PREVALENCE OF SLEEP DISORDERS IN TEENAGE GIRLS IN IRKUTSK (QUESTIONNAIRE DATA)

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ABSTRACT

Background. *Adequate sleep ensures a person's physical and psycho-emotional well-being. Adolescence is one of the critical stages of life. The exclusive attention of specialists and leveling the impact of adverse factors on the body during this period is the key to the proper development and preservation of the health of adolescents. Meanwhile, sleep problems in teenage girls remain poorly understood.*
The aim. *To study the features of the sleep regime and quality of sleep of teenage girls in the city of Irkutsk.*
Materials and methods. *A survey of 422 teenage girls in the city of Irkutsk was conducted using a translated version of a questionnaire about adolescent sleep habits to subjectively assess their sleep and wakefulness. Two groups were formed: group I – girls with sleep problems (n = 171); group II – girls without sleep problems (n = 251).*
Results. *Sleep disorders among teenage girls in the city of Irkutsk occurred with a frequency of 40.52 %. In most cases, a complex effect of various unfavorable factors on the sleep process has been identified. The features of sleep hygiene of teenage girls are reflected. The adolescents with sleep disorders we examined were characterized by higher rates of sleep latency, later bedtime, earlier awakening, decreased time of night sleep, as well as changes in the sleep shift indicator towards its increase.*
Conclusions. *The conducted survey allows us to draw a conclusion that the issues of sleep schedule and quality of female adolescents in Irkutsk are relevant and should undergo a more detailed comprehensive study. Considering the potential risks to health formation, including reproductive health in female adolescents, more attention should be devoted to proactively identifying sleep-related disorders in adolescents and providing timely interventions to address them.*

Key words: *female adolescents, sleep disorders, impaired sleep-wakefulness, reproductive health*

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ОСОБЕННОСТИ РЕЖИМА И КАЧЕСТВА СНА ДЕВОЧЕК-ПОДРОСТКОВ ГОРОДА ИРКУТСКА

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РЕЗЮМЕ

Обоснование. *Полноценный сон обеспечивает физическое и психоэмоциональное благополучие человека. Подростковый возраст является одним из критических этапов жизни. Исключительное внимание специалистов и нивелирование воздействия неблагоприятных факторов на организм в этот период является залогом правильного развития и сохранения здоровья подростков. Тем временем проблемы со сном у девочек-подростков остаются малоизученными.*

Цель исследования. *Изучить особенности режима и качества сна девочек-подростков города Иркутска.*

Материалы и методы. *Проведено анкетирование 422 девочек-подростков города Иркутска с использованием переводной версии опросника о привычках сна подростков для субъективной оценки своего сна и бодрствования. Сформированы две группы: I группа – девочки, имеющие проблемы со сном (n = 171); II группа – девочки, не имеющие проблем со сном (n = 251).*

Результаты. *О проблемах со сном сообщили 40,52 % опрошенных. Выявлено комплексное воздействие различных неблагоприятных факторов на качество сна. Отражены особенности гигиены сна девочек-подростков. Для группы девочек, имеющих проблемы со сном, было характерно повышение показателей латентности сна, более позднее время отхождения ко сну, более раннее пробуждение, сокращение времени сна, а также увеличение сдвига сна.*

Заключение. *Проведённый опрос позволяет сделать вывод о том, что вопросы режима и качества сна девочек-подростков города Иркутска актуальны и должны быть подвергнуты более детальному комплексному изучению. Учитывая потенциальную опасность для формирования здоровья, в том числе репродуктивной функции, девочек-подростков, следует уделять больше внимания активному выявлению у них проблем, связанных со сном, и своевременно проводить мероприятия по их устранению.*

Ключевые слова: *девочки-подростки, расстройства сна, нарушение цикла «сон-бодрствование», репродуктивное здоровье*

