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About authors:

Zhetishev Rashid Abdulovich, MD, PhD, Professor, Head of the Department of children's diseases, obstetrics and gynecology; tel.: +7662730940; e-mail: rashid.zhetishev@yandex.ru; https://orcid.org/0000-0002-7204-5799

Arkhestova Diana Ruslanovna, PhD, Associate Professor of the Department of children's diseases, obstetrics and gynecology; tel.: +79604300070; e-mail: diana_z.a@mail.ru; https://orcid.org/0000-0002-5490-4166

Beraji Binod, pediatrician, postgraduate student of the Department of children's diseases, obstetrics and gynecology; tel.: +7662730940; e-mail: rashid.zhetishev@yandex.ru; https://orcid.org/ 0000-0003-2981-6882

Zhetisheva Irina Salikhovna, PhD, Associate Professor of the Department of hospital therapy; tel.: +79280809239

Klimov Leonid Yakovlevich, MD, PhD, Associate Professor, Head of the Department of faculty pediatrics; tel.: +78652352339; e-mail: klimov_leo@mail.ru; https://orcid.org/0000-0001-7248-1614

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CHRONIC PAIN SYNDROME IN ADOLESCENTS

Ivanova T. I., Pisklakov A. V., Lubenitskaya A. N., Pavlenko N. I., Sitko L. A.

Omsk State Medical University, Russian Federation

ХРОНИЧЕСКИЙ БОЛЕВОЙ СИНДРОМ В ПОДРОСТКОВОЙ ПОПУЛЯЦИИ

Т. И. Иванова, А. В. Писклаков, А. Н. Лубеницкая, Н. И. Павленко, Л. А. Ситко

Омский государственный медицинский университет, Российская Федерация

Chronic pain is one of the crucial problems nowadays. This work aimed to study the prevalence and features of chronic pain syndrome in adolescents. An anonymous questionnaire survey was conducted among 5910 adolescents aged 14–18 years using the original questionnaire and the Hospital anxiety and depression scale (HADS) aimed at identifying chronic pain symptoms. The variables obtained are to be subjected to statistical analysis.

A significant prevalence of chronic pain among adolescents (14.6 % of the study group) has been revealed. The female gender is undoubtedly a personal factor increasing the risk of CP development (the ratio of girls who reported the presence of CP had been 75.4 %). The prevalence rate of pain multiple localization (in 862 teens with chronic pain) and the presence of additional concomitant symptoms worsened overall health has been detected. The results obtained in the study have demonstrated an urgent need for multidisciplinary research to determine the mechanisms of the onset and consolidation of pain syndromes to improve diagnosis and treatment to interrupt these mechanisms.

Keywords: chronic pain, anxiety, depression, affective disorders, adolescents

Хроническая боль является одной из ведущих проблем в наши дни. В работе изучалась распространенность и особенность синдрома хронической боли у подростков. Было обследовано 5910 человек в возрасте 14–18 лет с помощью оригинального опросника, направленного на выявление симптомов хронической боли, и Госпитальной шкалы тревоги и депрессии (Hospital anxiety and depression scale, HADS). Полученные переменные были подвергнуты статистическому анализу.

Выявлена значительная распространенность хронической боли среди подростков (14,6 % исследованной группы). Женский пол, несомненно, является персональным фактором, повышающим риск формирования хронической боли (доля девушек среди испытуемых, сообщивших о наличии хронической боли, составляет 75,4 %). Отмечена широкая распространенность множественных локализаций ощущений (47,3 % лиц с хронической болью), а также

наличие дополнительных сопутствующих симптомов, усугубляющих общее самочувствие. Результаты, полученные в настоящем исследовании, демонстрируют острую необходимость в мультидисциплинарных исследованиях, позволяющих определить механизмы возникновения и закрепления болевых синдромов, для совершенствования программ диагностики и терапии, которые смогут эти механизмы прервать.

