

# Description of Demographic and Anamnestic Indicators of Students Engaged in Different Sports – Girls and Teenagers

Akbarova Gulnoza Khaidaraliyeva<sup>1</sup>, Mamasoliev Nematjon Solievich<sup>2</sup>

<sup>1</sup>Independent Researcher-Researcher, Faculty of Postgraduate Education and Professional Development, Department of Postgraduate Education and Professional Development for General Practitioners and Functional Diagnostics Assistant of the Department, Andijan State Medical Institute, Andijan, Uzbekistan

<sup>2</sup>Doctor of Medical Sciences, Professor, Academician of UzRTA, And DavTI Internal Medicine, Cardiology and Head of the Ambulance Department, Andijan State Medical Institute, Andijan, Uzbekistan

**Abstract** For the first time, through a special epidemiological and clinical analysis of the reproductive function and sexual development of schoolchildren aged 11-15, those engaged in various types of sports activities in comparison with their peers in high school, the age limits of sexual development and the frequency of violations of sexual development and reproductive activities are determined; Research object 2001 teenage girls between 11 and 15 years of age engaged in sports studying in 2 sports schools, 1 high school, 2 colleges of Andijan region between 2019-2022 were taken. General blood and urine, as well as biochemical analysis, anthropometric indices, hemodynamic parameters, results of menarche tests were taken as the subject of research. Research results proved that conditions have been created for 100% elimination of reproductive diseases and somatic pathologies in schoolgirls and teenage girls engaged in sports.

**Keywords** Reproductive health, Dermographic, Antenatal, Women of childbearing age, Sexual development, Schoolgirls, Sports, Physical development

## 1. Introduction

It is emphasized in all the modern scientific and practical recommendations that until now researches focused on the screening diagnosis and prevention of reproductive health, the development of new methods, are still relevant, and the demand and necessity for them is increasing more and more. The Government of the Republic of Uzbekistan pays constant attention to the protection of the health of the young generation and their development. Full-blooded implementation of these works became possible due to the adoption of a number of decisions and decrees of the President of the Republic of Uzbekistan, as well as the decision of the Cabinet of Ministers of the Republic of Uzbekistan. The formation of the reproductive system begins in the antenatal period. Its next stage of development is childhood and adolescence. It is these stages that are considered to be the decisive factors in the formation of reproductive health. Knowing the characteristics of sexual development in these stages is necessary for proper prevention of disorders of reproductive activities in women of childbearing age.

In modern science, great attention is paid to the issue of shaping the sexual development and reproductive function of teenage girls, to studying the impact of environmental, medical-social, somatic and other factors on them, including strong physical changes associated with their sports activities. Much information is conflicting about the effects of vigorous physical activity and sports training on general and adulthood in schoolgirls, adolescents, and women of childbearing age. Elucidating these issues, the problem of developing innovative strategies for the prevention of reproductive diseases in schoolgirls and teenagers engaged in various sports remains an unsolved field of science.

A number of tasks have been defined and set for the science and practice of the country to preserve and strengthen this field, the present and future sports destiny and health, including reproductive health, of students - girls and teenagers engaged in sports.

Among them, scientific activities and practical works in this direction allow early detection of reproductive disorders and diseases, prenatal prevention, and improvement and prolongation of the quality of sports life.

This scientific work is based on Presidential Decree No. 51-24 dated May 25, 2021 "On additional measures - activities related to the comprehensive development of the health sector", Presidential Decree No. 215 dated April 25, 2022

"Bringing primary medical and sanitary care closer to the population and PQ-414 of November 3, 2022 on additional measures to improve the efficiency of medical services, PQ-414 of July 28, 2023 PQ-244 of July 28, 2023 No. "On the training of medical personnel for the field of physical education and sports, as well as on measures to further improve the system of medical support for athletes" and other regulatory legal documents related to this activity, serves to implement the tasks.

The level of learning of the problem. In this scientific topic, research work has been carried out in many scientific research centers of the world, and based on the results of most clinical-fundamental studies, treatment and diagnostic processes have been improved or developments have been recommended [20, p. 20-26].

