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Sleep patterns and insomnia among adolescents receiving child welfare services: A population-based study

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ABSTRACT

Objectives: Sleep problems are common in adolescence. We aimed to investigate sleep patterns and insomnia in Norwegian adolescents who have been in contact with child welfare services (CWS), both adolescents living in foster care (FC) and adolescents receiving in-home-services (IHS). Both groups were compared to youth who reported they were not receiving child welfare interventions.
Design: Cross-sectional.
Setting: The population-based study youth@hordaland from 2012 in Hordaland, Norway.
Participants: About 9421 adolescents (53.8% girls), age range 16-19 years, were divided into 3 groups; IHS group (n = 123), FC group (n = 132), and control group (n = 9166).
Measurements: Self-reported information about demographics, detailed sleep patterns, sleep problems, and adverse life events.
Results: Adolescents receiving IHS (vs. controls) had significantly shorter sleep duration, lower sleep efficiency, longer sleep onset latency (SOL), wake after sleep onset (WASO), and higher prevalence of insomnia. They had increased odds of insomnia (adjusted odds ratio [AOR] = 1.77, 95% confidence interval [CI] = 1.19-2.62) and SOL $\geq$ 30 minutes (AOR = 1.95, CI = 1.32-2.87). Adolescents in FC (vs. controls) reported lower sleep efficiency and longer WASO. When adjusting for sex and age, the associations did not substantially change. When additionally adjusting for adverse life events, the associations were considerably attenuated for both groups, and were no longer significant for the FC group.
Conclusion: Our results indicate a higher rate of sleep problems among adolescents receiving interventions from CWS, particularly those receiving IHS. Adverse life events accounted for a substantial part of the increased risk of sleep problems.

Introduction

Short sleep duration is common during adolescence, and the proportion of youth not obtaining sufficient sleep is on the rise.[1] Also, the high proportion of adolescents fulfilling the criteria for insomnia suggests that insufficient sleep quality is a public health concern.[2] The known negative associations between poor sleep and mental health problems and adjustment underlines the importance of addressing sleep in this age group.[3,4] While the focus on sleep patterns and insomnia in childhood and adolescence has increased in recent years, little is known about sleep in at-risk subgroups, such as adolescents receiving interventions from child welfare services (CWS).

The sparse literature on sleep in CWS-referred youth is restricted to some studies on CWS-referred youth in general and some studies on subgroups within the CWS, such as youth in foster care (FC). Moreover, much of the literature has largely focused on younger children. A recent study based on parental report (n = 113), found a similar sleep duration among children referred to the CWS compared

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with general population peers.[5] Other studies have shown that sleep patterns in this population generally fall within the normal range, as demonstrated both among 197 CWS-referred infants and toddlers when sleep diaries and sleep items on the Child Behavior Checklist (CBC-L) was used.[6] Similar results were found in a study of 25 preschoolers in FC, with parents completing a questionnaire about sleep.[7] Another small study of 32 children in FC found that they had longer sleep onset latency (SOL) and shorter sleep duration, but no differences were observed for sleep efficiency or wake after sleep onset (WASO) measured by actigraphy when compared to community controls.[8] Shorter sleep duration and longer SOL and WASO, measured by a FitBit wristband, were also found among 111 young adults previously in FC compared to a low income-sample of young adults.[9]

To our knowledge, previous studies have not investigated insomnia among adolescents distinguishing between those receiving in-home services (IHS) and those living in FC, although some studies have assessed specific symptoms of insomnia within subgroups of CWS-referred youth. Twenty percent of caregivers of 516 preadolescent foster children reported sleep problems on the sleep items included in the Child Behavior Checklist,[10] while 10% of 4280 children and adolescent entering state custody care had sleep problems, assessed by a single sleep item.[11] A large extent of sleep problems was further indicated by a Norwegian registry study reporting that 24% of 2171 adolescents and young adults placed under residential care in Norway used sleep medication, compared to 3% in the general population.[12]

Exposure to poverty, inadequate parenting, and maltreatment, are common among youth referred to the CWS.[13] A few studies have linked such adverse life events to increased risk of sleep problems among CWS-referred children and youth.[9] For instance, previous sexual abuse was related to poor sleep in samples of young foster care children,[7] and 315 adolescents placed under residential care.[14] Still, the interplay between placement type, exposure to adverse life events, and sleep problems among youth receiving IHS or living in FC have received little attention.

