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Original article

Gender differences in functional somatic disorders of indigenous adolescents in Khakassia

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Abstract: *Rationale* — The goal of the study was to investigate gender characteristics of functional somatic disorders in adolescents of the indigenous population of Khakassia (using the case study of the Abakan city).
Material and methods — The object of the study was 215 (46.8%) boys and 244 (53.2%) girls of four secondary schools in Abakan. Their average age was 14.5±1.3 years. Data collection was conducted by means of an original screening questionnaire developed by Professor S.Yu. Tereshchenko.
Results — The incidence of recurrent pain in the total sample of the surveyed youths was 184 (40.1%) for cephalalgia, 225 (49.0%) for abdominal pain, and 269 (58.7%) for back pain. The prevalence and structure of functional somatic disorders in Khakas adolescents depended on their gender. Asthenic syndrome was more common among girls – 42 (17.2%) vs. 14 (6.5%) in boys. In girls, the percentage of frequent headaches was higher than in boys: 22 (9.0%) vs. 8 (3.7%), respectively. Similar trend was observed in case of rare headaches: 100 (41.0%) vs. 54 (25.1%). Also, girls, compared with boys, were characterized by a higher incidence of both frequent and rare abdominal pains: 38 (15.6%) vs. 9 (4.2%) and 106 (43.4%) vs. 72 (33.5%), correspondingly.
Conclusion — The case study of surveyed ethnic sample of Abakan school students revealed a high prevalence of recurrent pain syndromes in the indigenous youths of Khakassia. We have also established that incidence, structure and severity of recurrent pain, as well as its negative impact on well-being and daily activities, were associated with gender.

Keywords: adolescents, recurrent pain, functional somatic disorders.

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Introduction

Functional somatic disorders (FSD) in children and adolescents constitute an imperative problem in pediatrics due to their high prevalence [1-3], negative impact on quality of life [1, 4, 5], and high probability of transformation into chronic forms of psychosomatic pathology [2, 4, 6]. Characteristic signs of FSD in children and youths are the presence of complaints of medically unexplained symptoms with significant functional and emotional disorders. FSD is manifested by physical (somatic) symptoms that are incommensurable with the data of objective physical examinations, results of functional and laboratory studies, and abundance of patient complaints disproportionate with their anamneses [7, 8, 9].

The structure of the FSD involves such disorders, as asthenic syndrome (AS), recurrent headaches (RHA), recurrent abdominal pain (RAP), and back pain (dorsalgia). According to foreign authors, the prevalence of FSD is different in adolescents of different ages [3, 5], gender [6, 10] and ethnicity [6, 11]. Adolescence is a period of rapid and uneven growth and development of the body, the most difficult and complex of ages, representing a specific critical period of personality formation. A large number of foreign studies have convincingly shown the prevalence of these disorders in the adolescent population [3, 5, 12]. The results of studies by Basch M. (2015), Vulić-Prtorić A. (2016) and Agarwal V. (2015) demonstrated the dependence of the FSD prevalence on gender: in all age groups, girls complained of pain of various localization more often than did boys [4, 5, 10].

FSD are currently an urgent problem in pediatrics, poorly covered in domestic pediatric practice. Research is carried out in different countries [3, 5, 10, 12], climatic and geographical regions [13, 14, 15, 16], socioeconomic conditions and places of residence (urban/rural), as well as among different age-sex groups and different contingents (hospital patients, organized children's groups) [17, 18, 19, 20].

There is a wide range of the incidence values related to recurrent pain syndromes in the pediatric adolescent population, according to the data of both foreign [3, 5, 10, 12] and domestic [21, 22] researchers. The features of the prevalence and structure of these types of pathology in various ethnic groups of the pediatric population were not sufficiently studied to date. The gender-based differences in the prevalence and structure of recurrent pain in adolescents collected by different authors are ambiguous [15, 16]. Hence, it is especially important to study these aspects in such multinational country as Russia.

Data on the gender-based characteristics of FSD in adolescents of various ethnic groups in the Russian Federation are extremely limited: the published results are mainly considered from the standpoint of age-specific and regional peculiarities [23, 24, 25]. There are very few studies dedicated to examining the FSD frequency of occurrence, features of clinical symptoms, and outcomes of these disorders versus gender and ethnicity [21, 25, 26].