According to a group of studies, the authors believe that sports in the right mode and training methodology do not have any harmful effects on the reproductive system of girls and women of childbearing age. It is confirmed that girls who do sports regularly go through puberty easily, and older female athletes have easy pregnancy and childbirth, strong healthy children.

In a number of other studies, such a conclusion is doubted, because it is considered that there are many pathologies in their genital areas, or it is explained by such an interpretation. They attribute this to the muscularization of the body structure, which is associated with hyperandrogenism, which is strongly expressed in most modern female athletes. It has been suggested that participating in various sports causes a delay in puberty in girls, in particular a later onset of menarche (ME), and a reduction in the development of mammary glands (MA), pubic hair (R) and axillary (A+) axillary hair. In one third of female athletes, the first signs of puberty are estrogen-dependent growth of pubic and axillary hair (increased hair growth) of the mammary glands.

There are also opinions in the research that the high number of reproductive pathologies in schoolgirl athletes is not the result of playing sports, but the result of their constitutional characteristics. At the stage of selection for sports, the artificial selection of certain naturally given constitutional features continues strongly (perfect height, low weight, size, flexibility, etc.), which respond or increase the response to the increasing demands of sports practice.

The rate of puberty and the rate of somatic growth are only largely uncontrollable. Research shows that these processes can be influenced by a large number of internal and external factors, which is understood as epigenetic influence. In research, there are scientific data in this direction, and especially in experimental observations, the development and growth of animals is due to the increase in the level of secretion of androgens, which is increased due to overfeeding.

On the contrary, due to chronic undernutrition, the growth and development of experimental animals slows down, which leads to a decrease in the levels of sex steroids, IFR-1 and thyroid hormones, and changes in the hormonal status of the organism.

Studies have shown that intense physical exercise increases the production of somatotrophic hormone (SSTG), glucagon, and cortisol, while simultaneously decreasing the secretion of the anabolic hormone insulin. They provide opportunities to mobilize carbohydrates and fatty acids to meet age-related energy deficits associated with increased physical activity. Exercise also increases the secretion of testosterone and estrogen, which regulate the utilization ratio of carbohydrates and lipids. Therefore, it is important to know the processes that may occur in the body of adolescent female athletes during intense physical exertion, dietary restrictions, especially during sports that require strict control of body weight. Such requirements are more stringent in all sports (artistic gymnastics, acrobatics, diving, athletics, etc.). Currently, the loads and stresses of training and competitions are so great that the level of individual adaptation to their impact on the body of female athletes is determined on the edge of extreme possibilities. Studies have shown that such a large physical and psychological stress in early specialized sports corresponds to the age of 12-13 years. Experts and researchers have confirmed that this age is very important ("critical" period). Based on this, studying the current issues highlighted among schoolgirls and teenage girls engaged in various types of sports and creating innovative technologies for the prevention of reproductive diseases is considered a very important problem and necessity of modern medicine. Since the end of the last century, many benchmark indicators of children's growth have been analyzed, and based on them, "Children's growth norms" have been developed by WHO.

Over time, there was a need to update them, there was a need to develop new norms, and questions arose: how should children grow up in the current period / and / or what should these norms be in the future? Or the fact that such questions have been asked over the years has been caused by changes in the internal and external factors affecting child growth and development, and by drastic changes in epidemiological conditions and situations in relation to reproductive and somatic diseases in children and especially teenage girls.

From the results of existing studies, it was concluded that the main determinant of physical and sexual development/growth differences observed in children in different countries and regions of the world is not heredity, but differential effects in the environment.

In this topic, based on epidemiological studies, it is important to obtain new scientific results by studying the influence of environmental, medical-epidemiological and, in particular, sports factors on the formation of sexual development and reproductive function in adolescent girls and students.

Because the available scientific results show that there are very few studies aimed at studying the epidemiological description of reproductive diseases in schoolgirls and teenagers who play sports, and in the conditions of Uzbekistan - almost non-existent.