The degree of exposure to adverse life events likely differs between youth receiving IHS compared to those placed in FC. Whereas FC-youth often have faced more severe exposure before placements, they appear to be at lower risk of maltreatment after receiving a foster family.[15] Youth receiving IHS, on the other hand, risk continued exposure,[16] but are spared the potential trauma of being separated from their biological parents. A recent meta-analysis found few differences in mental health problems between these 2 groups.[17] However, a previous study on the same population as the current study found that youth receiving IHS reported more mental health problems than peers in FC.[18] In the Norwegian CWS the preferred choice of intervention is the "least intrusive alternative,"[19] and therefore, voluntarily IHS are often preferred. Around 60% of children in contact with CWS receive support while living at home with their biological parents,[20] but if necessary, and voluntary services are not sufficient, the adolescent will be placed out of the home.[21] According to national statistics, about 8 of 10 of children in out-of-home-care lives in FC,[20] and approximately 3% of Norwegian children receive interventions each year.[22] The CWS in Norway has a relatively extensive outreach compared with many other Western countries.[23] Hence, the group of adolescents in contact with CWS in Norway may not be directly comparable to other countries.

Few studies have investigated sleep patterns and insomnia among adolescents receiving CWS. The study contributes to the current literature by using detailed sleep measurements to investigate sleep in 2 subgroups of adolescents receiving CWS. The aim of the present study was to assess sleep patterns, including sleep duration, SOL, WASO, sleep efficiency, oversleeping, and insomnia, among adolescents receiving IHS and those placed in FC, compared with the general adolescent population. We also wanted to examine to what extent adverse life events could explain any of the observed associations. Associations between poor sleep and adverse life events, such as abuse, neglect, and witnessing domestic violence, are also found in the general population.[24] Also, previous abuse has been linked to longer SOL, WASO, and lower sleep efficiency.[25] It is well documented that youth receiving IHS or in FC have more mental health problems than general population youth.[17] As mental health problems and sleep problems often co-occur,[26,27] we hypothesized that youth receiving IHS or in FC would display more sleep problems than general population peers.

Participants and method

Study population and procedure

Data stem from the population-based youth@hordaland study conducted in 2012 in Hordaland county in Western Norway. The youth@hordaland study was a collaboration between Hordaland County Council and the Regional Centre for Child and Youth Mental Health and Child Welfare. The main aim of youth@hordaland was to assess mental health, service use, and lifestyle factors. All adolescents born between 1993 and 1995 in Hordaland county were invited. The survey was web-based, and one school-hour (approx. 45 minutes) was allocated to complete the survey at school. The data collection and protection of confidentiality were organized by school personnel. For those not attending school, the invitation to the survey was sent by mail to their home address. Institutions where adolescents resided at the time of the study were contacted to allocate time for completion of the survey at the institution.

Ethical considerations. In accordance with Norwegian regulations, adolescents aged 16 years and older can make decisions regarding their own health (including participation in health studies), and thus gave consent themselves to participate. The participants' parents were informed about the study. The study was approved by the Regional Committee for Medical and Health Research Ethics in Western Norway.

Sample

Out of the 19,439 adolescents invited, 10,257 (53%) participated. Four hundred seventy-two responses were removed prior to analysis due to item nonresponse on whether they had contact with CWS, whereas 364 participants were removed due to obvious invalid responses on sleep variables (eg, negative sleep duration and sleep efficiency). The final number of participants was 9421 (M_{age} = 17.4 years, age range 16-19 years).

Measures

Demographic information. Information about age and sex was retrieved from the personal identification number from the Norwegian Population Registry for all participants. The adolescents reported whether they and their parents were born in Norway or abroad. Socioeconomic status (SES) was measured by maternal and paternal education, divided into primary school (year 1-10), upper secondary school (year 11-13), and college/university (year 14 and higher). SES also included the participants' perceived economic well-being. Employment status of parents was registered by the participants and coded according to the ISCO-08 classification.

Child welfare services (CWS). The independent variable in this study was CWS status,[28] and 3 groups were constructed, depending on contact with CWS during the past year and whether they lived with foster parents. The FC group was based on 3 variables specifying whether the participants currently lived with foster parents, foster

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mother, and/or foster father. A total of 132 (1.4%) were included in the FC group. The IHS group included the participants who reported contact with CWS during the past year and that they did not live with foster parents. This group also included a small subset of adolescents living in residential care. A total of 123 (1.3%) participants were included in the IHS group. The rest of the participants comprised the general population (n = 9166).

