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ЕЖЕМЕСЯЧНЫЙ НАУЧНЫЙ ЖУРНАЛ

Медицинские новости Грузии

საქართველოს სამედიცინო სიახლენი

GEORGIAN MEDICAL NEWS

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GMN: Georgian Medical News is peer-reviewed, published monthly journal committed to promoting the science and art of medicine and the betterment of public health, published by the GMN Editorial Board since 1994. GMN carries original scientific articles on medicine, biology and pharmacy, which are of experimental, theoretical and practical character; publishes original research, reviews, commentaries, editorials, essays, medical news, and correspondence in English and Russian.

GMN is indexed in MEDLINE, SCOPUS, PubMed and VINITI Russian Academy of Sciences. The full text content is available through EBSCO databases.

GMN: Медицинские новости Грузии - ежемесячный рецензируемый научный журнал, издаётся Редакционной коллегией с 1994 года на русском и английском языках в целях поддержки медицинской науки и улучшения здравоохранения. В журнале публикуются оригинальные научные статьи в области медицины, биологии и фармации, статьи обзорного характера, научные сообщения, новости медицины и здравоохранения. Журнал индексируется в MEDLINE, отражён в базе данных SCOPUS, PubMed и ВИНИТИ РАН. Полнотекстовые статьи журнала доступны через БД EBSCO.

GMN: Georgian Medical News – საქართველოს სამედიცინო სიახლენი – არის ყოველთვიური სამეცნიერო სამედიცინო რეცენზირებადი ჟურნალი, გამოიცემა 1994 წლიდან, წარმოადგენს სარედაქციო კოლეგიისა და აშშ-ის მეცნიერების, განათლების, ინდუსტრიის, ხელოვნებისა და ბუნებისმეტყველების საერთაშორისო აკადემიის ერთობლივ გამოცემას. GMN-ში რუსულ და ინგლისურ ენებზე ქვეყნდება ექსპერიმენტული, თეორიული და პრაქტიკული ხასიათის ორიგინალური სამეცნიერო სტატიები მედიცინის, ბიოლოგიისა და ფარმაციის სფეროში, მიმოხილვითი ხასიათის სტატიები.

ჟურნალი ინდექსირებულია MEDLINE-ის საერთაშორისო სისტემაში, ასახულია SCOPUS-ის, PubMed-ის და ВИНИТИ РАН-ის მონაცემთა ბაზებში. სტატიების სრული ტექსტი ხელმისაწვდომია EBSCO-ს მონაცემთა ბაზებიდან.

WEBSITE

www.geomednews.com

К СВЕДЕНИЮ АВТОРОВ!

При направлении статьи в редакцию необходимо соблюдать следующие правила:

1. Статья должна быть представлена в двух экземплярах, на русском или английском языках, напечатанная через **полтора интервала на одной стороне стандартного листа с шириной левого поля в три сантиметра**. Используемый компьютерный шрифт для текста на русском и английском языках - **Times New Roman** (**Кириллица**), для текста на грузинском языке следует использовать **AcadNusx.** Размер шрифта - **12**. К рукописи, напечатанной на компьютере, должен быть приложен CD со статьей.

2. Размер статьи должен быть не менее десяти и не более двадцати страниц машинописи, включая указатель литературы и резюме на английском, русском и грузинском языках.

3. В статье должны быть освещены актуальность данного материала, методы и результаты исследования и их обсуждение.

При представлении в печать научных экспериментальных работ авторы должны указывать вид и количество экспериментальных животных, применявшиеся методы обезболивания и усыпления (в ходе острых опытов).

4. К статье должны быть приложены краткое (на полстраницы) резюме на английском, русском и грузинском языках (включающее следующие разделы: цель исследования, материал и методы, результаты и заключение) и список ключевых слов (key words).

5. Таблицы необходимо представлять в печатной форме. Фотокопии не принимаются. **Все цифровые, итоговые и процентные данные в таблицах должны соответствовать таковым в тексте статьи**. Таблицы и графики должны быть озаглавлены.

6. Фотографии должны быть контрастными, фотокопии с рентгенограмм - в позитивном изображении. Рисунки, чертежи и диаграммы следует озаглавить, пронумеровать и вставить в соответствующее место текста **в tiff формате**.

В подписях к микрофотографиям следует указывать степень увеличения через окуляр или объектив и метод окраски или импрегнации срезов.

7. Фамилии отечественных авторов приводятся в оригинальной транскрипции.

8. При оформлении и направлении статей в журнал МНГ просим авторов соблюдать правила, изложенные в «Единых требованиях к рукописям, представляемым в биомедицинские журналы», принятых Международным комитетом редакторов медицинских журналов - http://www.spinesurgery.ru/files/publish.pdf и http://www.nlm.nih.gov/bsd/uniform_requirements.html
В конце каждой оригинальной статьи приводится библиографический список. В список литературы включаются все материалы, на которые имеются ссылки в тексте. Список составляется в алфавитном порядке и нумеруется. Литературный источник приводится на языке оригинала. В списке литературы сначала приводятся работы, написанные знаками грузинского алфавита, затем кириллицей и латиницей. Ссылки на цитируемые работы в тексте статьи даются в квадратных скобках в виде номера, соответствующего номеру данной работы в списке литературы. Большинство цитированных источников должны быть за последние 5-7 лет.