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INTRODUCTION

Sleep is one of the basic components of any person's health. No one can overestimate the role of sleep in ensuring the vital activity of the human body at any age [1, 2]. It is of particular importance in childhood and adolescence, a period of intense organism formation, physical and psycho-emotional maturation [3, 4]. Currently, sleep disorders in adolescents are quite widespread, occurring in about half of those examined and tending to increase, which cannot but cause concern about their further development and preservation of health, as the adverse consequences can be very serious [5–7]. A decrease in the quality of sleep is associated with the formation of many pathological processes. In particular, it has been proven that sleep disorders can cause cognitive impairment, social maladjustment, acute and exacerbation of chronic diseases [8, 9]. Multiple studies have shown that at any age period, the incidence of various sleep disorders is higher among females compared to males, which is associated with the activity and gender differences in the functioning of the hypothalamic-pituitary-gonadal system at different periods of life and its subordination to circadian rhythms [6, 10]. That is why active identification of sleep-related disorders among adolescent females is extremely important and necessary for timely implementation of a set of measures to prevent the development of unfavourable consequences for the forming female organism.

THE AIM OF THE STUDY

To study the features of sleep schedule and quality of female adolescents living in the city of Irkutsk.

MATERIALS AND METHODS

A questionnaire survey was conducted among 422 female adolescents 15–17 years old, students in grades 9–11 of 16 schools in Irkutsk, between January and March 2023.

Inclusion criteria: female sex; age 15–17 years; voluntary informed consent to participate in the study; residence in the city of Irkutsk. Exclusion criteria: male sex; age less than 15 years and more than 17 years; refusal to participate in the study.

We used the translated Russian version of the Adolescent Sleep Habits Survey [11] to assess sleep quality. The questionnaire was developed and validated by A.R. Wolfson et al. [12] specifically to study sleep hygiene in adolescents aged 12 to 18 years. It contains questions related to self-assessment of sleep hygiene during the last month, to which one or more answers can be submitted. The questionnaire was to be filled out in a calm environment, at home, at a time convenient for the child, without a time limit. In the survey, the girls made value judgements about their sleep and wakefulness during weekends and weekdays over the past month.

According to the results of the questionnaire, all female adolescents were divided into 2 groups. Group I – girls with sleep disorders ($n = 171$); Group II – girls without sleep disorders ($n = 251$).

The study was conducted in accordance with the provisions of the World Medical Association Declaration of Helsinki (1964, revision 2013) and approved by the Biomedical Ethics Committee of "Scientific Centre for Family Health and Human Reproduction Problems" (Minutes No. 2 dated 08.06.2022). All girls signed informed voluntary consent to participate in the study.

Statistical data processing was performed using Excel spreadsheets (Microsoft Corp., USA) and Statistica application software package, version 6.1 (StatSoft Inc., USA) (license holder – "Scientific Centre for Family Health and Human Reproduction Problems"). The type in the distribution of a characteristic was determined using the Shapiro – Wilk, Lilliefors and Kolmogorov – Smirnov criteria. For variables, median (*Me*) and 25th and 75th quartiles were calculated. Statistically significant differences between two unrelated groups on variables were determined using the parametric Student's t-criterion in case of normal distribution of a characteristic and the non-parametric Mann – Whitney U-criterion – in case of distribution of a characteristic other than normal. Differences between unrelated groups by attributes were determined using the χ^2 criterion with Yeats' continuity correction and Fisher's exact test when the number of at least one of the groups was less than 5. All differences were considered statistically significant at the $p < 0.05$ level.

RESULTS

Sleep disorders among the respondents were found in 171 female adolescents, which was 40.52 %. Among them, 16.96 % girls reported having these disorders for less than 1 month, 33.33 % – for 1 to 6 months, 19.88 % – for 6 to 12 months, 20.47 % – for 1 to 5 years, and 9.36 % – for more than 5 years. However, 36.84 % of the respondents reported worsening sleep disorders in the last 2 weeks, 31.58 % had no worsening and 31.58 % found it difficult to answer.

More than one cause of sleep disorders was reported simultaneously by 73.10 % of adolescents, and only 26.90 % gave one definite cause ($\chi^2 = 44.62$; $p < 0.0001$). Stressful situations (77.78 %), lack of sleep and wakefulness (67.84 %), problems in relationships with classmates (46.78 %) and parents (19.88 %), poor eating habits (31.58 %), health problems (15.20 %) were the most frequently observed by girls.

In the vast majority of cases, girls from both study groups slept alone in the room (77.78 % – in Group I, 84.46 % – in Group II). A tendency was revealed among the group of those with sleep disorders for girls to sleep with a family member, 22.22 and 15.54 %, respectively ($\chi^2 = 3.05$; $p = 0.08$).