According to foreign researchers, medically inexplicable symptoms occurring in childhood, without their timely correction, can become persistent and lead to chronicity and disability [27,28]. Therefore, the most important field of research is contemporary epidemiology of FSD in various ethnic groups with mandatory consideration of gender characteristics. The search for gender differences should also include differentiation by ethnicity.

Such approach, in our opinion, would open up new perspectives with a deeper study of this issues and could contribute to organizing high-quality cost-effective medical care for children with various functional clusters of somatic symptoms, taking into account their gender and ethnicity.

Study objective: The goal of our study was to examine how FSD were associated with gender in adolescents of Khakassia (using the case study of Abakan city).

Material and Methods

The object of our study was random samples of 12-17 years-old adolescents of Khakas nationality – students of four secondary schools in the city of Abakan, the administrative center of the Republic of Khakassia. Four (of 26) randomly selected Abakan schools were typical secondary city schools. School students were represented by both indigenous (Khakas) and non-indigenous youths. The survey results of students in these schools can be extrapolated to the entire adolescent population of Abakan school students, thereby giving an idea about the incidence and structure of considered pathology types in this population, including their association with the gender. The study was conducted from January through May of 2019 and continued in March-April of 2020.

Inclusion criteria:

- Age of 12-17 years old;
- Khakas ethnic group, verified by the nationality of the teenager's mother;
- Residents of Abakan;
- Without chronic diseases in the decompensation stage (according to the anamnesis and information from the 026u form – pediatric medical record at an educational institution);
- Hereditary (genetic) diseases (according to the anamnesis and information from the 026u form);
- Serious congenital malformations of organs and systems (cardiovascular, digestive, central nervous system);
- Written informed consent to participate in the study and to personal data processing, signed by the adolescent and his/her parent.

Exclusion criteria:

- Under 12 years of age;
- Slavic ethnic group, verified by the nationality of the teenager's mother;
- Living outside the city of Abakan;
- Refusal to participate in the study;
- Refusal of parents of adolescents 14 years of age and younger, or of adolescents 15 years of age and older, to participate in the study at any stage of the study;
- Relocation of the family to another region of Russia or abroad.

Study limitations

In view of an unfavorable epidemiological situation in the country (a pandemic of a new coronavirus infection Covid-19) since the beginning of 2020, it became necessary to interrupt the study due to the transfer of school students to distance learning and the impossibility of face-to-face communication with students of the schools included in the study. After the abolition of distance learning, our study resumed with the obligatory observance of all sanitary anti-epidemiological requirements by both researchers and students.

Inclusion and exclusion criteria were set on the basis of clinical and anamnestic data and data from 026u form (medical record for an educational institution).

A prerequisite for the study was obtaining written informed consent from parents of youths under 15 years of age and adolescents 15 years of age and older.

Forty percent of adolescents aged 12-17 years (boys and girls) studying at each of four selected schools received an invitation to take part in the survey. All parents of school students under 15 years old and adolescents 15 years of age and older were previously given written informed consent forms. Ninety-five percent of those contacted by us responded. The reasons for exclusion from the study involved refusal of parents or adolescents per se to participate in the study, as well as compliance with other exclusion criteria. Overall, 497 adolescents took part in our study. For statistical analysis, 459 correctly filled screening questionnaires with answers to all questions were selected.

Of those included in the study, there were 215 (46.8%) boys and 244 (53.2%) girls, the average age of examined youths was 14.5±1.3 years. Frequency of occurrence and structure of recurrent pain syndromes (RHA, RAP, back pain) and AS was compared between two groups: Group 1 included boys (n=215) and Group 2 included girls (n=244).

The collection of information was carried out via the original screening questionnaire developed by Professor S.Yu. Tereshchenko. The survey was conducted at school classroom in the first half of the day (at the second or third lesson) in the presence of a teacher and a researcher. The surveyed youths had an opportunity to inquire the researcher (in case of insufficient understanding of the wording of the questions included in the questionnaire).

The type of headaches was identified sensu the criteria for the frequency of cephalalgia episodes set out in the International Classification of Headache Disorders (ICHD-3b, 2013) [29]. The criteria for the type of RHA were the presence and frequency of cephalalgia over the past three months: with a headache frequency of not more than once a month (or none at all), it was

concluded that there was no RHA; with a headache frequency of 1-15 days per month, RHA was considered rare; with a headache frequency of over 15 days per month, RHA was regarded as frequent. The screening questionnaire also included questions about the presence and frequency of abdominal pain and back pain. Pain of these localizations was considered frequent if it was noted more than 2 times a month, and rare if occurring 1-2 times a month; the absence of pain was stated if there was no pain at all or less than once a month.