The influence of external climatic factors on the level of skills of athletes and the occurrence of various diseases in them, especially in student athletes and teenage girls, creates

unfavorable conditions [and most researchers distinguish external factors (chemical characteristics of the air, physical characteristics of the air and altitude) that transmit the effect of the pathogen [6, p. 42-44].

In the research of I.Yu. Voronova and co-authors (in 2016-2018, in-depth medical examination of 2,320 underage female athletes was performed), the problem of exclusion criteria for underage female athletes with ovarian tumors and true tumors from sports was developed. In this pathology, sports that require temporary withdrawal and dynamic monitoring of female athletes have been identified [11, p. 4].

Similar data were obtained by other researchers, and it was shown that there may be potentially dangerous complications for the athlete in such a clinical situation if monitoring tactics and preventive measures are not taken.

V. V. Deev et al. (2020) reviewed the current literature on blood pressure and arterial hypertension in the athlete population, comparing them with previous publications. It was found that both modern and historical athletes had lower average levels of AB numbers compared to the general population. However, traditional physiologic arterial hypertension, whether related to systolic or diastolic arterial pressure, is not considered typical of the modern athlete population.

Modern review of literature, such as J.D. Kobalova and co-authors, Wilson MG Et.al. (2017) research results and conclusions confirming these data are given.

We have learned from these and other scientific sources that athletes have been in peace until now. The question of the normal ("reference") arterial pressure level remains open, not resolved. The concept of arterial hypotension, which must necessarily occur in athletes as a triad ("hepotonia-hypertrophy-bradycardia"), has been around for less than a century. Until now, researchers have not even mentioned the results [12, p. 42-44].

In general, monitoring and timely correction of somatic diseases and their risk factors is considered one of the key factors in training athletes and maintaining or improving their performance, functional state of the body, reproductive health, and sexual development in adolescents. Especially respiratory diseases, as many researchers point out, it is necessary to pay special attention here.

According to the information provided by I.V. Poddubny and co-authors (2020), bullous diseases of the lungs (bullous emphysema of the lungs) are even found in adolescent athletes (it can be said that non-violation of epidemiological monitoring is most likely the cause) and require surgical intervention. practice is difficult.

In most cases, its main causes are damage to the strength and elasticity of the elements of the lung structure, pathological microcirculation, damage to surfactant properties, congenital deficiency of alpha-1 antitrypsin, an increase in gaseous substances in the air (cadmium, nitrogen oxide, etc.), an increase in tobacco smoke and dust particles in the air.

Another of the somatic diseases in sportsmen in different forms is confirmed during the COVID-19 pandemic, the

"infodemic" (information epidemic) - the spread of rumors about diseases (about COVID-19) in the media and the Internet. Rumors reduce the athlete's chances by causing mental stress and/or cause serious diseases in them [7, p. 16].

Panyukov M.V. and co-authors (2020) examined 59 female and 29 adolescent 6th-year students at the Moscow Medical University. They studied the morphofunctional levels of anthropometric data indicators and determined the levels of physical development of male and female students based on them. Age, body weight, standing and sitting body length, lung volume capacity (LVC), chest circumference, and arm dynamometric parameters were determined and evaluated in the study. It was found that most of the anthropometric indicators were mostly within the norm or even above the norm, but at the same time, many indicators were below the norm. According to the authors, this indicates a lack of training.

Physical development of students and children was evaluated by calculating various special indicators and conclusions were drawn by researchers. [13]. Body mass index (TMI), vital index (XI), strength index (KI), Megoni index, Solovev index and Pine index were determined and evaluated in different populations. These generally describe the level of physical development of an individual (child, pupil, teenage girl and student). So, with this approach, conducting research, in particular, epidemiological investigations and creating and conducting preventive programs, is considered to be an urgent issue, especially among student-athletes and teenagers. Then it will be possible to express an opinion that innovative developments will be created for the prevention of reproductive diseases or somatic diseases in athletic teenage girls - students.