9. Для получения права на публикацию статья должна иметь от руководителя работы или учреждения визу и сопроводительное отношение, написанные или напечатанные на бланке и заверенные подписью и печатью.

10. В конце статьи должны быть подписи всех авторов, полностью приведены их фамилии, имена и отчества, указаны служебный и домашний номера телефонов и адреса или иные координаты. Количество авторов (соавторов) не должно превышать пяти человек.

11. Редакция оставляет за собой право сокращать и исправлять статьи. Корректура авторам не высылается, вся работа и сверка проводится по авторскому оригиналу.

12. Недопустимо направление в редакцию работ, представленных к печати в иных издательствах или опубликованных в других изданиях.

При нарушении указанных правил статьи не рассматриваются.

REQUIREMENTS

Please note, materials submitted to the Editorial Office Staff are supposed to meet the following requirements:

1. Articles must be provided with a double copy, in English or Russian languages and typed or compu-ter-printed on a single side of standard typing paper, with the left margin of **3** centimeters width, and **1.5** spacing between the lines, typeface - **Times New Roman** (**Cyrillic**), print size - **12** (referring to Georgian and Russian materials). With computer-printed texts please enclose a CD carrying the same file titled with Latin symbols.

2. Size of the article, including index and resume in English, Russian and Georgian languages must be at least 10 pages and not exceed the limit of 20 pages of typed or computer-printed text.

3. Submitted material must include a coverage of a topical subject, research methods, results, and review.

Authors of the scientific-research works must indicate the number of experimental biological species drawn in, list the employed methods of anesthetization and soporific means used during acute tests.

4. Articles must have a short (half page) abstract in English, Russian and Georgian (including the following sections: aim of study, material and methods, results and conclusions) and a list of key words.

5. Tables must be presented in an original typed or computer-printed form, instead of a photocopied version. **Numbers, totals, percentile data on the tables must coincide with those in the texts of the articles.** Tables and graphs must be headed.

6. Photographs are required to be contrasted and must be submitted with doubles. Please number each photograph with a pencil on its back, indicate author's name, title of the article (short version), and mark out its top and bottom parts. Drawings must be accurate, drafts and diagrams drawn in Indian ink (or black ink). Photocopies of the X-ray photographs must be presented in a positive image in **tiff format**.

Accurately numbered subtitles for each illustration must be listed on a separate sheet of paper. In the subtitles for the microphotographs please indicate the ocular and objective lens magnification power, method of coloring or impregnation of the microscopic sections (preparations).

7. Please indicate last names, first and middle initials of the native authors, present names and initials of the foreign authors in the transcription of the original language, enclose in parenthesis corresponding number under which the author is listed in the reference materials.

8. Please follow guidance offered to authors by The International Committee of Medical Journal Editors guidance in its Uniform Requirements for Manuscripts Submitted to Biomedical Journals publication available online at: http://www.nlm.nih.gov/bsd/uniform_requirements.html
http://www.icmje.org/urm_full.pdf
In GMN style for each work cited in the text, a bibliographic reference is given, and this is located at the end of the article under the title "References". All references cited in the text must be listed. The list of references should be arranged alphabetically and then numbered. References are numbered in the text [numbers in square brackets] and in the reference list and numbers are repeated throughout the text as needed. The bibliographic description is given in the language of publication (citations in Georgian script are followed by Cyrillic and Latin).

9. To obtain the rights of publication articles must be accompanied by a visa from the project instructor or the establishment, where the work has been performed, and a reference letter, both written or typed on a special signed form, certified by a stamp or a seal.

10. Articles must be signed by all of the authors at the end, and they must be provided with a list of full names, office and home phone numbers and addresses or other non-office locations where the authors could be reached. The number of the authors (co-authors) must not exceed the limit of 5 people.

11. Editorial Staff reserves the rights to cut down in size and correct the articles. Proof-sheets are not sent out to the authors. The entire editorial and collation work is performed according to the author's original text.

12. Sending in the works that have already been assigned to the press by other Editorial Staffs or have been printed by other publishers is not permissible.

Articles that Fail to Meet the Aforementioned Requirements are not Assigned to be Reviewed.

ავტორთა საყურადღებოდ!

რედაქციაში სტატიის წარმოდგენისას საჭიროა დავიცვათ შემდეგი წესები:

1. სტატია უნდა წარმოადგინოთ 2 ცალად, რუსულ ან ინგლისურ ენებზე,დაბეჭდილი სტანდარტული ფურცლის 1 გვერდზე, 3 სმ სიგანის მარცხენა ველისა და სტრიქონებს შორის 1,5 ინტერვალის დაცვით. გამოყენებული კომპიუტერული შრიფტი რუსულ და ინგლისურენოვან ტექსტებში - **Times New Roman (Кириллица)**, ხოლო ქართულენოვან ტექსტში საჭიროა გამოვიყენოთ **AcadNusx.** შრიფტის ზომა – 12. სტატიას თან უნდა ახლდეს CD სტატიით.