Sleep. The participants reported bedtime and rise time separated in weekdays and weekends. Bedtime was subtracted from rise time to calculate time in bed (TIB). WASO and SOL were reported in hours and minutes by the participants. SOL was dichotomized into "< 30 min" and "30 min and more." Sleep duration was calculated by subtracting SOL and WASO from TIB. Sleep efficiency (in percentages) was calculated by dividing sleep duration by TIB and multiplying by 100. Participants reported how often they were not able to get to school in time because of oversleeping on a Likert scale with the response alternatives "never," "a few times a year," "a few times a month," "several times a week," or "every day." "Oversleeping" was dichotomized into "never/a few times a year" as not having a problem with oversleeping, and "a few times a month/several times a week/every day" as having problems with oversleeping.

Insomnia was operationalized consistent with DSM-5 criteria[29] and according to a previously used operationalization.[2] The participants reported whether they had difficulties initiating and maintaining sleep (DIMS) on a Likert-scale with the alternatives "not true," "sometimes true," and "certainly true." If confirming having problems ("somewhat true" or "certainly true"), they were asked how many times a week it occurred, reported separately for initiating and maintaining sleep. They also reported daytime sleepiness or tiredness with the alternatives "not true," "sometimes true," and "certainly true." If confirming sleepiness or tiredness, they were asked to report separately how many days a week they were experiencing the problems. The following 3 criteria were used as an operationalization for insomnia (1) the presence of either difficulties initiating sleep or difficulties maintaining sleep, for at least 3 nights per week, (2) the presence of daytime sleepiness and tiredness for at least 3 days per week, and (3) a duration of the sleep problems for at least 3 months.

Adverse life events. Adverse life events were measured by the question "Have you ever experienced any of the following events?" with following alternatives:

1) "Death of someone close to you," with the response alternatives "parent/guardian," "sibling," "grandparent," "other close person in the family," "close friend," and "girlfriend/boyfriend"
2) "A catastrophe or serious accident"
3) "Violence from a grownup (you were beaten, pulled by your hair, or the like)"
4) "Witnessed someone you care about being exposed to violence from a grownup"
5) "Unwanted sexual actions"

A variable indicating the total number of adverse life events was calculated, where death of a parent/guardian, sibling, close friend, and girlfriend/boyfriend were included as separate adverse events, giving a total of 8 possible adverse events. As few adolescents reported 5 or more adverse life events, responses of 4 or more were collapsed into one category, giving the categories: 0, 1, 2, 3, and 4 or more. The variable was coherent with previously used operationalization.[30]

Statistical analysis

SPSS 25.0 (IBM Corporation, Armonk NY) for Windows/Apple Mac was used for all analyses. Chi-squared tests were used to compare sociodemographic variables between the IHS group and FC group against the general adolescent population. In our first set of analyses, we fitted a series of ordinary least squares (OLS) regressions to investigate the association between CWS status and sleep patterns. Sleep patterns include bedtime, rise time, TIB, sleep duration, and sleep efficiency, in both weekdays and weekends, and WASO and SOL, not separated in weekdays and weekends. Age and gender were added as covariates due to the unbalanced age and gender distributions across the 3 groups. From these models, estimated marginal means (EMMs) were calculated using the R-package "emmeans."[31] EMMs calculate the predicted means of each sleep outcome for each level of the factorial predictor (IHS, FC, GP) at the mean values of the covariates. The analyses were adjusted for multiple comparison by using the Benjamini and Hochberg false discovery rate control,[32,33] specifying 24 comparisons and a significance level of 0.05. The p values ranging from .001 to .019 remained significant (for example the p value of .007 was compared to an adjusted cut-off at 0.027, while the p value of .19 was compared to a cut-off at .031). Logistic regression analyses were used to estimate associations between IHS/FC and sleep problems, including insomnia, SOL, and oversleeping, comparing the IHS group and FC group separately against the general population. The analyses were performed in 3 steps: (1) unadjusted, (2) adjusted for sex and age, and (3) additional adjustment for adverse life events. The analyses were adjusted for multiple comparison as described above, specifying 18 comparisons and a significance level of 0.05. The p values of .001 (adjusted cut-offs ranging from 0.002 to 0.022), .004 (adjusted cut-off 0.025), .005 (adjusted cut-off 0.028), and .008 (adjusted cut-off 0.031) remained significant in the adjusted analyses.

Results

Study sample

More females than males received IHS, while slightly more males than females lived in FC. Compared with the general population, adolescents receiving IHS or living in FC were somewhat younger, more likely to be of foreign origin, and more likely to have unemployed- or parents with low levels of education. Additionally, the IHS group perceived their economic well-being more frequent to be poor (Table 1). A total of 174 reported having contact with CWS during the past year. In the FC group, 38.6% reported having contact with CWS the past year. The adolescents with missing responses on whether or not they had been in contact with the CWS during the past year (n = 472) were somewhat different from the adolescents with valid responses (n = 10,257). Specifically, they were more often boys (60.8% vs. 46.7%; $p < .001$) and were slightly older (17.58 vs. 17.42 years of age; $p < .001$).