In Group I, 77.78 % of the adolescents slept in the same bed every night, almost every night – 18.13 %, quite a few nights – 3.51 %, constantly in different beds – 0.58 %.

In Group II, these indices were 84.46 %, 11.16 %, 3.59 %, and 0.79 %, respectively. Consequently, a tendency towards a higher incidence of sleeping in the same bed among girls without sleep disorders was revealed.

In both study groups, the main reason for going to bed on weekdays was identified by girls as "I want to sleep" (52.05 % – in Group I, 68.13 % – in Group II; $p = 0.0009$), with the second most frequent reason being "finishing my homework" (28.07 and 18.73 %, respectively; $p = 0.02$), in the third place – "finishing social networking" (16.96 and 7.57 %, respectively; $p = 0.003$). Therefore, we can assume that girls with sleep disorders are more likely to perform mental activities immediately before going to bed, which negatively affects the sleep process.

On weekends, the desire to sleep was also the main reason (57.89 % – in Group I, 74.50 % – in Group II; $p = 0.0003$), followed by "finishing social networking" (18.13 and 13.15 %, respectively; $p = 0.16$) and "finishing homework" (9.94 and 4.78 %, respectively; $p = 0.04$). In addition, 4.60 % of adolescents in Group I reported that they finished watching TV programs immediately before going to bed, while in Group II only 2.79 % of respondents gave that answer ($p = 0.02$).

Assessment of sleep latency indicators revealed a statistically significantly longer process of falling asleep in girls with sleep disorders compared to adolescents without these disorders (Table 1).

Analyses of nocturnal sleep timing during the school week revealed that girls with sleep disorders tended to go to bed later than girls without such disorders ($p < 0.0001$). In addition, their maximum bedtime was also significantly later ($p < 0.0001$). Indicators of morning wake-up time also had statistically significant differences between groups: adolescents from Study Group I had a statistically significant earlier wake-up time ($p = 0.02$). Differences were also found on weekends when school was not required: girls with sleep complaints went to bed later ($p < 0.0001$) and woke up later ($p = 0.02$ – for usual time, $p < 0.0001$ – for the latest time) than those without these complaints. The average and minimum sleep duration indices during the school week in both study groups were below the recommended norms, and in the group of girls with sleep disorders they were statistically significantly lower than in girls with normal sleep ($p < 0.0001$ and $p < 0.0001$, respectively). At weekends, sleep in both groups was expectedly longer and fell within the range of normative values for this age group – 8–10 hours, but its minimum duration tended to decrease in adolescents with sleep disorders ($p = 0.08$), and its maximum duration in this group was statistically significantly higher than in female adolescents without sleep disorders ($p < 0.0001$). Sleep shift indices in the groups also had statistically significant differences in the direction of its increase in those with sleep disorders ($p < 0.0001$) (Table 1).

DISCUSSION

The recent increase in the number of people with sleep disorders, including children and adolescents, requires more attentive attitude of physicians of various specialties, primarily pediatricians, to this problem [13, 14]. Of utmost importance to remember that adolescence is one of the critical stages of human life, when the key processes of maturation and restructuring of all systems of the body, accompanied by various hormonal shifts. Of particular importance is the close relationship between the sleep- wakefulness and the menstrual cycle, including through the hypothalamic-pituitary-gonadal system, the activity of which becomes more pronounced during puberty in adolescents and determines gender differences in the characteristics of sleep during this period of life. This stage is characterised in particular by a wave-like secretion of luteinising hormone, with an increase in both the amplitude and frequency of its secretion pulses during night sleep, leading to an increase in estradiol and progesterone levels in girls in the morning hours. Melatonin secreted during sleep has a direct suppressive effect on the secretion of luteinising hormone, and changes in its concentration in female adolescents can cause both sleep disorders and disturbances in the mechanisms of functioning of the hypothalamic-pituitary-gonadal system [15]. Exceptional attention of specialists and levelling the impact of various unfavourable factors on the organism during this period of life is the key to proper development and preservation of female adolescent health, including reproductive potential [16].