2. სტატიის მოცულობა არ უნდა შეადგენდეს 10 გვერდზე ნაკლებს და 20 გვერდზე მეტს ლიტერატურის სიის და რეზიუმეების (ინგლისურ, რუსულ და ქართულ ენებზე) ჩათვლით.

3. სტატიაში საჭიროა გაშუქდეს: საკითხის აქტუალობა; კვლევის მიზანი; საკვლევი მასალა და გამოყენებული მეთოდები; მიღებული შედეგები და მათი განსჯა. ექსპერიმენტული ხასიათის სტატიების წარმოდგენისას ავტორებმა უნდა მიუთითონ საექსპერიმენტო ცხოველების სახეობა და რაოდენობა; გაუტკივარებისა და დაძინების მეთოდები (მწვავე ცდების პირობებში).

4. სტატიას თან უნდა ახლდეს რეზიუმე ინგლისურ, რუსულ და ქართულ ენებზე არანაკლებ ნახევარი გვერდის მოცულობისა (სათაურის, ავტორების, დაწესებულების მითითებით და უნდა შეიცავდეს შემდეგ განყოფილებებს: მიზანი, მასალა და მეთოდები, შედეგები და დასკვნები; ტექსტუალური ნაწილი არ უნდა იყოს 15 სტრიქონზე ნაკლები) და საკვანძო სიტყვების ჩამონათვალი (key words).

5. ცხრილები საჭიროა წარმოადგინოთ ნაბეჭდი სახით. ყველა ციფრული, შემაჯამებელი და პროცენტული მონაცემები უნდა შეესაბამებოდეს ტექსტში მოყვანილს.

6. ფოტოსურათები უნდა იყოს კონტრასტული; სურათები, ნახაზები, დიაგრამები - დასათაურებული, დანომრილი და სათანადო ადგილას ჩასმული. რენტგენოგრამების ფოტოასლები წარმოადგინეთ პოზიტიური გამოსახულებით **tiff** ფორმატში. მიკროფოტოსურათების წარწერებში საჭიროა მიუთითოთ ოკულარის ან ობიექტივის საშუალებით გადიდების ხარისხი, ანათალების შეღებვის ან იმპრეგნაციის მეთოდი და აღნიშნოთ სურათის ზედა და ქვედა ნაწილები.

7. სამამულო ავტორების გვარები სტატიაში აღინიშნება ინიციალების თანდართვით, უცხოურისა – უცხოური ტრანსკრიპციით.

8. სტატიას თან უნდა ახლდეს ავტორის მიერ გამოყენებული სამამულო და უცხოური შრომების ბიბლიოგრაფიული სია (ბოლო 5-8 წლის სიღრმით). ანბანური წყობით წარმოდგენილ ბიბლიოგრაფიულ სიაში მიუთითეთ ჯერ სამამულო, შემდეგ უცხოელი ავტორები (გვარი, ინიციალები, სტატიის სათაური, ჟურნალის დასახელება, გამოცემის ადგილი, წელი, ჟურნალის №, პირველი და ბოლო გვერდები). მონოგრაფიის შემთხვევაში მიუთითეთ გამოცემის წელი, ადგილი და გვერდების საერთო რაოდენობა. ტექსტში კვადრატულ ფჩხილებში უნდა მიუთითოთ ავტორის შესაბამისი N ლიტერატურის სიის მიხედვით. მიზანშეწონილია, რომ ციტირებული წყაროების უმეტესი ნაწილი იყოს 5-6 წლის სიღრმის.

9. სტატიას თან უნდა ახლდეს: ა) დაწესებულების ან სამეცნიერო ხელმძღვანელის წარდგინება, დამოწმებული ხელმოწერითა და ბეჭდით; ბ) დარგის სპეციალისტის დამოწმებული რეცენზია, რომელშიც მითითებული იქნება საკითხის აქტუალობა, მასალის საკმაობა, მეთოდის სანდოობა, შედეგების სამეცნიერო-პრაქტიკული მნიშვნელობა.

10. სტატიის ბოლოს საჭიროა ყველა ავტორის ხელმოწერა, რომელთა რაოდენობა არ უნდა აღემატებოდეს 5-ს.

11. რედაქცია იტოვებს უფლებას შეასწოროს სტატია. ტექსტზე მუშაობა და შეჯერება ხდება საავტორო ორიგინალის მიხედვით.

12. დაუშვებელია რედაქციაში ისეთი სტატიის წარდგენა, რომელიც დასაბეჭდად წარდგენილი იყო სხვა რედაქციაში ან გამოქვეყნებული იყო სხვა გამოცემებში.

აღნიშნული წესების დარღვევის შემთხვევაში სტატიები არ განიხილება.

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INCIDENCE AND CHARACTER OF SUBJECTIVE SLEEP DISORDERS IN THE GEORGIAN POPULATION OF CHILDREN AND ADOLESCENTS WITH AUTISM SPECTRUM DISORDER (ASD)

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Abstract.