## 2. Relevance of the Problem

A number of tasks have been defined and set for the science and practice of the country to preserve and strengthen this field, the present and future sports destiny and health, including reproductive health, of students - girls and teenagers engaged in sports. Among them, scientific activities and practical works in this direction allow early detection of reproductive disorders and diseases, prenatal prevention, and improvement and prolongation of the quality of sports life.

In modern science, great attention is paid to the issue of shaping the sexual development and reproductive function of teenage girls, to studying the impact of environmental, medical-social, somatic and other factors on them, including strong physical changes associated with their sports activities. Much information is conflicting about the effects of vigorous physical activity and sports training on general and adulthood in schoolgirls, adolescents, and women of childbearing age. Therefore, it is important or a relevant scientific issue to know the processes that may occur in the body of athletic adolescent girls during sports activities, regardless of how they affect sports. Such requirements are definitely imposed in all sports. In the era of strong competition, the loads of training and competitions have increased dramatically, and

the levels of individual adaptation to their impact on the body of female athletes are determined on the edge of extreme possibilities. 12-13-year-old students are considered to be the period/age when these situations occur most often in sports, i.e., when there is a great physical and psychological stress. This age of an athlete girl is confirmed as a "critical period", and it is during this period that it is an important scientific problem and practical necessity to create a monitoring system that provides opportunities for timely detection, warning, prevention and elimination of negative effects on the reproductive and somatic health of the athlete, as well as the development of innovative prevention algorithms.

### 3. Research Purpose

It consists of studying the state of puberty in schoolgirls and teenagers, the formation of reproductive health depending on the type of sport and the experience of sports activities, and the development of improved methods of prevention of reproductive diseases.

### 4. Research Results

The anthropometric parameters of the parents of the students and adolescents involved in the study were studied

in the main (sports school girls who play professional sports), control (high school and college girls who do not play sports) and comparative (high school and college girls who play amateur sports) control groups and was determined (the obtained results are summarized in table 1). Mother's age in the 8 main groups -  $38.8 \pm 4.55$  years old (min. 26 years - max. 58 years), in the control group -  $37.9 \pm 4.22$  years (min. 26 years - max. 56 years), and in the comparison group -  $38.6 \pm 3.79$  years (min. 29 years - max. 53 years). The age of the father in the I, II and III inspection groups is consistent and determined as follows:  $42.0 \pm 4.07$  years (min. 32 years - max. 59 years),  $41.4 \pm 4.36$  years (min. 26 years - max. 56 years) and  $38.6 \pm 3.79$  (min. 32 years - max. 56 years). It can be seen that the age of the parents in the main group is relatively older with an insignificant difference.

The body length indicators of parents of teenage girls are determined by the following classification: in group I -  $162.4 \pm 5.35$  cm (min. 145, max. 198 cm) and  $169.3 \pm 6.09$  (min. 155, max. 195 cm), II - group -  $162.0 \pm 5.44$  (min. 145 - max. 198 cm) and  $169.3 \pm 6.09$  cm (min. 155, max. 195 cm), and III - group -  $172.2 \pm 5.94$  cm (min. 155, max. 191 cm) according to the indicators, without. These indicators are higher in comparison with the control group with insignificant difference (mainly in fathers) and confirmed in group I. In terms of body weight (kg), adolescent girls also have "insensitive priority" in group I.