The adolescent period is also critical in the process of shaping a child's sleep. A significant proportion of adolescents nowadays have problems related to sleep disorders, either short-term or over a long period of time [3, 7]. The incidence of sleep disorders that was revealed by this study was quite high and comparable with the rates obtained earlier in similar studies. For instance, according to various sources, sleep disorders among adolescents occur with a frequency ranging from 7 to 40 % [13, 17]. A number of studies have reported higher rates. According to K.A. Gazenkampf et al. (2019), nocturnal sleep disorders were observed in 52 % of high school students [18], and according to F. Brooks et al. (2015), among female adolescents in England, 49 % reported sleep disorders [19]. It should be emphasised that the female adolescents who were surveyed more often reported sleep disorders for quite a long time, namely from 1 to 6 months, which suggests a prolonged influence of unfavourable conditions on the development of the organism. At the same time, there was a tendency for sleep problems to worsen over time, which probably indicates the occurrence of any functional disorders of the organism.

It is known that the important factors influencing the quality of sleep are compliance with the sleep and wakefulness schedule, daily sleep time, room temperature during sleep, lighting and noise level in the room during sleep, the impact of so-called blue radiation (use of social networks just before going to bed, watching TV, studying at the computer), psycho-emotional stress, the level of physical activity, the nature of nutrition, the use of tonic drinks, alcohol, smoking [4, 20]. Having studied the sleep habits of the surveyed girls, it was concluded that in the vast majority of cases there was a complex impact of various unfavourable factors on the sleep process, which often have the possibility

TABLE 1

PECULIARITIES OF FEMALE ADOLESCENT GIRLS' SLEEP PATTERNS AT WEEKDAYS AND WEEKENDS

Indicators	Group I (*n* = 171)	Group II (*n* = 251)	*p*
Sleep latency during the school week (min)			
Mean	30.00 (15.00; 60.00)	15.00 (10.00; 30.00)	0.0001*
Minimum	10.00 (5.00; 30.00)	10.00 (5.00; 15.00)	0.0001*
Maximum	60.00 (30.00; 120.00)	40.00 (20.00; 60.00)	0.0001*
Weekend sleep latency (min)			
Mean	30.00 (12.00; 60.00)	15.00 (10.00; 30.00)	0.0001*
Minimum	10.00 (5.00; 30.00)	10.00 (5.00; 15.00)	0.0004*
Maximum	60.00 (30.00; 120.00)	60.00 (20.00; 60.00)	0.0001*
Bedtime during the school week			
Regular	23:40 (23:00; 00:30)	23:00 (22:30; 24:00)	0.0001*
Earliest	22:00 (21:00; 23:00)	22:00 (21:05; 22:40)	0.81
At the latest	02:00 (01:00; 03:30)	01:00 (23:40; 02:00)	0.0001*
Wake-up time during the school week			
Regular	06:30 (06:00; 07:00)	06:30 (06:05; 07:00)	0.93
Earliest	06:00 (05:30; 06:30)	06:00 (05:40; 06:30)	0.02*
At the latest	07:00 (06:40; 07:30)	07:00 (06:40; 07:30)	0.45
Bedtime on weekends			
Regular	00:00 (23:00; 01:30)	00:00 (23:00; 01:00)	0.18
Earliest	22:30 (22:00; 23:00)	22:30 (22:00; 23:00)	0.76
At the latest	03:00 (01:00; 04:00)	02:00 (00:00; 03:00)	0.0001*
Wake-up time on weekends			
Regular	10:00 (09:10; 11:30)	10:00 (09:00; 11:00)	0.02*
Earliest	08:40 (07:30; 09:30)	08:30 (08:00; 09:00)	0.93
At the latest	12:30 (11:30; 14:00)	12:00 (10:30; 13:00)	0.0001*
Length of night sleep during the school week (h)			
Mean	6.00 (5.50; 7.00)	7.00 (6.20; 8.00)	0.0001*
Minimum	4.00 (3.00; 5.50)	6.00 (5.00; 7.00)	0.0001*
Maximum	8.00 (7.50; 10.00)	8.40 (8.00; 9.00)	0.86
Night sleep duration on weekends (h)			
Mean	9.00 (8.00; 10.00)	9.00 (8.00; 10.00)	0.62
Minimum	8.00 (6.00; 8.00)	8.00 (7.00; 9.00)	0.08*
Maximum	12.00 (10.00; 12.00)	10.00 (10.00; 12.00)	0.0001*
Sleep shift, min	150.00 (90.00; 240.00)	120.00(60.00; 180.00)	0.0001*