Sleep patterns and insomnia

As outlined in Table 2, compared with general population, the IHS group reported significantly shorter sleep duration on weekdays (5:06 hours vs. 6:27 hours) and weekends (7:33 hours vs. 8:39 hours). They also reported significantly later bedtimes on weekdays (23:1 vs. 23:19; $p < .05$) and weekends (02:05 vs. 1:35; $p < .001$), and risetime (11:45 vs. 11:16; $p < .001$) in the weekends. In the weekdays they reported less time spent in bed (7:16 vs. 7:29; $p < .05$). Further, the sleep efficiency was lower for the IHS group, both during weekdays (69.6% vs. 85.4%) and weekends (77.3% vs. 89.1%) compared with the general population (all ps < 0.001). Finally, both mean SOL (1:23 hours vs. 0:48 hours) and WASO (0:43 hours vs. 0:15 hours) were longer in the IHS group than in the general population (all ps < 0.001). Adolescents in FC had an earlier risetime than the general population, but only in weekdays (6:34 vs.6:46; $p < .001$). They also had somewhat shorter sleep duration than the general population in weekdays only (5:59 hours vs. 6:27 hours; $p = .02$). In addition, sleep efficiency was lower among adolescents in FC than the general population in both weekdays (80.4% vs. 85.4%) and weekends (85.2% vs. 89.1%; ps < 0.05), and WASO was higher (0:30 hours vs. 0:15 hours; $p < .05$).

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Table 1
Demographical variables in the youth@hordaland-study for the general population, and for those who receive CWS interventions (IHS and FC, N = 9421)

Demographic variables	GenPop (n = 9166) n (%)	Received CWS interventions: IHS (n = 123) n (%)	Received CWS interventions: FC (n = 132) n (%)
Sex		**$p = .002$**	$p = .429$
Girls	4935 (53.8)	**84 (68.3)**	66 (50.0)
Age[1]	17.43 (.84)	**17.15 (.75), $p < .001$**	**17.23 (0.80), $p = .008$**
Ethnicity			
Self: from Norway	8631 (95.3)	**101 (84.9), $p < .001$**	**93 (74.4), $p < .001$**
Mother: from Norway	8423 (92.0)	**104 (84.6), $p = .005$**	**93 (71.5), $p < .001$**
Father: from Norway	8284 (90.7)	**96 (78.0), $p < .001$**	**95 (74.2), $p < .001$**
Maternal education		**$p < .001$**	**$p = .011$**
Primary school	678 (9.7)	**25 (30.9)**	**16 (19.0)**
Upper secondary school	2869 (41.2)	**34 (42.0)**	**35 (41.7)**
College / University	3420 (49.1)	**22 (27.2)**	**33 (39.3)**
Paternal education		**$p < .001$**	$p = .165$
Primary school	708 (10.4)	**16 (23.2)**	12 (15.2)
Upper secondary school	3160 (46.3)	**37 (53.6)**	40 (50.6)
College / university	2964 (43.4)	**16 (23.2)**	27 (34.2)
Mother: employed	8000 (92.5)	**80 (72.1), $p < .001$**	**74 (69.2), $p < .001$**
Father: employed	7953 (95.2)	**80 (86.0), $p < .001$**	**85 (85.0), $p < .001$**
Perceived economic well-being		**$p < .001$**	$p = .135$
Better than others	2296 (25.5)	**22 (18.6)**	31 (25.0)
Equal to others	6086 (67.7)	**60 (50.8)**	79 (63.7)
Poorer than others	607 (6.8)	**36 (30.5)**	14 (11.3)

Note. GenPop, general population; CWS, child welfare services; FC, foster care; IHS, in-home services.
Bold fonts denote statistically significant differences ($p < .05$), compared with the general population (reference).
[1] Mean (SD).

Table 2
Sleep patterns and insomnia among adolescents receiving child welfare services (N = 9421)