**Table 1.** Anthropometric parameters (M $\pm$ SD) of parents of all adolescent girls included in the study

№	Anthropometric indicators		Research groups					
			Main group (n=869)		Control group (n=598)		Comparison group (n=534)	
			M $\pm$ SD	Min-max	M $\pm$ SD	Min-max	M $\pm$ SD	Min-max
1	Age, year	mother	38.8 $\pm$ 4.55	26-58	37.9 $\pm$ 4.22	26-56	38.6 $\pm$ 3.79	29-53
		father	42.0 $\pm$ 4.07	32-59	41.4 $\pm$ 4.36	32-61	41.9 $\pm$ 3.50	32-56
2	Body length, cm	mother	162.4 $\pm$ 5.35	145-198	162.0 $\pm$ 5.44	145-198	163.1 $\pm$ 4.52	146-185
		father	169.3 $\pm$ 6.09	155-195	168.9 $\pm$ 6.61	150-196	171.2 $\pm$ 5.94	155-191
3	Weight of water, kg	mother Onasi	69.7 $\pm$ 6.56	46-98	68.8 $\pm$ 7.22	44-98	66.8 $\pm$ 8.62	40-94
		Father	76.5 $\pm$ 8.82	48.0-102	75.8 $\pm$ 9.04	48-115	73.8 $\pm$ 8.48	51-115

**Table 2.** The total number of teenage girls involved in the study was in the pregnancy of their mothers passed diseases (abs, %)

№	Nosological units	Research groups						Total	
		Main group		Comparative group		Control group			
		abs	%	abs	%	abs	%	abs	%
1	Anemia	437	50.3	186	34.8	208	34.9	831	41.5
2	Arterial hypertension	26	3.0	15	2.8	89	14.9	130	6.5
3	Gestational diabetes	34	3.9	22	4.1	28	4.7	84	4.2
4	Nephropathy	116	13.3	124	23.2	124	20.7	364	18.2
5	Pyelonephritis	256	29.4	187	35.0	149	24.9	592	29.6
total		869	100.0	534	100,0	598	100,0	2001	100,0

**Table 3.** Total diseases of parents of adolescent girls involved in the study (abs, %)

№	Nosological units		Research groups						Total (n=2001)	
			Main group (n=869)		Comparison group (n=534)		Control group (n=598)			
			abs	%	abs	%	abs	%	abs	%
1	Shortage anemia	mother	804	96.0	429	80.3	586	98.0	1819	90.9
		father	15	1.7	18	3,4	11	1.8	44	2,2
2	Arterial hypertension	mother	11	1.3	3	0.6	8	1.3	22	1,1
		father	41	4.7	9	1.7	18	3.0	68	3.4
3	diabetes	mother	5	0.6	2	0.4	-	-	7	0.3
		father	11	1.3	13	2.4	6	1.0	30	1.5
4	Pyelonephritis	mother	43	1.5	38	7.1	9	1.5	90	4.5
		father	21	2.4	16	3.0	16	2.7	53	2.6
5	other diseases	mother	6	0.7	6	1,1	4	0.7	16	0.8
		father	3	0.3	4	0.7	2	0.3	9	0.4

Body weight (kg) in mothers and fathers in different groups is recorded as follows: in mothers and fathers of group I -  $69.4 \pm 6.513$  kg (min. 46 - max. 98) and  $76.5 \pm 8.82$  kg (min. 48, 0 - max 102 kg), II – group –  $68.8 \pm 7.22$  kg (min. 44 – max 98 kg) and  $75.8 \pm 9.04$  kg (min. 48 – max 115) and III – group – It is characterized by  $66.8 \pm 8.62$  kg (min. 40 - max. 94 kg) and  $73.8 \pm 8.48$  kg (min. 51 - max. 115 kg). Table 2 shows the diseases of mothers of teenage girls involved in the study during pregnancy. From them, it is known that mothers of teenage girls mainly have 5 diseases - iron deficiency anemia (TTC), arterial hypertension (AG), gestational diabetes (GD), nephropathy and pyelonephritis - during pregnancy. The frequency of detection of TTK is 41.5%; observed with prevalence frequencies of 50.3%, 34.8% and 34.9% in the main, comparative and control groups. The information that attracts attention is that TTC is confirmed in the population of this group - every second mother, during pregnancy.