Aim of the Study: This study aims to assess the incidence and characteristics of sleep disorders in children and adolescents with Autism Spectrum Disorder (ASD) in Georgia. This research is particularly relevant because ASD is a neurodevelopmental disorder, and one of its most challenging issues is sleep disorders. In Georgia, the number of children and adolescents with ASD has increased significantly over the past two decades, yet sleep disorders among this population have not been studied at all to date.

Material and Methods: The parents (volunteers) of 500 ASD children/adolescents (without comorbid conditions and medication-free) participated in this study. Children and adolescents with ASD who had sleep disorders were identified based on subjective data collected from their parents using a modified version of the Children's Sleep Habits Questionnaire, as well as the Simonds & Paraga modified version. The control group consisted of typically developing, age-matched peers. Results treated statistically by ANOVA, with Student's t criteria.

Results and conclusion: For the first time, we discovered serious sleep disorders in 61% of Georgian children and adolescents with ASD characterized by: a) difficulties falling asleep, significant increases in sleep latency, and heightened sleep resistance; b) frequent awakenings and challenges in maintaining nighttime sleep; and c) a notable increase in anxiety and nightmares. All of these considerably worsen sleep quality, which can, in turn, have further consequences on the behavioral symptoms of ASD. The results will serve as diagnostic criteria for clinicians to prescribe personalized sleep therapy for each child or adolescent with ASD, in conjunction with behavioral therapy.

Key words. Autism spectrum disorder, Georgian ASD population, incidence of sleep disorders.

Introduction.

ASD is a neurodevelopmental disorder marked by a wide range of clinical symptoms. The key characteristics of ASD include unusual social interactions, ongoing challenges with reciprocal social communication in various contexts, and the presence of restricted, repetitive, and stereotyped behaviors and interests. Approximately 30% of children and adolescents with ASD also face additional intellectual or other disorders [1,2]. Recent studies have shown a significant correlation between the severity of ASD behavioral symptoms and gut microbiota profiles [3]. According to a 2020 report, the prevalence of ASD in the United States was reported as 1 in 54. Boys are diagnosed with ASD more frequently than girls, with a ratio of 4:1 [1]. Data from the Autism and Developmental Disorders Monitoring Network shows a concerning trend; in 2000, the prevalence of ASD among children was 1 in 150, then 1 in 88 in 2008, and 1 in 68 by 2010 [4]. While there appears to be some reduction in prevalence over the years, these figures remain alarming. A survey conducted by the Lachkepiani Association of Child Neurologists and Neurosurgeons between 2007 and 2009 indicated that 1 in 110 children in Georgia has autism. More recent data from the National Center for Disease Control and Public Health of Georgia shows a prevalence of 1 in 88 children. There are currently 2,500 children under the age of six with ASD in Georgia, highlighting a significant concern for public health.

The clinical symptoms of ASD vary widely among children, displaying a range of complexities. The latest edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) categorizes ASD into three levels of severity based on the degree of impairment in social communication, restricted interests, and repetitive behaviors. This classification helps determine the level of support that may be required for a child or adolescent with ASD [5,6]. Generally, children with more severe forms of ASD have lower social adaptability and need greater support. Additionally, children with a low developmental level benefit from early, intensive interventions to encourage their developmental progress. Unfortunately, in ASD individuals who do not receive timely identification and diagnosis of the full spectrum of symptoms tend to have poorer developmental outcomes [1,7].

Sleep disorders are significant and concerning issues for children and adolescents with ASD [8-10]. Because ASD individuals often experience challenges with social communication and other developmental aspects, much of the data regarding sleep disorders in this population comes from parents' surveys by using specialized questionnaires. According to these surveys, the prevalence of sleep disorders among children and adolescents with ASD ranges from 40% to 80% [11]. The range of sleep-related issues in children with ASD is quite broad, likely due to varying criteria used in different subjective sleep surveys. A parent survey revealed that 53% of children, aged 2–5 years, experience sleep disorders [12]. In a sample of 89 ASD children, 56 were found to have sleep disorders with various manifestations of insomnia [13]. The parents reported the following prevalence of sleep disorders: sleep complications (54%), insomnia (56%), parasomnia (53%), general sleep disorders (25%), sleep breathing problems (55%), and daytime sleep disorders (31%) [14-16]. This suggests that sleep disorders are common symptoms among children and adolescents with ASD [2,17-21]. Sleep issues can significantly impact children's daily functioning, affecting their behavior,

learning, memory regulation, and cognitive abilities [9,13,22]. These problems may also lead to emotional difficulties, such as aggression, irritability, hyperactivity, and depression [23]. For children with ASD, sleep disorders can worsen behavioral challenges, resulting in more severe deficits in social skills and lower scores on social assessments [15,24]. Children who do not get enough sleep often exhibit rude and repetitive behaviors and struggle with making friends. Moreover, the exacerbation of behavioral disorders associated with ASD can further complicate sleep patterns. This creates a concerning feedback loop, making sleep problems one of the most pressing challenges for families of children and adolescents coping with ASD.