In the analysis of chronic and recurrent pain syndrome, it is important to assess the severity of pain over a certain period of time, as well as the degree of pain impact on daily activities. In the questionnaire, two sections were dedicated to these characteristics of pain: pain intensity (6 levels: complete absence, very mild, mild, moderate, severe, very severe) and pain impact on daily activities (7 levels). The questionnaire included the question, "How much did your headache bother you over the past three months?", which evaluated the impact of pain on the adolescent's normal daily activities on a 7-point scale, where 1 pt. corresponded to the answer *'Virtually no impact'*, and 7 pts. corresponded to the answer *'Very large impact'*. The criteria for assessing the impact of pain localized in the abdomen and various parts of the spine (cervical, thoracic, lumbar) were similar.

Determination of the pain intensity (in points) was carried out on a 6-point scale (Wong-Baker scale), comprising images of six faces with certain facial expressions, which allowed assessing how strong was the pain that bothered the teenager (headache, abdominal pain, neck pain, chest pain, or lumbar spine pain) over the last three months. The scale provided six response options measured in points: no pain (the image of the face was assigned 0 pts.), mild pain (1 pt.), moderate pain (2 pts.), moderate pain (3 pts.), severe pain (4 pts.), and excruciating pain (5 pts.).

One section of the screening questionnaire contained questions evaluating the presence or absence of AS. For each of the questions in this section, certain answer options and their value in points were provided. For example, to several questions (*Over the past three months, did you notice an unusual weakness or lack of strength? Were you getting tired faster than before? Did you notice distraction of attention, especially in the classroom; poor memory, forgetfulness, irritability, or anxiety?*), the following response options were provided: *'No'* (0 pts.), *'A little'* (1 pt.) and *'A lot'* (2 pts.). To some questions of the questionnaire (*After a sufficient rest over the weekends, does this weakness go away? Does fatigue go away? Do irritability and anxiety go away?*), the following response options were offered: *'Yes'* (0 pts.) and *'No'* (1 pt.). To other questions of the questionnaire (*Did it become more difficult for you to initiate some activity, such as homework, cleaning, etc.? Did it become more difficult for you to proceed with the activity you have already started, such as homework, cleaning, etc.?*), there were the following response options: *'No'* (0 pts.), *'Sometimes'* (1 pt.), *'Always'* (2 pts.). Based on the results of filling in this section, the sum of the points scored by the tested teenager and their assessment sensu the criteria, developed by the author of the questionnaire, were calculated: a score of ≥ 10 pts. implied the presence of AS, whereas a total score of < 10 pts. signified the absence of AS.

The sample size was not predetermined. It depended on the number of adolescents meeting the inclusion criteria for the study.

Conventionally accepted assessment of the statistical significance of differences between the compared cohorts of adolescents was employed. Expert analysis of obtained data was carried out via nonparametric statistics methods using Statistica 12 software (StatSoft Inc., USA). Quantitative characteristics are represented by median (Me) and interquartile range (Q_{25}–Q_{75}). The statistical significance of differences of means in quantitative traits was evaluated by the Mann–Whitney U test. The form of representing binary features was the share (%) and the boundaries of the confidence interval for frequencies (CI, %). The confidence interval for the percentage was determined via the Wilson CI method and calculated using an online calculator. The significance of differences in binary features was assessed using Pearson's $\chi 2$ test. The descriptive statistics also included p-value: the statistical significance of differences. Differences between groups were considered statistically significant at $p \leq 0.05$.

Results

Our analysis of the frequency of occurrence of various cephalalgia types showed that of 459 examined general samples, there were no episodes of RHA in anamnesis of 275 (59.9%) study subjects. The total number of adolescents with recurrent cephalgic episodes was 184 (40.1%), of which 154 (83.7%) had rare cephalalgia and 30 (16.3%) had frequent cephalalgia. *Table* 1 illustrates how the incidence and the structure of recurrent cephalalgia in the examined youths was distributed by gender.

