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Applying a Translated Version of the Adolescent Sleep Habits Survey in Russian High School Children with Obesity

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Abstract

Background: Inadequate sleep duration and sleep patterns have been associated with metabolic and circadian changes that promote obesity. The aim of this study was to applicate a translated version of the Adolescent Sleep Habits Survey to assess sleep habits and schedules in Russian obese adolescents.

Methods and Results: We questioned 87 adolescents aged between 15 and 17 years: 57 with obesity and 30 with a normal weight (NW). In total, some sleep problems were observed in 60.8% of obese respondents and 28.6% of NW participants (P=0.048). School-night wake times in obese adolescents did not differ significantly from the same variables in NW adolescents. School-night bedtimes and TST only in an obese sample were later and shorter, respectively, than in NW subjects (P<0.001 for both variables). Surprisingly, NW adolescents had a greater bedtime shift than obese peers (P<0.001). Finally, about half of obese respondents reported that they usually eat (62.7%) and watch TV (44.4%) in bed (P<0.001 for both variables compared with controls).

Conclusions: Applying a translated version of ASHS helps assess sleep habits and schedules in Russian adolescents, including obese patients. (**International Journal of Biomedicine. 2020;10(1):61-65.**)

Key Words: adolescents • obesity • sleep-wake rtythm • sleep habits • self-reported survey

Abbreviations

ASHS, Adolescent Sleep Habits Survey; **BMI**, body mass index; **NW**, normal weight; **TST**, total sleep times

Introduction

The World Health Organization has identified obesity as a global epidemic with rates of obesity, poor diet, and lack of physical activity rapidly rising in children, adolescents, and adults.[1,2] On average, the prevalence of obesity in school-age children in Europe was 4.9%.[3] According to the results of a multicenter study conducted in Russia, 19.9% of children and adolescents are overweight, 5% are obese.[4] Primary or exogenous obesity is a multi-factorial disorder that results from the interaction between an unfavorable socio-cultural environment and polygenic predisposition in an individual.[5] Sleep is a risk factor linked to the development and maintenance of obesity, and it has emerged as a potential target for obesity prevention.[6] It is hypothesized that sleep impacts weight through a variety of biological and behavioral pathways. For example, sleep restriction has been shown to negatively impact energy and glucose metabolism, alter appetitive hormones, and allow for more time to engage in obesogenic behaviors (e.g., television watching, poor diet choices).[7]

It is known that during adolescence physiological sleep patterns and psychosocial influences on sleep change. Some studies show that adolescents, compared to adults, have shorter sleep durations, later bedtimes, and greater discrepancies between weekday and weekend sleep schedules.[8,9] Regular

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insufficient sleep and excessive daytime sleepiness are serious epidemics among adolescents. In several studies with large samples of adolescents, researchers reported that from 45% to 80% of adolescents experience insufficient sleep on school nights.[10-12] Thereby, adolescents may be particularly vulnerable to sleep-related changes in their weight. Most research on sleep and obesity in adolescents has focused on the associations between sleep duration and sleep quality. Recent studies suggest that patterns of sleep, in addition to sleep duration and quality, may be related to the weight status and may provide a more comprehensive picture of the relationship between BMI and sleep.[13] Specifically, later bedtimes show positive relationships with obesity and negative relationships with physical activity and fruit and vegetable consumption in children and adolescents.[14-16] Furthermore, discrepancies between weekday and weekend bedtimes(bedtime shift) may dysregulate circadian rhythms, as the circadian system is slow to adapt to rapid shifts in sleep, which can then influence metabolic processes.[17] So, a combination of factors, including circadian phase delay, reduced sleep pressure, early school start times, caffeine use, electronic media usage, modern lifestyles, and social obligations, has minimized the opportunities for adolescents to obtain adequate sleep and thus has increased the risk of obesity.