Ключевые слова: хроническая боль, тревога, депрессия, аффективные расстройства, подростки

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CP – chronic pain

HADS – Hospital anxiety and depression scale

Chronic pain syndrome (CP) is a topical interdisciplinary problem having a high prevalence. A series of studies have shown the prevalence of CP is common in the general population, with a prevalence ranging from 10 % to 80 % [1, 2]. Among children and adolescents, a reported prevalence of 20 % to 40 %, where 5 % is highly severe pain leading to disability [3]. Over the past decade, a significant increase in the number of admissions and readmissions associated with CP has been recorded [4]. The most common kinds of pain are headaches and visceral and musculoskeletal pains observed frequently among female adolescents, with their peak at the age of 14 years [5]. Furthermore, most (70–93 %) of girls reported experiencing discomfort associated with menstrual periods [6].

The presence of a persistent pain syndrome, and the inability, in many cases, to attribute its occurrence to any specific cause significantly impairs physical and psychosocial functioning and reduces the quality of life [7]. Frequent comorbid symptoms are sleeping disturbance, fatigue, and cognitive impairment [8–10]. The condition of patients with CP in 80 % of cases meets the criteria for an anxiety disorder [11], while the severity of anxiety depends on the quality of pain sensations [12]. Psychological stress is both a potential factor and a possible result of living with pain [12–15]. This fact is a matter of special attention since young people with persistent pain and concomitant depression are subject to a higher risk of thoughts of suicide and suicide attempts [16]. A retrospective study conducted in the United States showed that 8.8 % of those who died from suicide had signs of CP in history, and since 2003 the number increased from 7.4 % to 10.2 % in 2014 [17]. The prevalence of CP syndrome among children and adolescents has been increasing, and longitudinal studies have demonstrated that up to 64 % of young people will continue to experience persistent pain in adulthood [18]. In such patients, pain is likely to be widespread and neuropathic and accompanied by changes in mental status and a decrease in functional status [5].

The objective was to study the prevalence of CP syndrome in adolescents in the city of Omsk and its association with the symptoms of anxiety and depression.

Material and Methods. According to the Omsk Statistics Center, as of January 1st, 2021, in Omsk Region, the number of young people aged 10–19 years was 207 362. In November 2020, 5910 adolescents aged 14–18 (2.85 % of this population group) participated in the continuous ad-hoc survey. The mean age of participants was 16.2 years (SD=1.8), predominantly 15, 16 and 17 years old, and most of the respondents were teen girls (Table 1).

Each participant was proposed to complete an original questionnaire via Google Forms to identify a presence of pain that lasted at least six months (including the localization of pain), where the additional symptoms were registered and the levels of anxiety and depression were assessed by the HADS (Hospital anxiety and depression scale) [19].

Table 1

Socio-demographics characteristics of the study population

Gender		Age					
		14 y.o.	15 y.o.	16 y.o.	17 y.o.	18 y.o.	Total
Young females	N	173	983	857	906	862	3781
	% from persons of the same gender	4.6	26.0	22.7	24.0	22.8	100.0
	% from persons of the same age	56.5	56.6	60.3	65.6	80.9	64.0**
Young males	N	133	753	564	475	204	2129
	% from persons of the same gender	5.2	29.4	24.0	23.4	18.0	100.0
	% from persons of the same age	43.5	43.4	39.7	34.4	19.1	36.0
Total	N	306	1736	1421	1381	1066	5910
	%	5.2	29.4**	24.0**	23.4**	18.0	100.0

*p<0.01; **p<0.001.

All variables obtained were subjected to statistical analysis. The prevalence of CP was calculated for each age group. Socio-demographics and clinical characteristics were studied by calculating the weighting percentages. Quantitative indicators (the HADS scale scoring) were assessed using the calculation of the mean values and the standard errors of the mean values, including the percentage ratio of the qualitative parameters.

Statistical analysis was performed in MS Office Excel 2016 (Microsoft, USA) and Statistica 12.0 (StatSoft, USA). Data analysis was performed with the Student's t-test and Mann – Whitney method. The p value of 0.05 was chosen as the critical level of statistical significance of differences.

Results and Discussion. Eight hundred sixty-two teens (14.6 % of the respondents) reported that pain lasted over six months; 665 of them were teen girls (75.4 % with CP, and 17.6 % of all surveyed girls), 193 were teen

boys (24.6 % of them with CP, 9.3 % of all surveyed boys). The prevalence of CP among girls was significantly higher than among boys (p<0.001) and all adolescents participating in the survey.