Despite the evidence presented, sleep disorders remain one of the least studied aspects of autism. In Georgia, where the challenges faced by children and adolescents with ASD have become particularly prominent over the past two decades, the situation is even more challenging. To date, only the incidence of ASD among children and adolescents has been recorded, and no studies have been conducted to assess the prevalence of subjective sleep disorders in individuals with ASD. Additionally, there has been no research into the nature of these sleep disorders. A thorough examination of sleep disorders in this population is crucial, as it can highlight the importance of addressing sleep issues in children and adolescents with ASD. Improving sleep therapy could enhance adult endogenous neurogenesis and, in turn, positively impact other significant behavioral disorders associated with ASD.

Consequently, it is crucial to conduct a comprehensive assessment of the incidence and characteristics of sleep disorders, which can vary significantly among children and adolescents with ASD. These disorders may require a highly individualized approach in terms of procedures and medications. Therefore, this investigation aims to study the incidence, nature, and specific features of subjective sleep disorders in the Georgian population of children and adolescents with ASD, as well as the relationship between these sleep disorders and the severity of other behavioral symptoms associated with ASD.

Materials and Methods.

The volunteered parents of ASD children and adolescents (n=500) who did not have any clinically diagnosed comorbid conditions, such as epilepsy or attention deficit hyperactivity disorder, and were not on any medication, participated in the study. During the research process, we collaborated with several centers of "Neurodevelopment" in Georgia that provide behavioral therapy for children and adolescents with ASD. These centers volunteered to connect us with parents of individuals who had already been diagnosed with ASD by a physician according to the DSM-5 criteria. Sleep disorders were identified in children and adolescents with ASD, selected on subjective reports obtained from their parents. Following sleep subjective assessment questionnaires were used: Children's Sleep Habit Questionnaire and modified version [19]; the modified Simonds and Paraga Sleep Questionnaire [25]. The data of the subjective survey have been treated statistically using one-way ANOVA with Student's t-test.

The control group consisted of 50 typically developing children and adolescents who did not have any physician-diagnosed conditions.

For the assessment of sleep disorders, the following criteria were used: incidence of sleep disorders, sleep onset latency, sleep resistance, frequency of nighttime sleep awakenings, anxiety and nightmares, difficulties in morning awakening, and daily sleepiness.

The study protocols were approved by the Research Bioethics Committee of Ivane Beritashvili Center of Experimental Biomedicine. Informed consent was obtained from the parents, the ASD individual's relative or legal representatives.

Results and Discussion.

Based on a thorough analysis of the results from a questionnaire-based survey of parents of the children and adolescents diagnosed with ASD and TD children, several important findings have emerged. Notably, sleep disorders are prevalent among children and adolescents with ASD in the Georgian population. As shown in Figure 1, 61% of children and adolescents with ASD experience sleep disorders (61±5% of ASD group with subjective sleep disorders, versus 39±5% without subjective sleep disorders). This is a significantly higher incidence compared to the TD group (75±10% in TD without subjective sleep disorders, versus 25%±6 in TD with subjective sleep disorders).

Sleep onset latency (SOL) is a significant indicator of sleep disturbances. It refers to the duration from when a person lies down in bed until they fall asleep. In our study, we measured this criterion among three groups: 1) typically developing (TD) children and adolescents, 2) children and adolescents with ASD without report of subjective sleep disorders, and 3) children and adolescents with ASD with reported subjective sleep disorders.

Figure 2 illustrates the results of a comparative statistical analysis examining the changes in the latent period of falling asleep for children and adolescents with ASD. The subjective average data for typically developing age-matched controls was compared to the data for children and adolescents with ASD who do not have sleep disorders (Figure 2, comparison 1 with 2), and also to those with ASD who do have sleep disorders (Figure 2, comparison 1 with 3). Obtained findings show that SOL does not differ significantly between the TD and the ASD groups without subjective sleep disorders. On average, it takes about 20±5 minutes for the TD group to fall asleep, while those in the ASD group without subjective sleep disorders take approximately 30±6 minutes. In contrast, when comparing the TD group to ASD children and adolescents with subjective sleep disorders, we observe a dramatic increase in sleep onset latency, which is 4.5 times longer in the latter group (Figure 2, 90±10 min, hatched column). The significant increase in SOL observed in this study indicates a marked rise in sleep resistance among children and adolescents with ASD who are experiencing subjective sleep disorders. Furthermore, it appeared that 71±10% of 100% ASD children and adolescents with subjective sleep disorders experience the typical difficulties in falling asleep (Figure 4, $p<0.05$). This widespread issue is particularly concerning, as it can have negative effects on other aspects of sleep disorders (see Figure 4).