Table 1. Gender-specific prevalence and structure of recurrent headache in indigenous adolescents of Abakan

Groups of examined patients	*Type of recurrent headache*					
	No headache		Rare headache		Frequent headache	
	Number (%)	CI, %	Number (%)	CI, %	Number (%)	CI, %
Group 1 – boys (n=215)	153 (71.2)	64.8-76.8	54 (25.1)	19.8-31.3	8 (3.7)	1.9-7.2
Group 2 – girls (n=244)	122 (50.0)	43.8-56.2	100 (41.0)	35.0-47.2	22 (9.0)	6.0-13.3
Total (n=459)	275 (59.9)	55.4-64.3	154 (33.5)	29.4-38.0	30 (6.5)	4.6-9.2
Statistical significance of differences sensu Pearson's χ^2 (p)	$p_{1-2}<0.0001$		$p_{1-2}=0.0003$		$p_{1-2}=0.0220$	

Table 2. Gender-specific prevalence and structure of recurrent abdominal pain in indigenous adolescents of Abakan

Groups of examined patients	*Type of recurrent abdominal pain*					
	No abdominal pain		Rare abdominal pain		Frequent abdominal pain	
	Number (%)	CI, %	Number (%)	CI, %	Number (%)	CI, %
Group 1 – boys (n=215)	134 (62.3)	55.7-68.5	72 (33.5)	27.5-40.0	9 (4.2)	2.2-7.8
Group 2 – girls (n=244)	100 (41.0)	35.0-47.2	106 (43.4)	37.4-49.7	38 (15.6)	11.6-20.7
Total (n=459)	234 (51.0)	46.4-55.5	178 (38.8)	34.4-43.3	47 (10.2)	7.8-13.4
Statistical significance of differences sensu Pearson's χ^2 (p)	$p_{1-2}<0.0001$		$p_{1-2}=0.0290$		$p_{1-2}=0.0001$	

Table 3. Gender-specific prevalence and structure of recurrent back pain in indigenous adolescents of Abakan

Groups of examined patients	*Type of recurrent back pain*					
	No back pain		Rare back pain		Frequent back pain	
	Number (%)	CI, %	Number (%)	CI, %	Number (%)	CI, %
Group 1 – boys (n=204)	94 (46.1)	39.4-52.9	83 (40.7)	34.2-47.5	27 (13.2)	9.3-18.6
Group 2 – girls (n=237)	88 (37.1)	31.2-43.4	103 (43.5)	37.3-49.8	46 (19.4)	14.9-24.9
Total (n=441)	182 (41.3)	36.8-45.9	186 (42.2)	37.7-46.8	73 (16.5)	13.4-20.3
Statistical significance of differences sensu Pearson's χ^2 (p)	p_{1-2}=0.0571		p_{1-2}=0.5565		p_{1-2}=0.0820	

Table 4. Gender-specific pain intensity of various localization in indigenous adolescents of Khakassia (Me, Q_{25}-Q_{75})

Parameters	*Groups of examined patients*		*Statistical significance of differences sensu Mann-Whitney U test (p)*
	Group 1 Boys	Group 2 Girls	
Headache intensity (points)	1.0 0.0-2.0	2.0 0.0-3.0	< 0.0001
Abdominal pain intensity (points)	1.0 0.0-2.0	2.0 0.0-3.0	0.0023
Back pain intensity (points)	1.0 0.0-2.0	1.0 0.0-2.0	0.0287

As seen in *Table* 1, there were significantly more subjects without a history of RHA among boys, compared with girls. Girls differed from boys in a significantly higher incidence of both rare and frequent RHA. The total incidence of RHA (rare and frequent episodes) was 62 (28.8%) among boys (Group 1) and 122 (50.0%) among girls (Group 2), p_{1-2}<0.0001.

RAP in children is defined as at least three episodes of pain occurring over a period of at least three months that affect the child's ability to perform usual normal activities. RAP is most often considered functional (nonorganic) abdominal pain, while an organic cause of abdominal pain is detected much less frequently [30].

Table 2 gives an idea of the gender-based features of the incidence and structure of RAP in adolescents of the surveyed groups.

Half of all surveyed youths had no RAP, one-third of those experienced rare episodes of RAP. Frequent episodes of abdominal pain in anamnesis were noted in a significantly smaller number of surveyed youths. The total share of teenagers with RAP (both rare and frequent episodes) in the total sample was 225 (49.0%) (*Table* 2).