The frequency of CP, according to the survey results, was equal among girls of all age groups, with a relative predominance at ages 14, 15, and 17 years. The persistent pain among young men was more often determined by the respondents aged 17 and 18 years.

Analyzing the prevalence of various localizations of CP in girls the multiple localization was detected in 336 cases (50.5 % in the group with CP and 5.7 % among all interviewed girls); chronic abdominal pain was determined in 183 respondents (27.5 % in the group with CP, and 3.1 % among all female respondents), p<0.001. At the same time, back pain prevailed in male adolescents, 76 respondents (38.6 % in the group with CP and 1.3 % among all boys participated in the survey), and multiple localization of pain was registered in 72 cases (36.6 % in the group with CP, and 1.2 % amid all male teens), p<0.001 (Table 2).

Table 2

Prevalence of various localization of CP in adolescents depending on gender

Anatomic region	Female adolescents			Male adolescents		
	Absolute number	% from girls with CP	% from total number of girls	Absolute number	% from young males with CP	% from total number of young males
Multiple localizations	336	50.5	5.7	72	36.6	1.2
Lower back	245	36.8	4.2	47	23.9	0.8
Upper back	328	49.3	5.6	76	38.6	1.3
Head	153	23.0	2.6	35	17.8	0.6
Lower limbs	160	24.1	2.7	53	26.9	0.9
Upper limbs	57	8.6	1.0	23	11.7	0.4
Perineum	22	3.3	0.4	7	3.6	0.1
Abdomen	183	27.5	3.1	33	16.8	0.6
Chest	91	13.7	1.5	18	9.1	0.3
Face	49	7.7	0.8	21	10.1	0.4

Analysis of the impact of CP on the psycho-emotional state of adolescents demonstrated an apparent positive correlation. A third of the respondents with CP reported a violation of relationships with others due to irritability and tearfulness. What was interesting was the girls reported such impact significantly more often than boys (p<0.001). Difficulty focusing accompanied pain in 38.5 % of cases. Among girls, the prevalence of this parameter was also higher (p<0.001).

According to the analysis of survey data using the HADS scale, 664 adolescents (11.2 % of the study group) indicated the symptoms of clinically apparent anxiety, 392 respondents (6.6 %) noted the signs of clinically apparent depression, and 164 people reported the combination of anxiety and depression symptoms (2.77 %) (Table 3).

Notably, the prevalence of such symptoms was much higher among the teen respondents who were suffering from CP: 31.4 % with the manifestations of anxiety, 15.5 % with depression, and 9.6 % of adolescents had the mixed symptoms, versus 7.8 %, 5.1 % and 1 .6 %, respectively among the adolescents without the manifestations of CP.

The mean anxiety score on the HADS scale among girls was significantly higher than among boys. Moreover, that pattern was observed both in the group of respondents who reported persistent pain (8.8±3.6 vs. 5.5±3.1) and in the group without any CP manifestations (7.0±3.6 vs. 7±2.4). Concurrently, female teens were found to have a significantly higher ratio of anxiety manifestations than boys (p<0.001).

Table 3

Presence of clinically apparent symptoms of anxiety and depression (according to HADS) in individuals with persistent pain syndrome and without it

Gender Age	Female adolescents				Male adolescents			
	with CP		without CP		with CP		without CP	
	N	%	N	%	N	%	N	%
Clinically apparent symptoms of anxiety								
Mean value	8.8±3.6		5.5±3.1		7.0±3.6		3.7±2.4	
Total	226	34.0**	330	10.6	45	22.9	63	3.3
Clinically apparent symptoms of depression								
Mean value	6.4±3.0		4.6±2.6		6.7±3.1		4.4±2.6	
Total	104	15.6	170	5.5	30	15.2	89	4.6
Combination of clinically apparent symptoms of anxiety and depression								
Total	65	9.8	70	2.2**	18	9.1	11	0.6

*p<0.01; **p<0.001.