Common sleep problems identified in existing research include difficulty falling asleep, reduced sleep duration, delayed sleep

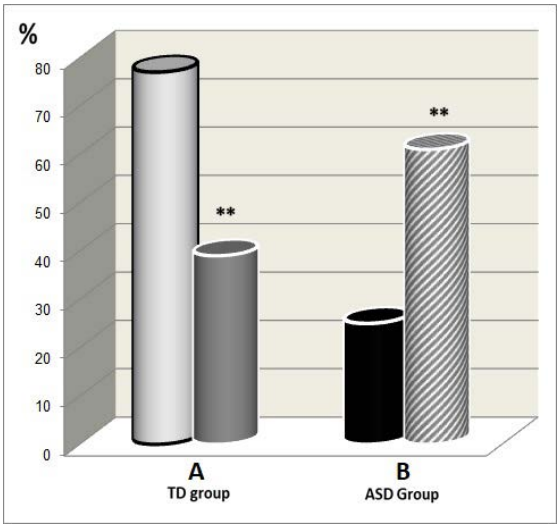

Figure 1. *Incidence of subjective sleep disorders in the Georgian population of ASD children and adolescents. On A, Light Gray column - percentage number of TD children and adolescents without subjective sleep disorders; dark Gray column - percentage number of TD children and adolescents with subjective sleep disorders. On B, black column - percentage number of children and adolescents without subjective sleep disorders; hatched column - percentage number of ASD children and adolescents with sleep disorders. **=p<0.05.*

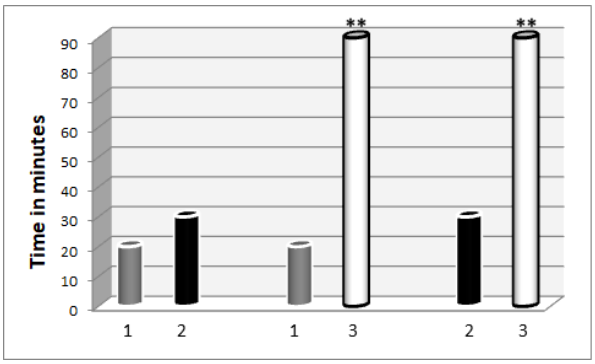

Figure 2. *Changes in the Sleep Onset Latency (SOL) for children and adolescents with ASD who experience subjective sleep disorders. The data is categorized as follows: 1 – data from the typically developing (TD) group; 2 – data from the ASD group without subjective sleep disorders; 3 – data from the ASD group with subjective sleep disorders. Statistical comparisons were made between groups: 1 with 2, 1 with 3, and 2 with 3. **=p<0.05.*

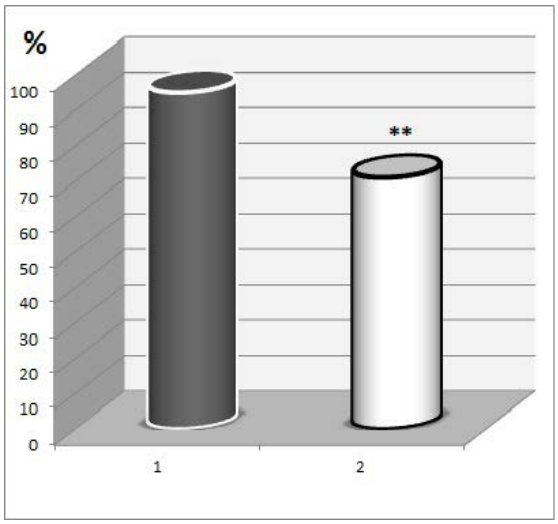

Figure 3. *The percentage ratio of ASD children and adolescents with subjective sleep disorders, compared to those who have typical difficulties in falling asleep. 1 - The percentage of ASD children and adolescents with subjective sleep disorders, 2 - the percentage of those with regular difficulties in falling asleep. **=p<0.05.*

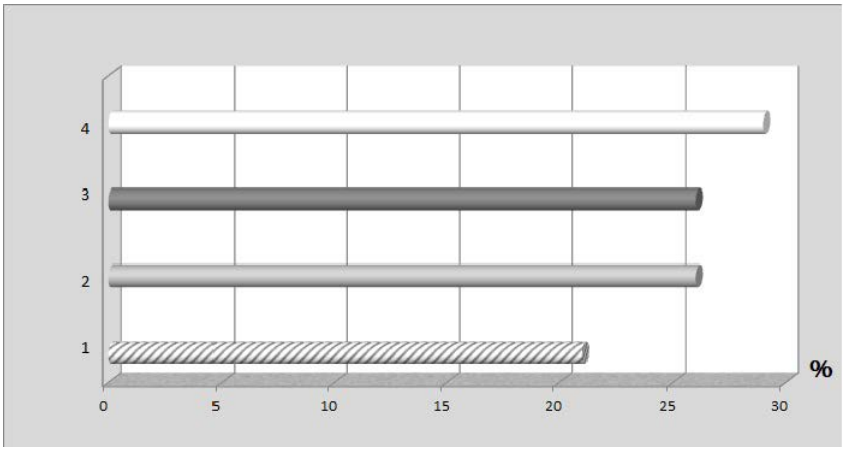

Figure 4. *The incidence of various parameters indicators of sleep disorders, assessed in every 100 ASD children and adolescents experiencing subjective sleep disorders: 1) difficulties waking up in the morning 2) awakenings during nighttime sleep, 3) daytime sleepiness, and 4) anxiety and nightmares. **=p<0.05.*