The subjective assessment of sleep patterns is widely performed in sleep studies. From the earliest times of epidemiology, questionnaires have been used as a basic instrument for data collecting and screening.[18] Self-reported sleeping habit questionnaires are relatively easy to utilize and continue to be the most requested and widely used method. Respondents usually estimate bedtimes, waking times, hours of sleep, sleep habits, sleepiness, and so on. Most of the questionnaires are valid only for pre-pubertal children or adults, but not adolescents. Wolfson and colleagues (1998) successfully attempted to study sleep and waking behaviors in American high school children using the Sleep Habits Survey and showed that most of the adolescents surveyed do not get enough sleep, and their sleep loss interferes with daytime functioning.[19] In 2003, the above-mentioned authors examined the validity of this questionnaire through a comparison of retrospective survey descriptions of usual school- and weekend-night sleep habits with diary-reported sleep patterns and actigraphically estimated sleep behaviors. Their results support the validity of the Sleep Habits Survey estimates in comparison with sleep diary and actigraphy in high school children.[20] Sung (2011) used the Youth Sleep Habits Survey to assess self-reported sleep duration in obese adolescents.[21] Shahid and colleagues described this questionnaire as ASHS for schoolchildren in grades 4 through 12, developed in 2009 as part of Pediatric Sleep Disorders Program.[22,23] However, the administration of this sleep questionnaire for Russian obese adolescents is not established.

Based on the description above, the problem of this research is that sleep is a risk factor linked to the development of obesity, and many adolescents report sleep-wake schedules that involve late bedtimes and short sleep in self-report survey questionnaires.

The purpose of this study was to translate and applicate the ASHS to assess sleep habits and schedules in Russian adolescents with obesity.

Materials and Methods

We conducted a cross-sectional study, which involved 57 obese patients (Group 1) aged 15 to 17 years, who were referred to the Clinic of the Scientific Center for Family Health and Human Reproduction in 2019. Thirty age- and sex-matched adolescents with NW were included in the control group (Group 2).

Study inclusion criteria were the 15-17 year age range; BMI Z-score >2 for age and sex for Group 1 and BMI Z-score from -1 to +1 for age and sex for Group 2; and a signed informed consent form. The study exclusion criterion was unwillingness to participate in this study.

The program of the study included a general medical examination with anthropometric measurements, questioning and statistical analysis.

Anthropometric parameters of adolescents were assessed once when they were included in the study. Body mass index (BMI, kg/m^2) was calculated. The growth and weight parameters of the adolescents were evaluated using the reference values of the WHO and the AnthroPlus calculator (2009). The nutritional status was determined by the values of the Z-score.[24]

To fulfill the purpose of this study, the sleeping habits were evaluated subjectively, using a questionnaire—the Russian version of the ASHS. This is a structured survey featuring both open-ended and multiple-choice questions, which allows for the collection of demographic details, familial and medical histories, and information regarding sleep habits, schedules, and behaviors. Two versions of the self-reported survey were used (differing only in their mention of either male- or female-related developmental milestones). Each version is a pencil-and-paper instrument, consisting of between 61 (for boys) and 62 (for girls) questions and should require between 20 and 30 min for completion. Research assistants met with the participants once upon admission to the hospital. The survey items queried adolescents about usual sleeping and waking behaviors (sleep problems, sleep habits, sleep history, daytime sleepiness and sleep/wake rhythms) over the last two weeks, which is a typical interval for point-assessment sleep habit surveys. This article examines the following the ASHS variables: (1) for sleep problems ("Do you have sleep problems(s)?" answered as "Yes" or "No"; (2) for usual sleep habits (school and weekend nights separately): (a) ASHS bedtime: usual bedtime ("What time do you usually go to bed on school days?" answered as one specific time, such as 10:30 p.m.); (b) ASHS wake time: usual wake time ("What time do you usually wake up on weekends?" answered as one time, such as 9:30 a.m.); (c) ASHS TST: usual total sleep time ("Figure out how long you usually sleep on a school night and fill it in here," answered as specific hours and minutes such as 7 hours, 30 minutes); (d) ASHS latency: usual sleep latency ("On weekends, after you go to bed at night, about how long does it usually take you to fall asleep?" answered as specific minutes, such as 20 minutes; if longer than one

hour, change to minutes); (3) for possible sleep habits: (a) ASHS activities: possible activities in bed ("How often have you done any of the following activities in bed?: read, watch TV, eat, do schoolwork, worry" answered as "Every night," "Several times," "Twice," "Once" or "Never"; (b) ASHS falling asleep: possible activities if difficulty falling asleep ("When you have difficulty falling asleep or getting back to sleep, what do you do?: try to get to sleep, do something in bed, get up and watch TV, get up and drink warm milk/water/tea/coffee, other" checked as "All that apply").