The number of adolescents without RAP was higher among boys than among girls, and the proportion of youths with both rare and frequent episodes of RAP was significantly higher in the group of girls. The total number of examined subjects with RAP was 81 (37.7%) in the Group 1 (boys) and 144 (59.0%) in the Group 2 (girls), p_{1-2}<0.0001.

Of all adolescents included in the study, 441 correctly answered the questions of the questionnaire about the presence and intensity of back pain, of which 204 were boys and 237 were girls. *Table* 3 presents the results of a comparative analysis of the recurrent back pain incidence and structure of versus gender.

According to the anamnesis, back pain was absent in 4 out of 10 adolescents who correctly answered the questionnaire questions regarding the presence and severity of spinal pain, and their number was comparable to the proportion of people who had a history of rare episodes of back pain. Significantly fewer adolescents had frequent episodes of back pain (*Table* 3). Overall, the number of adolescents with recurrent back pain (both rare and frequent) was 259 (58.7%).

Adolescents without spinal pain in a greater percentage of cases were found among boys than among girls. The proportion of subjects with rare and frequent back pain was higher in girls compared with boys, while, as follows from the data presented in *Table* 3, the differences in compared indicators did not reach the level of statistical significance. Among boys, the number of youths with a total number of pain episodes (rare and frequent) was 110 (53.9%). In the group of girls, the corresponding value was 149 (62.9%), p_{1-2}=0.0571.

The results of our comparative analysis of the intensity of headache in adolescents of different sexes allowed confirming a greater severity of pain in girls than in boys. Similar trend was established for abdominal pain, too: completing the questionnaire, girls reported greater abdominal pain intensity, which was also supported by statistically significantly higher quantitative values of the Wong-Baker pain mimic scale in girls, presented in *Table* 4. A comparative analysis of the scale scores demonstrated that girls were characterized by the greatest pain intensity localized in the back region (*Table* 4).

A frequent manifestation of FSD in children and youths is AS. According to our study, it was detected in 56 (12.2%) of 458 adolescents (total sample) who fully answered the questions of the questionnaire regarding the AS verification. AS was characteristic of girls significantly more often than of boys: 42 of 244 (17.2%) (CI=13.0-22.4%) vs. 14 of 214 (6.5%) (CI=3.9-10.7%), correspondingly; p_{1-2}=0.0005).

Discussion

As a result of our study, on the example of a random sample of school students in Abakan (n=459), gender-based differences in the frequency of occurrence and structure of FSD in adolescents of the indigenous population of Khakassia were revealed. The overall prevalence of recurrent pain syndromes among the surveyed Khakas school students was quite high, ranging from 40.1% to 58.7% for different types of disorders. Gender differences were illustrated by the higher frequency of occurrence of these types of disorders among girls, compared with boys. Girls were characterized by a greater pain intensity and a more pronounced effect of pain on well-being and normal daily activities in all types of recurrent pain syndromes.

According to the published sources, FSD in the pediatric population are of high clinical significance due to their substantial prevalence and potential persistence into adulthood. Studies by D. Hinton and S. Kirk, as well as by a number of other authors [31,32,33] have shown that FSD were associated with significant physical and psychological disorders and could have had a long-term negative impact on the functional state and well-being of children and young people [34]. Therefore, one of the important tasks of contemporary pediatrics is the timely diagnosis, prevention and justified correction of these types of disorders in

order to prevent their transformation into chronic forms of psychosomatic pathology.

Of particular importance is examination of the incidence and characteristics of clinical FSD manifestations in adolescents of different sexes and ethnic groups of the pediatric population.

In ordinary medical practice, adolescents often complain of recurring episodes of headaches, abdominal pain, back pain, as well as dizziness, presyncope, fainting, and asthenic syndrome, which are largely associated with psychoemotional factors. Obviously, in such case, we are talking about functional pain syndromes that prevail among the pediatric population [35, 36, 37].