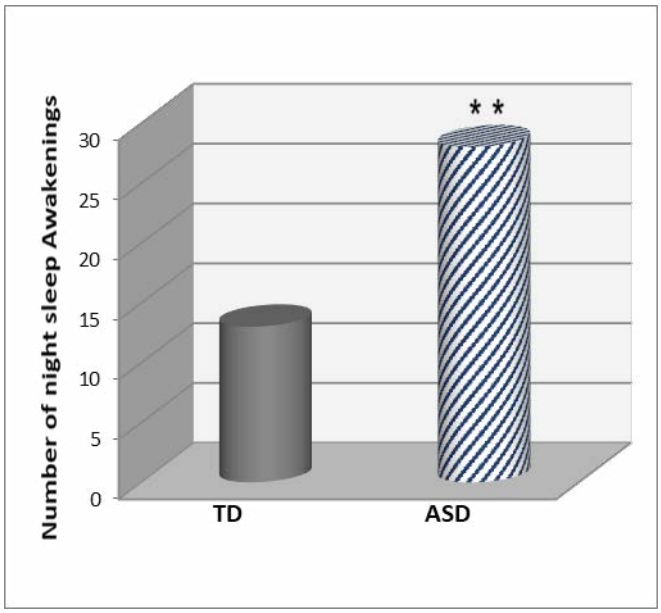

Figure 5. *Changes in the number of nighttime sleep awakenings in TD and ASD children and Adolescents with subjective sleep disorders, **=p<0.05.*

onset, and nocturnal awakenings [2,19,20]. Additionally, other studies have reported high rates of sleep resistance and daytime sleepiness [21,26].

Results of our study, regarding the indices of sleep disorders, demonstrate that this issue significantly affects a considerable percentage of children and adolescents.

Specifically, according to subjective survey, 21±5% have difficulties with morning awakenings (Figure 4.1), 26±3% experience awakenings during nighttime sleep (Figure 4.2) another 26±6% suffer from daytime sleepiness (Figure 4.3) and 30±5% deal with anxiety and nightmares (Figure 4.4).

One of the most important indicators of normal sleep is its continuity throughout the nighttime, measured by the number of awakenings. To assess this, we calculated the number of night awakenings in TD children and adolescents matched by age and in ASD children and adolescents who experience subjective sleep disorders. The results, illustrated in Figure 5, demonstrate a statistically significant increase in nighttime awakenings among ASD children and adolescents, 30±3% compared to only 15±5% in the typically developing age-matched controls. These frequent awakenings disrupt sleep continuity, significantly impair sleep quality, and negatively impact subsequent behavior. Thus, we have studied, for the first time, the incidence and characteristics of subjective sleep disorders in children and adolescents with ASD, within the Georgian population. Our findings reveal concerning data, highlighting a notably high percentage of sleep disorders in this group.

We discovered that serious sleep disturbances affect 61% of Georgian individuals with ASD, which manifest in several ways: a) significantly prolonged sleep latency, b) frequent awakenings during the night, c) considerable difficulties in both falling asleep and maintaining uninterrupted sleep, and d) increased levels of anxiety and nightmares.

These issues greatly impact sleep quality and can contribute to the worsening of behavioral symptoms commonly seen in children and adolescents with ASD. The results obtained

highlight the urgent need for research in this area. The findings are expected to be highly significant for medicine, enabling clinicians to prescribe customized sleep therapy for children and adolescents with ASD, in addition to their existing behavioral therapies.

Given the essential restorative role of healthy sleep, this therapy could enhance impaired neurodevelopmental processes by supporting adult neurogenesis. Ultimately, the outcomes of this study have the potential to transform the lives of thousands of children and adolescents with ASD living in Georgia and the condition of their family members.

We are currently in the next phase of our research, investigating objective sleep disorders through continuous overnight sleep EEG/polysomnography recordings in both the typically developing (TD) group and the ASD group with subjective sleep disorders based on parent surveys. In the upcoming article, we will describe the objective changes in ultradian structure, cyclicity, and other indices of sleep stages observed in both groups.

Additionally, we acknowledge that our ability to compare our findings with results from studies conducted in other countries is currently limited. This discrepancy is particularly interesting given the cultural differences, variations in dietary practices, and differences in healthcare systems in Georgia. Once we have collected objective data on various aspects of sleep disorders and completed a comparative assessment of the alignment between subjective and objective data, we plan to conduct a more comprehensive analysis.

Conclusion.

This study reveals, for the first time, that there is a notably high incidence of subjective sleep disorders (61%) among children and adolescents with ASD in the Georgian population. These disorders manifest through: a) significantly prolonged sleep latency, leading to sleep resistance; b) frequent awakenings during the night; c) considerable difficulties in both falling asleep and maintaining sleep continuity, and d) heightened levels of anxiety and nightmares.