The study was conducted in accordance with ethical principles of the WMA Declaration of Helsinki (1964, ed. 2013) and approved by the Ethics Committee of Scientific Centre for Family Health and Human Reproduction Problems. Written informed consent was obtained from the patient/parent/guardian/ relative of each patient.

Statistical analysis was performed using the *Statistica* 6.1 software package (Stat-Soft Inc., USA). The normality of distribution of continuous variables was tested by the Kolmogorov-Smirnov test with the Lilliefors correction and Shapiro-Wilk test. Baseline characteristics were summarized as frequencies and percentages for categorical variables and as mean±standard deviation (SD) for continuous variables. For data with normal distribution, inter-group comparisons were performed using Student's t-test. Mann-Whitney U test was used to compare means of variables not normally distributed. Group comparisons with respect to categorical variables were performed using chi-square tests or, alternatively, Fisher's exact test. A probability value of $P<0.05$ was considered statistically significant.

Results and Discussion

Characteristics and response to the ASHS for the participants were analyzed. Comparisons for age, sex, zBMI and survey variables (for usual sleep habits) between participant groups are shown in Table1. Adolescents of Group 1 had a mean age of 16.2 years with an average zBMI of 2.56, whereas Group 2 adolescents (n=30) had a mean age of 16.1 years ($P>0.05$) with an average zBMI of 0.7 ($P<0.05$). The proportion of girls in the study was 22.8% and 20.1% for Group 1 and Group 2, respectively ($P>0.05$).

School-night wake times in Group 1 did not differ significantly from the same variables in Group 2. On average, estimates were within 5 minutes, and all participants reported waking up at about 7:10 a.m. Conversely, survey-reported school-night bedtimes in Group 1 were significantly later (on average 60 minutes) and TST significantly less (on overage 65 minutes) than in Group 2 ($P<0.001$ for both variables). However, participants of Group 1 reported a trend toward longer times falling asleep versus adolescents of Group 2. Finally, survey-reported weekend bedtimes, TST and wake times in Group 1 did not differ significantly from the same variables in Group 2.

Next, we carried out a comparative analysis of the remaining questionnaire data and obtained the following results: About 60.8% of respondents in Group 1 answered that they have some sleep problems, compared with 28.6% in Group 2 ($P=0.048$). According to the self-assessment of possible sleep habits in the last two weeks, in the section "ASHS activities," 24.3% of respondents noted their activities in bed as "Read" in Group 1 and 25.1% in Group 2 ($P>0.05$); as "Watched TV" 37.4% and 31.1% ($P>0.05$), respectively; as "Ate" 54.8% in Group 1 and 27.1% in Group 2 ($P<0.05$); as "Did schoolwork" 16.9% and 17.1%, respectively ($P>0.05$); as "Worried" 24.6% in Group 1 and 19.8% in Group 2 ($P>0.05$). Furthermore, more than half of Group 1 adolescents (62.7%) answered "ate in the bed" as "Every day/night" compared with 28.3% of Group 2 respondents ($P=0.034$); and 44.4% of participants in Group 1 answered "watched TV in the bed" as "Every night" compared to 18.5% participants in Group 2 ($P=0.048$). In section "ASHS falling asleep" respondents noted when they had difficulty falling asleep: 42.8% of Group 1 respondents and 71.8% of Group 2 respondents "stayed in bed and tried to get to sleep" ($P=0.047$); 33% vs. 18.1% ($P=0.63$), respectively, "Did something in bed"(e.g., read, ate or watched TV); 9.1% of Group 1 adolescents and 10.1% of Group 2 participants "got up and watched TV" ($P=0.93$); also, 15.1% of Group 1 respondents answered that they "got up and drunk warm milk/water/tea/coffee."