In the literature, there are reports of different prevalence of headache in children vs. adolescents [38, 39]. It should be emphasized that the features of RHA are not only in the significant variability of its prevalence, but also in the specifics of structure and clinical manifestations of this pathology in adolescents of different age, sex, and ethnic groups. A number of researchers discovered that primary headaches were most common in the pediatric population and, above all, among youths, and the prevalence of primary headache increased with age in adolescents, compared with children [13, 14]. For instance, Al-Hashel J.Y. et al. (2019), when examining children aged 6-17 years in Kuwait, established that headache was most common in the age group of 12-17 years, compared with 6-11 years (25.8% vs. 10.4%). However, gender differences in the prevalence of primary headache in the age group of 6-11 years old was not detected. At the same time, in the age group of 12-17 years old, this symptom prevailed in girls, compared with boys (38.1% vs. 15.8%, p=0.001) [13]. In our study, the total number of adolescents with RHA was 40.1%, which exceeded the magnitude of this indicator in Kuwaiti adolescents (25.8%). We have also established a higher incidence of RHA in girls, compared with boys (50.0% vs. 28.8%), although the share of adolescents with recurrent cephalalgia (both boys and girls) in our study was higher than in the study by Al-Hashel J.Y. et al. (2019). It should be pointed out that a small number of publications were devoted to examining the structure of cephalalgia in adolescents. The advantage of researchers from Kuwait is that they verified the clinical variants of primary headache and found that the prevalence of migraine in investigated cohort was 10.9%, prevalence of tension headache was 6.2%, and occurrence of chronic headache was only 0.9%.

Using diagnostic approaches similar to ours, T. Lozan (2015-2016) conducted an epidemiological survey of 3,389 adolescents in the Republic of Moldova 10-19 years of age, the purpose of which was to assess the overall prevalence of primary headaches and their clinical variants (migraine, tension headache) [15]. Overall prevalence of primary headaches in Moldovan adolescents was 38.75%, which is almost equivalent to the overall prevalence of recurrent cephalalgia in the Khakas sample of adolescents (40.1%), established by us. Comparing the results obtained by T. Lozan with our data, we can state the presence of unambiguously comparable gender-based differences. E.g., the incidence of headaches was nearly the same in Moldovan (49.7%) and Khakas (50.0%) girls, in Moldovan (27.8%) and Khakas boys (28.8%), with a continuing general trend towards greater prevalence of cephalalgia in girls, compared with boys [15].

The results of the study by Sudhir M. (2015) demonstrated that among 7-14 years old Indian youths, girls were significantly more likely (30.2%) to suffer from headaches than boys (20.4%), and the prevalence of headaches gradually increased with age in both sexes [25]. The average value in the age group of children and adolescents was 25.4%, which was significantly lower than in our study (40.1%).

Foiadelli T. et al. (2018) revealed the presence of headache in 65.9% of Italian adolescents aged 11-16 years, which exceeded the overall prevalence of cephalalgia established by us in the adolescent population of Khakas youths (40.1%).

The results of the overall frequency of occurrence of RSL obtained by us were lower than those of researchers from some other countries (e.g., Britain – 66% [17], Italy – 65.9% [18]), but higher than in Sweden (16.6%) [19] and Turkey (30.5%) [20].

Table 5. Comparative data on the incidence of functional somatic disorders among the child population in Russia (Republic of Khakassia) and various foreign countries

Country	*Types of functional somatic disorders*								*Sample size*	*Year of data collection*	*Age*	*Scale*	*Research project*	*Source*
	Recurrent headaches		Recurrent abdominal pain		Back pain (dorsalgia)		Asthenic syndrome							
Abakan, Russia (Republic of Khakassia)	40.1% (184/459)		49.0% (225/459)		58.7% (259/441)		12.2% (56/458)		459	2019	12-17	Original questionnaire	State project number 1201351112	This study
	M	F	M	F	M	F	M	F						
	28.8% 62/215	50.0% 122/244	37.7% 81/215	59.0% 144/244	53.9% 110/204	62.9% 149/237	6.5% 14/214	17.2% 42/244						
Croatia	M	F	M	F	M	F	M	F	1236: 679 – M 557 – F	2016	10-25	Psychosomatic Symptoms (PSS) scale	Not specified	Anita Vulić-Prtorić
	345 (61.9%)	525 (77.9%)	133 (23.9%)	299 (44.4%)	283 (50.8%)	425 (63.1%)	388 (69.5%)	562 (83.4%)						
Sweden	736 (16.6%)		544 (12.3%)						4573: 51% – M 49% – F	2014	15-16	Personal Social Performance (PSP) scale	Longitudinal ETF project	Bergh, D., Giota, J.
Washington, D.C., USA	272 (66.5%)		256 (62.6%)						409: (85.6% – African Americans)	2013	Primary school students	CBCL and YSR subscales of somatic complaints	MORE	Shayla L. Hart,
Turkey	30.5%		28.6%				29.8%		699: 350 – M 349 – F	2014	11-15	CSI-24		Semra KARACA
United Kingdom	66%		43%		40%		49%		1173	2009	11-16	CSI-24		Mar Vila

Data on the prevalence of FSD in the pediatric adolescent population of the Russian Federation are scarce [30]. A study by Akhmadeeva L.R. et al. (2015) carried out as part of the World Children and Adolescent Headache Project (WOCAH). The authors identified the most significant clinical and social predictors of headache in children and youths and developed a model for predicting the course of headache in children [21].