Mean depression score according to the HADS scale and the prevalence among females and males were relatively the same. However, it was important to point out that in the group of adolescents suffering from CP, boys aged 17 and 18 were found to have the affective symptoms much more frequently than girls (18.4 % versus 9.6 %, and 20.0 % and 13.3 %, respectively (p<0.001)). Upon that, the detection of these symptoms was relatively the same among adolescents without any manifestations of CP.

Boys aged 17 and 18 years suffering from persistent pain much more frequently than girls demonstrated the symptoms of combined anxiety-depressive pathology (10.2 % versus 6.0 %, and 16.7 % versus 5.2 %, respectively (p<0.001)). In the group of respondents who did not report CP, the prevalence of these manifestations was higher among female teens.

Additional symptoms accompanying pain were assessed within the study. Five hundred fifty-six adolescents reported such symptoms (64.5 % of teens with CP). The most common symptoms (p<0.001) were: weakness, malaise (364 teens, 42.2 % of them with CP), sleep disorders (199 adolescents, 23.1 %), and poor or loss of appetite (152 respondents, 17.6 %). Almost a third of teens, 256, with CP (29.7 %) reported two or more additional symptoms. The same predicted patterns persisted compared in the female and male groups and in all age groups.

Analyzing the data obtained, it was found that anxiety and depression symptoms detection primarily correlated with the characteristics of the clinical course of CP syndrome.

The prevalence of clinically pronounced manifestations of depression in the group reported on two or more additional symptoms was higher than in the group reported on multiple localization of pain: 22.6 % versus 17.6 % among girls (p<0.01) and 20.5 % versus 13.9 % among boys (p<0.01). The parameters mentioned above significantly exceeded the parameters obtained in a healthy

group, 5.5 % in girls and 4.6 % in boys. No significant gender differences in the prevalence of depressive symptoms in all groups were detected.

The maximum anxiety score on the HADS scale was registered among girls suffering from CP, who reported two or more additional symptoms accompanying it (11.0±3.3) and multiple localization of pain (9.7±3.5). In the same groups, the highest score of anxiety manifestations was found (54.7 % and 41.7 % versus 40.9 % and 26.4 % among the boys in both groups ($p<0.001$)). Moreover, the incidence of anxiety symptoms in the group of girls with several symptoms (54.7 %) was higher than in the group with multiple localization of pain (41.7 %). It also significantly exceeded this parameter among healthy individuals of both genders (10.6 % girls and 3.3 % boys ($p<0.001$).

It should be determined that similar patterns were revealed while analyzing the prevalence of combined anxiety-depressive symptoms. This parameter is the group of girls with multiple additional somatic manifestations (16.5 %) was higher ($p<0.001$) than in the same group of boys (13.6 %) and among the respondents who reported pain in several parts of the body (11.9 % of girls and 8.3 % of boys). These parameters also significantly exceeded the data among healthy individuals, 0.2 % in girls and 0.6 % in boys.

Thus, the prevalence of CP among adolescents in the current study corresponds to the data presented in the up-to-date scientific literature (11–38 %) [18, 20], emphasizing the problem's relevance. The female gender is undoubtedly an individual factor increasing the risk of CP development, its more severe course and adding the concomitant affective pathology. The prevalence rate of pain in multiple localizations has been registered, and the presence of additional concomitant symptoms worsened the general condition, including sleep disorders, weakness, loss of appetite, dyspeptic disorders, etc. An increasing number of pain symptoms significantly elevates the probability of anxiety-depressive disorders diagnosis, which has been proved by the recent publications in the scientific journals and confirmed by the present study. Analysis of the survey results highlights the crucial psychological problems the young people suffering from persistent pain face. One-third of them report difficulty focusing and trouble in relationships with family and friends, followed by worsening social functioning and emotional state. It has been found that the prevalence of anxiety and depression among adolescents with CP has been considerably higher than in a healthy group. The study's cross-sectional design has limited the ability to conclude cause-effect relations; however, the comorbidity of anxiety-depressive pathology and CP has been undeniable. CP is a complex phenomenon stipulating additional stress in various areas of life and negatively affecting physical, emotional and social functioning [21]. Persistent pain syndromes among children and adolescents are a severe problem worldwide.