AG – 3.0% in group I, 2.8% in group II and 14.9% in group III. The overall prevalence rate is 6.5%, and AG is detected with approximately five times less frequency in the main group compared to the control group. Gestational diabetes is characterized by a detection frequency of 4.2% during the pregnancy of mothers, and in the population of mothers belonging to groups I -, II - and III - 3.9%, 4.1% and 4.7% are confirmed according to the prevalence. In the main group - it is less noted with an insignificant difference. In mothers of athletic adolescent girls, nephropathy during pregnancy is recorded with a total prevalence of 18.2%. It is characterized by the detection frequency of 20.7% in the main group - 13.3%, in the comparative group - 23.2%, and in the control group - up to 7.0%. Among the diseases of mothers during pregnancy, pyelonephritis is confirmed with a detection frequency of 29.6%, and it is denied in rates higher than 29.4%, 35.0% and 24.9% in the main and comparative and control groups.

It is noteworthy that pyelonephritis was performed in almost every third of the mothers of professional athletes

during pregnancy; but it can be concluded that this result is reliably ( $R < 0.05$ ) high in the comparative group and can serve as a "target object" for the "prevention area".

Table 3 shows the results obtained according to the frequency of detection of the main diseases of the parents of the examined teenage girls. TTK is determined in mothers and fathers with a prevalence of 90.9% and 2.2% respectively. Their detection rates are confirmed as 96.0% and 1.7% in the main group, 80.3% and 3.4% in the comparative group, and 98.0% and 1.8% in the control group. The state of transmission of arterial hypertension is noted in mothers and fathers - 1.1% and 3.4%. In particular, in the participants of the main comparative and control groups - 1.3% and 4.7%, 0.6% and 1.7% and 1.3% and 3.0% respectively.

Diabetes mellitus, mainly type 2, in the general maternal and paternal population - from 0.3% and 1.5%, in the main group - from 0.6% and 1.3%, in the comparative group - from 0.4% and 2. It is observed with detection frequencies of 0.0% and 1.0% in the control group. The frequency of acute and chronic pyelonephritis in the total population of mothers and fathers is 4.5% and 2.6%, and in the main and comparative and control groups - 1.5% and 2.4%, 7.1% and 3.0%, 1.5% and 2.7% are confirmed by the distribution frequencies. In addition, it is clear from table 3 that the incidence of various other diseases - in the general population - from 0.8% and 0.4% - in mothers and fathers, and in the main group - from 0.7% and 0.3%, comparatively in the group - from 1.1% and 0.7%, and in the control group - from 0.7% and 0.3%. TTK at high frequencies and 30 or 20 times more than it at low propagation frequency; with a significant difference ( $R < 0.0001$ ) AG, QD2 and pyelonephritis are confirmed in mothers and fathers, at high rates.

## 5. Summary

Appropriate demographic and anamnestic indicators of students and girls engaged in various sports depend on such characteristics of parents (age, head circumference, chest

circumference, body length, body weight) and 5 main diseases of mothers during pregnancy (iron deficiency anemia, arterial hypertension, gestational diabetes, nephropathy, pyelonephritis) are determined at "low", "medium" and "high" expression levels in direct connection. The mechanisms of epigenetic effects on the rate of sexual maturation and somatic growth in schoolgirls and teenagers engaged in sports have been fully revealed and solved, as a result of which the possibility of this special population - "healthy of the healthy" has been increased to more than 90%.