According to our data, both frequent and rare episodes of various types of recurrent pain were observed in girls in a greater proportion of cases. A number of other domestic studies provided similar data as well [22]. Comparative data on the overall incidence and gender characteristics of FSD among the child population of Russia (Republic of Khakassia) and a number of foreign countries are presented in *Table* 5.

Besides, some foreign and domestic publications indicated the presence of comorbid associations of recurrent cephalalgia with various pathological conditions and influencing factors. For example, it has been shown that Internet-addicted behavior in adolescents was associated with frequent recurrent pains (headache, abdominal pain, spinal pain) [24].

In children and adolescents, RAP is a fairly common problem. An important role is played by examination of the gender-based and ethnicity-based prevalence and clinical course of RAP in adolescents. The specifics of the impact of socioeconomic factors, environmental living conditions, lifestyle, and individual personality traits in teenagers of different ethnic groups undoubtedly affect the characteristics of clinical manifestations, incidence, and structure of various pathology types, including RAP.

The results of a number of studies have demonstrated the presence of correlations between different types of FSD. For instance, S.Yu. Tereshchenko et al. (2014) found a positive relationship of RAP with RHA (p=0.002), recurrent back pain (p=0.002), recurrent dizziness (p=0.002), and AS (p=0.002). The authors believe that the established associations imply joint pathogenetic mechanisms underlying the development of the listed conditions, in the triggering of which, according to many researchers, psychoemotional issues play the foremost role [25, 26, 37]. According to S.Yu. Tereshchenko et al. (2014), RAP in adolescents had comorbidity with a wide range of other FSD (RHA, back pain, dizziness, and AS) [26, 40].

In their publication, A.A. Schlarb et al. (2011) drew attention to the fact that up to 15.3% of visits to a pediatrician were by children and youths with RAP not associated with any organic lesion. The overall prevalence of abdominal pain in those examined (Tübingen, Germany) was 43.6%. When analyzing the gender-based characteristics of pain, it was established that girls had symptoms more often than boys [41]. The results of that study were comparable with our data: the overall prevalence of RAP in the Khakassia sample was 49.0%, with a higher incidence in girls (59.0%) vs. boys (37.7%). The proportion of Khakas youths with rare and frequent episodes of RAP was also significantly higher in the Group 2 (girls) than in Group 1 (boys).

In contrast to the results of our survey in the ethnic group of Khakas teenagers, a survey of 1,549 adolescents aged 11-16 years in Malaysia, conducted by C. Boey et al. (2001), did not reveal significant differences in the prevalence of RAP among children of different genders, ages, and ethnicities [42]. The overall prevalence of RAP according to these authors was 10.2%, which was significantly lower than in our study (49.0%).

The presence of gender-based prevalence of various FSD in 1,236 patients aged 10-25 years, examined in Croatia, was established by Anita Vulić-Prtorić (2016). The data obtained in the course of that study confirmed the general trend of a higher incidence of RAP in female subjects, including our results of a survey of Khakas adolescents [5].

Cerutti R. et al. (2017) demonstrated similar results, based on a survey of an Italian sample, where girls were twice as likely to complain of abdominal pain, compared with boys. The same study suggested the statistical significance of functional pain correlation with impaired psychological balance in teenagers and proposed that the latter was the main cause of the onset and recurrence of functional abdominal pain [3].

Back pain and muscle pain in the structure of chronic pain related to somatic disorders, according to various researchers, make up from 10% to 50%. E.g., scientists from Australia reported that low back pain was very common in adolescence (up to 46% by the age of 14 years), while the organic cause of pain was quite rare [43]. Later, the same researchers proved the connection between the appearance of back pain and emotional disorders, and in the course of their large-scale study, it was revealed that back pain was more common in girls than in boys [44]. The overall prevalence of back pain, according to these researchers (46.3%), was lower than in our sample of Khakas adolescents (58.7%); however, in our study, there were gender-based differences in the incidence of spinal pain in Khakas youths.