Conclusions. The sophistication of biopsychosocial factors' interrelations influencing pain perception, and combining in each individual, requires a complex approach to prevention, diagnosis, and treatment of pain. Understanding the individual differences and their interrelationships contributing to the development and persistence of pain syndromes is crucial for effective pain assessment and management, stipulated as a basis for personal pain management that meets the needs of each patient.

The results obtained in this study have demonstrated an urgent need for multidisciplinary research to determine the mechanisms of the onset and consolidation of pain syndromes and to improve diagnosis and treatment to interrupt these mechanisms.

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About authors:

Ivanova Tatyana Ilyinichna, MD, Associate Professor, Senior Researcher at the Scientific Laboratory of the Faculty of Dentistry; tel.: +79139799300; e-mail: tanysikiva@mail.ru; https://orcid.org/0000-0002-6872-9688

Pisklakov Andrey Valerievich, MD, PhD, Professor, Head of the Department of pediatric surgery, pediatric reproductive medicine; tel.: +79136311323; e-mail: pisklakovomsk@mail.ru; https://orcid.org/0000-0001-7594-7723

Lubenitskaya Aleksandra Nikolaevna, graduate student, Department of psychiatry, medical psychology; tel.: +79836228326; e-mail: lpmania25@gmail.com; https://orcid.org/0000-0003-4568-1527

Pavlenko Natalya Ivanovna, MD, Associate Professor of the Department of pediatric surgery and pediatric reproductive medicine; tel.: +79131512583; e-mail: nipavlenko@mail.ru; https://orcid.org/0000-0001-6242-6195

Sitko Leonid Aleksandrovich, MD, PhD, Professor of the Department of pediatric surgery, pediatric reproductive medicine; tel.: +79139652211; e-mail: sitkola128@mail.ru; https://orcid.org/0000-0001-7611-1848

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LONG-TERM FOLLOW-UP ANALYSIS AFTER AUTOLOGOUS HEMATOPOIETIC STEM CELL TRANSPLANTATION FOR CHILDREN WITH MULTIPLE SCLEROSIS

Kirgizov K. I. [1], Demyanov G. V. [2], Kisilevsky M. V. [1], Demyanov S. V. [2], Skorobogatova E. V. [2], Ershov A. V. [2, 3]

[1] N. N. Blokhin National Medical Research Centre of Oncology, Moscow, Russian Federation
[2] I. M. Sechenov First Moscow State Medical University (Sechenov University), Russian Federation
[3] V. A. Negovsky Research Institute of General Reanimatology, Federal Scientific and Clinical Center of Reanimatology and Rehabilitation, Moscow, Russian Federation

АНАЛИЗ ДОЛГОСРОЧНОГО НАБЛЮДЕНИЯ ПОСЛЕ АУТОЛОГИЧНОЙ ТРАНСПЛАНТАЦИИ ГЕМОПОЭТИЧЕСКИХ СТВОЛОВЫХ КЛЕТОК У ДЕТЕЙ, СТРАДАЮЩИХ РАССЕЯННЫМ СКЛЕРОЗОМ

К. И. Киргизов [1], Г. В. Демьянов [2], М. В. Киселевский [1], С. В. Демьянов [2], Е. В. Скоробогатова [2], А. В. Ершов [2, 3]

[1] Национальный медицинский исследовательский центр онкологии им. Н. Н. Блохина, Москва, Российская Федерация
[2] Первый Московский государственный медицинский университет им. И. М. Сеченова (Сеченовский Университет), Российская Федерация
[3] Научно-исследовательский институт общей реаниматологии им. В. А. Неговского «Федеральный научно-клинический центр реаниматологии и реабилитологии», Москва, Российская Федерация

Autologous hematopoietic stem cell transplantation (aHSCT) is effective and safe treatment for multiple sclerosis in children. The purpose of this study was to improve treatment outcomes by analyzing long-term follow-up after transplantation and evaluating late effects, as well as studying the immune profile in patients after aHSCT. Sixteen patients were included in the study. All patients included in the study were under 18 years of age. All patients had severe refractory multiple scle-