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Zilis darRvevebis incidenturoba da xasiaTi autizmis speqtris darRvevis (asd) mqone bavSvebisa da mozardebis saqarTvelos populaciaSi

n. naWyebia*, x. beJaniSvili, n. maRlakeliZe, n. rogava, e. CxartiSvili, m. babiloZe, m. SavguliZe, n. fifia, o. mWedliZe, v. comaia, i. xaCiZe, e. CijavaZe

ivane beritaSvilis eqsperimentuli biomedicinis centris Zil-RviZilis ciklis neirobiologiis laboratoria, Tbilisi, saqarTvelo

abstraqti

Sesavali. kvlevis mizani iyo Zilis darRvevebis incidenturobis da xasiaTis kvleva asd bavSvebis da mozardebis saqarTvelos populaciaSi. kvlevis aqtualoba Zalian maRalia, radgan saqarTveloSi, asd-s raodenobrivi maCvenebeli, bolo wlebSi, gansakuTrebiT maRali gaxda, Tumca Zilis darRvevebis sixSire da xasiaTi, dRemde, Seswavlili ar aris.

masala da meTodebi. kvlevaSi monawileobdnen im asd bavSvebis da mozardebis mSoblebi (moxaliseebi, n=500), romlebsac ar hqondaT romelime, seriozuli, Tanmxlebi daavadeba. Zilis darRvevebis mqone asd bavSvebis da mozardebis SerCeva, subieqturi, monacemebis safuZvelze ganxorcielda. gamoviyeneT Zilis Sefasebis kiTxvarebi - bavSvTa Zilis Cvevebis kiTxvari da misi modificirebuli versia da simondsis da paragas Zilis kiTxvaris modificirebuli versia. sakontrolo jgufs Seadgendnen Sesabamisi asakis, tipurad ganviTarebadi, bavSvebi da mozardebi.

Sedegebi da daskvnebi. kvlevaSi pirvelad iqna aRwerili Zilis seriozuli darRvevebi, asd bavSvebis da mozardebis saqarTvelos populaciis 61%-Si. darRvevebi gamovlinda: a) daZinebis seriozul garTulebasa da Zilis faruli periodis mniSvnelovan gaxangrZlivebaSi; b) Zilis rezinstentobis matebaSi, g) xSir SeRviZebebSi, Ramis Zilis ganmavlobaSi; e) SfoTvisa da Ramis koSmarebis mniSvnelovan gaZlierebaSi. es yvelaferi ufro metad auaresebs Zilis xarisxs, rac asd bavSvebis da mozardebis qceviT simptomebs auaresebs. miRebuli Sedegebis gamoyeneba SesaZlebelia, sadiagnostiko kriteriumebis saxiT, rac klinicistebs saSualebas miscems daniSnon Zilis individualuri Terapia, qceviT TerapiasTan erTad.

sakvanZo sityvebi. autizmis speqtris darRveva, saqarTvelos asd populacia, Zilis darRvevebi

Частота и характер субъективных нарушений сна в Грузинской популяции детей и подростков с расстройствами аутистического спектра (РАС)

Н. Начкебия*, Х. Бежанишвили, Н. Маглакелидзе, Н. Рогава, Э. Чхартишвили, М. Бабилодзе, М. Шавгулидзе, Н. Пипия, О. Мчедлидзе, В. Цомая, И. Хачидзе, Э. Чиджавадзе

Иване Бериташвили Центр экспериментальной биомедицины, Лаборатория нейробиологии цикла сон-бодрствование, Тбилиси, Грузия

Цель исследования. В исследований оценивалась частота и особенности нарушений сна у детей/подростков с РАС в Грузинской популяции. Актуальность исследований высока, поскольку РАС характеризуется гетерогенным спектром симптоматики, с одной из самых серьезных проблем расстройств сна. В Грузии, где число детей с РАС стало особенно заметным в последние годы, нарушения сна у детей/подростков с РАС до сих пор не изучались; настоящее исследование является первым. М**атериалы и методы.** В исследовании приняли участие родители (волонтеры) 500 детей/подростков с РАС. Индивиди с РАС и нарушениями сна были отобраны на основе субъективных данных, полученных от их родителей с использованием опросника привычек сна детей (модифицированная версия) и модифицированной версии Саймондс и Паррага. Контролем служили типично развивающиеся сверстники того же возраста. **Результаты и выводы.** Исследование впервые выявило серьезные нарушения сна у 61% детей и подростков с РАС Грузинской популяции. Нарушения проявляются: а) серьезными трудностями засыпания, приводящие удлинению латентного периода сна; б) повышением устойчивости ко сну, в) частыми пробуждениями во время ночного сна; г) трудностями в поддержании непрерывности ночного сна; д) значительным усилением тревожности и ночных кошмаров. Все это значительно ухудшает качество сна и отрицательно отражается в поведенческих симптомах характерных детей и подростков с РАС. Полученные результаты могут быть использованы врачами в качестве необходимого диагностического критерия для назначения индивидуальной терапии сна для каждого ребенка/подростка с РАС, наряду с поведенческой терапией.

Ключевые слова. Расстройства аутистического спектра, Грузинская популяция РАС, частота расстройств сна