Note. Bedtime and wake-up time are presented in 24-hour format; data are presented as Me (25th; 75th quartiles);* – statistically significant differences between groups, $p < 0.05$.

of levelling. Of particular note, this study has demonstrated increased social media communication using a smartphone by girls with sleep disorders just before bedtime, contributing to increased sleep latency and decreased sleep duration. To avoid negative effects to the sleep quality, it is recommended to avoid any use of screens for 1 hour before going to bed. The measures undertaken to correct sleep hygiene, in our opinion, can reduce the prevalence of sleep disorders in female adolescents, thereby reducing the risk of adverse effects on the organism. Our results are consistent with findings in other studies. Specifically, O.P. Gritsina et al. (2019) in a recent study have revealed that the majority of students do not comply with the sleep regime and hygiene, which affects its qualitative characteristics [2].

Modern living conditions and the development of new technologies make adjustments to the organisation of the daily routine and lifestyle of both adults and children, often leading to a shortening of the daily sleep time. In addition to schoolwork, teens are loaded with extracurricular activities and sports. Besides, nowadays there is an increase in the duration of children's stay at the computer, watching TV, and doing school homework [2, 18, 20]. The increased mental activity just before bedtime in girls with sleep disorders revealed in this study may be one of the factors triggering the development of sleep-related disorders, and may also lead to increased daytime sleepiness, emotional and behavioural disturbances, increased fatigue, reduced attention span and other consequences.

The average duration of sleep required for adolescence has been defined to be between 8 and 10 hours [21]. Furthermore, longer sleep duration is known to occur on weekends than on weekdays as a result of the need for early awakening associated with the start of school activities [22]. Meanwhile, sleep in adolescence is characterised by a number of features such as delayed sleep onset, longer sleep latency and longer wakefulness duration. A later secretion of melatonin and slower accumulation of the homeostatic urge to sleep are associated with these effects [4]. Accordingly, adolescents develop an "evening" chronotype with a tendency to go to sleep later and wake up later [23]. One should consider that the fascination in the late evening hours with various gadgets that produce blue radiation has an even more negative effect on the process of falling asleep and leads to a shorter night's sleep. This study also confirmed a decrease in female adolescent sleep duration scores, but these changes were most pronounced in the group with sleep disorders. These girls had higher sleep latency scores and later bedtimes during both the school week and weekends, resulting in shorter sleep durations. Additionally, as a result of a later wake-up time, the sleep shift values in this group of respondents were higher, reflecting the uneven distribution of sleep time during the week. These findings indicate pronounced impaired sleep-wakefulness in female adolescents with sleep disorders, which increases the risk of adverse effects. The results of this study are consistent with the studies of other authors [2, 13]. In particular, it was previously revealed that about 60–70 % of adolescents sleep less than 8 hours on weekdays, and according to the work of K.A. Gazenkampf et al. (2017), this indicator reached the level of 87 % [18]. Reduced sleep duration in adolescents is also reflected in the work of S.N. Kolomeichuk and L.I. Teplova (2019), where adolescents living in Karelia were surveyed. Gender peculiarities were also revealed in the form of more unfavourable qualitative and quantitative characteristics of sleep in girls compared to boys [7].

CONCLUSION

Notwithstanding all the advances made in recent decades in the study of sleep-related issues, sleep disorders are increasingly common among adolescents and especially among female adolescents. The conducted survey allows us to conclude that the issues of sleep schedule and sleep quality of female adolescents in Irkutsk are important and should be subjected to a more detailed comprehensive study. Considering the potential danger to the health of the growing adolescent organism, in particular the negative impact on the formation of female adolescent reproductive function, more attention should be paid to the active identification of sleep-related disorders in adolescent females and to the timely implementation of a set of measures to address them. As we believe, normalising sleep duration, improving sleep quality and improving sleep conditions can have a significant positive impact on the health of female adolescents.

Limitations of our study may include the small sample size as well as the subjective assessment of sleep of the female adolescents surveyed. We therefore believe that it is necessary to continue studying this problem and additionally apply methods of objective study in female adolescent sleep.

Conflict of interest

The authors of this article declare no conflicts of interest.

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