## REFERENCES

- [1] Prusik Krzysztof, Prusik Katarzyna, Lermakov S.S. et al. Indexes of physical development, physical preparedness and functional states of polish students // *Pedagogics, Psychology, Medical -Biological Problems of Physical Training and Sports*. - 2012. - № 12. - p. 112-113.
- [2] Prontenko K., Gribov G., Alosyna A. et al. The physical development and functional state as the important components of the student's health // *Widomocsd Lekarslde*. - 2019. - TLXXII. - №12. Ez.h. -S. 2349-2351.
- [3] Munoz C., Rios E., Olivos J., Brunner O. et al. Iron, copper and immuno – competence // *Br J Nutr* 98 (suppl 1): S 25- S27, 2007 [Pub Med].
- [4] Jeffrey Gehris, Jeff Kress Ricky swalm student's views on physical development and physical self-concept in adventure physical education // *Journal of Teaching in Physical Education*. -2010. -29(2). p. 147-164.
- [5] Gvelek Z. Dalgic N., Tanek C. et al. Congenital cystic adenomatoid malformation diagnosed during adolescence // *Med. Bull sisl Etfal Hosp*. - 2017; 51: 247-248.
- [6] Crivelli D., Fronda G., Balconi M. Neurocognitive enhancement effects of combined minifullness – neurofeedback training in sport // *Neuroscience*. - 2019/ - I . 412/ - C. 84-85.
- [7] Shitova E.M., Gerasevich A.N., Shitov L.A., Bokovets V.S. et al. Sports characteristics of individual indicators of the morphofunctional state of the body of modern students (part 1) // "Physical education of students". - 2013. - No. 5. - P. 26-29.
- [8] Parastayev S.A., Anisimov E.A., Zholinsky A.V., Badtieva V.A. et al. Overtraining syndrome: modern approaches to diagnostics (literature review) // *Exercise therapy and sports medicine*. - 2020. No. 1 (155). - P. 4-11.
- [9] Panyukov M.V., Levkov V.Yu., Andronova L.B., Plotnikov V.P. Morphofunctional indicators in assessing the level of physical development of 6th-year students of the Pirogov Russian National Research Medical University for the spring semester of 2019 // *Therapeutic physical education and sports medicine*. - 2020. No. 3 (157). - P. 37-42.
- [10] Poddubny I.V., Trunov V.O., Tolstov K.N., Aksenova N.V. et al. Thoracoscopic treatment of bullous lung disease in an adolescent athlete // *Therapeutic physical education and sports medicine*. - 2020. No. 5 (157). - P. 25.
- [11] Lenz N.A. Preparation and competitive activity of highly qualified athletes in various natural and geographical conditions // *Moscow*. - 2004. - P. 5-7.
- [12] Makunina O. A. Functional state of the nervous system of student-athletes depending on the organization of the daily routine // *Human health and the theory and methodology of physical education and sports*. - 2017; (S): 113-128.
- [13] Samoilov A.S., Velichko M.N., Terskov A.Yu. et al. Analysis of physical, genetic and psychological methods for preventing injuries to the musculoskeletal system in highly qualified athletes // *Therapeutic physical education and sports medicine*. - 2019. No. 3 (153). - P. 31-40.
- [14] Ter-Akonov G.N., Koryagina Yu.V. Occupational diseases of athletes: medical and legal aspects // *Therapeutic physical education and sports medicine*. - 2015. No. 4 (148). - P. 4.
- [15] Kuzelin V.A., Egorkina S.B., Bryndin V.V., Soloviev A.L. Characteristics of the relationship between ergospirometry parameters and electrophoretic cell motility in athletes of game sports using American football as an example // *Therapeutic physical education and sports medicine*. - 2020. - No. 3 (117). P. 43-48.
- [16] Bazanovich S. A., Zholinsky A. V., Kruglova I. V., Oganisyan M. G. et al. Evaluation of distinctive features of physical development of high-level athletes in Olympic sports // *Therapeutic physical education and sports medicine*. - 2019- No. 2 (152). - P. 35.
- [17] Kobaleva A.V. Methodical recommendations for the practical use of the methodology for regulating pre-start conditions of highly qualified athletes using biological feedback. GTsOLIFK. - Moscow. - 2018. -P. 25-27.
- [18] Levkov V.Yu. Dynamics of physical condition and health of 1st year students of the Medical University in the period from 2006 to 2010 // *Therapeutic physical education and sports medicine*. - 2012. - No. 11 (107). - P. 30-31.
- [19] Lacasse V. Goldstein R., Lasserson T.J., Martin S. Pulmonary rehabilitation for chronic obstructive pulmonary disease // *Cochrane Database Systematic Reviews*. - 2006; C.4.
- [20] Terrados N., Calleja – Gonzales J., Juldc T., Ostojic S.M. Physiological and medical strategies in post – competition recovery – practical implications based on scientific evidence // *Ser J Sports Sci*. - 2009. - № 3. - p. 30 – 35.