Table 1.

Comparisons for age, sex, zBMI and ASHS assessment between participant groups

Variable	Group 1	Group 2
Age, y	16.3 ± 0.5	16.1 ± 0.3
Gender (M/F)	44 (77.2)/13(22.8)	24(80)/6(20)
BMI, kg/m2	34.9 ± 2.3*	19.8 ± 1.9
zBMI	2.4± 0.4*	0.7± 0.2
School-night TST, min	450.2(82.4)*	515.1(45.8)
Weekend-night TST, min	612.7(124.1)	618.5(83.2)
School-night bedtime^	23:07(1:22)*	22:05(45)
School-night wake time^	7:12(50)	7:07(42)
Weekend-night bedtime^	23:52(1:34)	23:47(53)
Weekend-night wake time^	10:05(1:31)	10:15(1:23)
Bedtime shift^	53(1:17)	1:47(52)*
School-night sleep latency, min	17(9.2)	13.6(8.4)
Weekend-night sleep latency, min	20.1(15.7)	15.7(10.1)

*^Bedtimes, wake times and bedtime shift are expressed in 24-h clock; zBMI, body mass index-for-age z-score; *P<0.05*

Our study found that adolescents with obesity have later school-night bedtimes, trend toward greater sleep latency and significantly shorter weekday sleep duration versus a NW peer. Of note is that as student sleep opportunities are curtailed most in the morning so as not to be late for school, the time that adolescents go to bed is a key determinant of how much sleep they obtain.[25] Surprisingly, NW adolescents had a greater bedtime shift than obese peers ($P<0.001$); that result differs from the results of Hayes et al. (2018), who found the same schedule pattern in adolescents with overweight and obesity.[26]

In that study, 186 respondents aged from 12 to 17 years reported typical sleep and wake times on weekdays and weekends using the Pittsburgh Sleep Quality Index questionnaire. In contrast to our results, that study found that zBMI was not related to weekday bedtimes, but significantly related to weekend bedtimes as well as bedtime shift in obese adolescents. However, shorter school-night TST in obese participants confirms the availability of relationships between sleep duration and overweight, which have been reported in the majority of the extant literature.[7,14,27,28] In the current study, we found that self-reported average sleep duration on the weekdays in an obese group was not within the recommended 8–10, hours, in contrast to the control group.[29,30] Specifically, only 14% of the obese adolescents reported more than 8 hours of sleep on school nights compared with 83% of NW adolescents.

It is argued that later bedtimes and sleep deficit occur due to the confluence of psychosocial and biological factors of adolescent development.[31] Much work has been done to determine how the types of activities adolescents engage in immediately before sleep impact subsequent sleep.[32,33] As the current study shows, about half of obese respondents reported that they "ate and watched TV in bed every night" in the last two weeks, which significantly differed from NW adolescents. The same behavioral patterns are also an important risk factor for obesity and are significantly associated with the severity of overweight. Many studies have found that screen time is adversely associated with both sleep outcomes [34] and obesity.[35] A previous study in children and adolescents with overweight and obesity showed that later bedtimes were related to increased daily high calorie food intake and screen time.[36]

The present study adds additional evidence and extends the current literature on the association of sleep habits with weight in adolescents with obesity. It showed that about two thirds of obese respondents had some sleep problems compared with one third of controls (P<0.05). Despite some limitations of the study, such as small sample size and self-reported survey estimates of sleep patterns only, we found certain differences between usual school- and weekend-night sleep habits in obese and NW participants, which allow justifying the possibility of using ASHS to assess sleep habits and schedules in Russian adolescents, including those with obesity. However, despite the results, future studies should use objective measures of sleep (polysomnography) and consider accurate measurement, particularly as self-reported sleep duration tends to be overestimated.

Competing Interests

The authors declare that they have no competing interests.

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