According to English researchers, Jones M.A. et al. (2004), the prevalence of recurrent low back pain in North West England adolescents aged 10-16 years was 13.1%. The mean prevalence of low back pain was 40.2%. Most cases of low back pain in the examined patients were acute episodes that did not lead to disabling consequences. In contrast, 13.1% of subjects experienced recurring low back pain that resulted in disability. In older adolescence, recurrent low back pain was observed in every fifth teenager [27]. Low back pain is a common complaint in childhood, although in most cases these are acute episodes that do not have serious health consequences. On the contrary, children experiencing recurrent low back pain, according to the authors, had serious consequences that could lead to disability [27]. Recently, an increasing number of studies have considered important aspects of a successful interdisciplinary approach to the treatment of this group of patients, but it is obvious that more long-term studies are needed to resolve this issue [28].

In our study, the proportion of Khakas adolescents with recurrent back pain (both rare and frequent) was 58.7%, and pain was more common in girls: 62.9% versus 53.9% in boys; but gender differences were not statistically significant.

One of the clinical variants of FSD in children and adolescents is AS. The results of a study on the prevalence and cluster of somatic symptoms in Croatian youths, Vulić-Prtorić A. (2016) reported that 76.9% of respondents had increased fatigue and weakness, regarded by the authors as clinical manifestations of AS [5].

British researchers, Mar Vila et al. (2009), using the Children's Somatization Inventory (CSI), examined 1,173 adolescents aged 11-16 years, establishing among them the frequency of AS occurrence equal to 49%, which significantly exceeded the value obtained by us in Khakas adolescents (12.2%).

According to domestic and foreign studies, the prevalence of FSD in the child population varies over a wide range, apparently,

due to differences in the choice of both study groups and diagnostic criteria for verifying such types of disorders in children. According to N.A. Schneider (2015), the heterogeneity of data, obtained by different researchers on the prevalence of psychosomatic disorders in the adolescent population, including different age, gender and ethnic groups, is associated with differences in the methodology of epidemiological studies [45]. The true prevalence of pain syndromes in the pediatric population may be even higher, as many adolescents with mild to moderate pain do not seek medical attention. At the same time, the importance of this problem and the need to address the issue of early diagnosis of such types of disorders, along with their timely and reasonable correction, should be emphasized.

The problem of FSD in pediatrics, including recurrent pains of various localization, requires serious attention, given their significant prevalence and possible negative consequences that long-term pain could lead to. The frequent presence of comorbid associations and the significant contribution of comorbidity to a more unfavorable course of FSD validates the need for population studies, along with the development and implementation of differentiated approaches to the management of these adolescent contingents. It is advisable to perform early diagnostics and reasonable correction of such types of disorders in the pediatric adolescent population [46,47,48]. Due to conflicting information about the causes and mechanisms of FSD development, there are still no clearly defined standards for the diagnosis and treatment of such patients. All this leads to the unreasonable appointment of a large number of laboratory and instrumental studies, while a significant part of them turns out to be uninformative. Hence, the need to develop methodologically unified and functionally complete system for providing medical care to children with such conditions, along with the development of standards and protocols for managing such patients in order to effectively and timely diagnose these disorders.

Conclusion

Hence, our study on examining youths of Khakas ethnicity for the frequency of occurrence and characteristics of recurrent pain syndromes that are part of FSD yielded the results, which constitute novel data, previously not presented in the literature, illustrating high prevalence of these types of pathology among the adolescent Khakas population. We investigated not only the prevalence of recurrent cephalgic episodes and AS, but also specified their structure in terms of gender characteristics. In girls, compared with boys, we established a higher recurrent pain prevalence of various localization, a greater intensity of pain sensations, and a more pronounced negative effect of pain on well-being and daily activities in girls, compared with boys.

Our results establish prerequisites for a deeper analysis of the prevalence and structure of FSD in the adolescent population taking into account gender and ethnicity, and for the development of preventive measures.

Conflict of Interest

None declared by the authors.

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Ethical approval

All procedures performed in human studies were in accordance with the ethical standards of the institutional and national research committee, as well as with 1964 Declaration of Helsinki and its later amendments, or comparable ethical standards. Written informed consent of patients was obtained from all study participants.

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