing, kyokushinkai karate, triathlon and pankration, more than 0.2-1.3 years. At the same time, in young female athletes engaged in dance sport and weightlifting, the time of onset of Me is less than in the population in Ukraine by 3 months to six months [1, pp. 423-425; 2, pp. 18-22; 10, pp. 42-45]. In all sports, the investigated female athletes, except dance sport, have increased timing of establishment of OMC, higher than the norm

by 1-1.4 years. The same applies to the duration of OMC and the number of days of menstrual bleeding (MB). In all female athletes, except for girls involved in dance sport, the frequency of menstrual menstruation is reduced (rare), with the phenomena of oligo-opsomenorrhoea and algodysmenorrhoea. Regarding the timing of sporting activities and their relationship with the onset of menarche (before or after the onset of Me), with subsequent variants of OMC disorders in the group of female athletes (n=106) of pubertal age, the data are shown in Table 3 - at  $p \leq 0.05$ .

**Table 3:** Relationship of menarche to the beginning of sports in female athletes of pubertal age.

Indicator name	Before menarche	After the onset of menarche
Women's boxing (n=17)	14 (82,35%)	3 (17,65%)
Kickboxing (n=23)	14 (60,87%)	9 (39,13%)
Dance sport (n=15)	15 (100,00%)	-
Canoeing (n=19)	15 (78,95%)	4 (21,05%)
Kyokushinkai Karate (n=18)	13 (72,22%)	5 (27,78%)
Pankration (n=14)	8 (51,74%)	6 (42,86%)
Total female athletes (n=106)	71 (77,17%)	21 (22,83%)

The analysis of the data obtained revealed that 69 (97.18%) female athletes of pubertal age who started sporting activities before the onset of Me and 14 (66.67%) female athletes who started activities in the first year-1.5-2 years after Me identified various, often combined disorders of OMC, mainly as hypomendrial syndrome, with phenomena of oligo-opsomenorrhoea, algodysmenorrhoea and premenstrual syndrome (PMS)

[2, pp. 18-22; 3, pp. 114-116; 5, pp. 76-83; 7; 10, pp. 42-45; 11, pp. 89-96; 14, pp. 193-196; 15, pp. 20-22; 16, pp. 80-85; 17, pp. 104-116]. Analysis of the data obtained in the group of young female athletes (n=121) also revealed that the proportion of various OMC disorders prevails in the female athletes who started their training before their first menstruation. The results are presented in Table 4 - at  $p \leq 0.05$ .

**Table 4:** Relationship of menarche to the onset of sports in female athletes of adolescent age.

Indicator name	Before menarche	After the onset of menarche
Women's boxing (n=13)	10 (76,92%)	3 (23,08%)
Kickboxing (n=24)	18 (75,00%)	6 (25,0%)
Dance sport (n=15)	11 (73,33%)	4 (26,67%)
Canoeing (n=21)	18 (85,71%)	3 (14,29%)
Kyokushinkai Karate (n=19)	15 (78,95%)	4 (21,05%)
Tennis (n=12)	12 (100,00%)	-
Weightlifting (n=11)	3 (27,27%)	8 (72,73%)
Powerlifting (n=16)	6 (37,50%)	10 (62,50%)
Triathlon (n=7)	2 (28,57%)	5 (71,43%)
Pankration (n=12)	5 (41,67%)	7 (58,33%)
Total female athletes (n=150)	100 (66,67%)	50 (33,33%)

The analysis of the obtained data showed that practically in every sport (except weightlifting, powerlifting, triathlon) [6, p. 131-135; 8, p. 72-75,

female athletes who started their sports activities before their first menstruation dominate. In this group all the female athletes who started their sports activities before

menarche also recorded the phenomena of hypomenstrual syndrome, with the phenomena of oligo-opsomenorrhea, algodysmenorrhea and premenstrual syndrome (PMS) - in 89 (89,00%) female athletes. The 50 (33.33%) female athletes who started to participate in sports 1-2 years after menarche also identified a variety of OMC disorders, similar to the group of female athletes of pubertal age. 43 (86.00%) female athletes have pronounced somatic and psychological manifestations of PMS. In addition, 14 (28.00%) with the phenomena of secondary amenorrhea were already present in this group. Additional interviewing determined that these female athletes have the highest physical and psycho-emotional stress, as well as the longest experience in sports - from 5 to 9.5 years. In view of all of the above, the following conclusions can be made.

## Conclusions

1. In our opinion, there is a direct correlation between the timing of menarche and the time of the beginning of sports.
2. We believe that the beginning of sports training, in the period before the appearance of menarche in girls, together with other (objective and subjective) factors, is one of the main causes of disorders in the reproductive system of female athletes, including the violation of the formation and dynamics of menarche.
3. The revealed disorders of OMC in female athletes of pubertal and adolescent age who started their sports activities in the period after the appearance of menarche should be regarded as a complex, multifactorial process (intensive, inadequate physical and psychological loads, permanent stress, rapid decrease in body weight, including loss of fat mass, imbalanced nutritional behavior), resulting in compensatory adaptive manifestations in the body of female athletes.
4. The use of knowledge about cyclic changes in the body of girls and female athletes, knowledge about the formation and dynamics of their OMC, taking into account the timing of menarche, is necessary in modern women's sports.

## Abbreviations

- ME** - menarche, or first menstruation.  
**OMC** – ovarian and menstrual cycle.

**MB** - menstrual bleeding.

**PS** - Premenstrual syndrome.

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