Sleep variables	GenPop (n = 9166) M (95% CI)	Received CWS interventions: IHS (n = 123) M (95% CI)	IHS Effect size	Received CWS interventions: FC (n = 132) M (95% CI)	FC Effect size
Weekdays					
Bedtime	23:19 (23:17, 23:20)	**23:31 (23:21, 23:42, $p = .019$)**	**0.21**	23:11 (23:01, 23:22, $p = .171$)	−0.12
Rise time	6:48 (6:47, 6:49)	6:46 (6:39, 6:54, $p = .663$)	−0.04	**6:34 (6:27, 6:41, $p < .001$)**	**−0.34**
Time in bed (h:min)	7:29 (7:28, 7:31)	**7:16 (7:05, 7:27, $p = .016$)**	**−0.22**	7:23 (7:12, 7:33, $p = .217$)	−0.11
Sleep duration (h:min)	6:27 (6:25, 6:29)	**5:06 (4:48, 5:24, $p < .001$)**	**−0.81**	**5:59 (5:42, 6:17, $p = .002$)**	**−0.28**
Sleep efficiency (%)	85.7 (85.30, 86.03)	**69.9 (66.75, 73.09, $p < .001$)**	**−0.89**	**80.7 (77.65, 83.74, $p = .002$)**	**−0.28**
Weekends					
Bedtime	01:35 (01:33, 01:36)	**02:05 (01:49, 02:20, $p < .001$)**	**0.34**	01:26 (01:11,01:41, $p = .271$)	−0.10
Rise time	11:16 (11:14, 11:18)	**11:45 (11:29, 12:02, $< .001$)**	**0.32**	11:17 (11:01, 11:33, $p = .954$)	0.01
Time in bed (h:min)	9:41 (9:40, 9:43)	9:42 (9:27, 9:57, $p = .949$)	0.01	9:51 (9:36, 10:05, $p = .211$)	0.11
Sleep duration (h:min)	8:39 (8:37, 8:41)	**7:33 (7:13,7:53, $p < .001$)**	**−0.60**	8:27 (8:08, 8:47, $p = .247$)	−0.10
Sleep efficiency (%)	89.0 (88.73, 89.30)	**77.0 (74.60, 79.51, $p < .001$)**	**−0.87**	**85.3 (82.90, 87.61, $p = .002$)**	**−0.27**
Sleep onset latency (h:min)[1]	0:48 (0:47, 0:49)	**1:23 (1:13, 1:33, $p < .001$)**	**0.60**	0:51 (0:41, 1:01, $p = .610$)	0.04
Wake after sleep onset (h:min)[1]	0:15 (0:14, 0:16)	**0:43 (0:36, 0:51, $p < .001$)**	**0.72**	**0:30 (0:23, 0:37, $p = .007$)**	**0.38**

Note. GenPop, general population; CWS, child welfare services; FC, foster care; IHS, in-home services; M, mean; h, hours; m, minutes.
Estimated marginal means adjusted by age and gender. Effect sizes are represented by the standardized mean difference.
Bold fonts denote statistically significant differences ($p < .05$), compared with the general population (reference).
[1] Both weekends and weekdays.

Table 3 shows that the IHS group in unadjusted analyses had significantly higher odds for insomnia (odds ratio [OR] = 2.87), sleep onset latency (OR = 2.77), and oversleeping (OR = 2.94; all ps < 0.001). Adjustment for sex and age did only slightly change these associations. However, additional adjustment for adverse life events attenuated the associations considerably (adjusted OR ranging from 1.77 to 2.15; all ps < 0.01). The associations were less consistent and robust for the FC group, whereby only oversleeping (OR = 1.65) were significantly different from the general population. These associations were not substantially attenuated after adjustment for age and sex, but no significant differences remained after the additional adjustment for adverse life events.

Discussion

In the present large-scale study, adolescents receiving IHS and those living in FC differed from the general population on several sleep parameters. The IHS group presented with shorter sleep duration, longer SOL, longer WASO, lower sleep efficiency in both weekdays and on weekends, and a had higher rate of insomnia than the general population. The FC group presented with shorter sleep duration in weekdays, longer WASO, and lower sleep efficiency. Adjusting for adverse life events attenuated the associations between CWS status and sleep problems, and youth in FC were no longer significantly different to the general population.

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Table 3
Logistic regression analyses for associations between IHS- and FC-status and measures of sleep (N = 9421)

	Received CWS interventions	
Sleep variables	IHS (n = 123)	FC (n = 132)
Insomnia DSM-V		
Unadjusted, OR [95% CI]	**2.87 [1.99, 4.13], $p < .001$**	.95 [.60, 1.49], $p = .806$
Partially adjusted, AOR [95% CI][1]	**2.68 [1.84, 3.92], $p < .001$**	1.01 [.64, 1.59], $p = .979$
Fully adjusted, AOR [95% CI][2]	**1.77 [1.19, 2.62], $p = .005$**	.80 [.49, 1.29], $p = .351$
Sleep onset latency ≥ 30 min		
Unadjusted, OR [95% CI]	**2.77 [1.91, 4.01], $p < .001$**	1.14 [.80, 1.61], $p = .470$
Partially adjusted, AOR [95% CI][1]	**2.61 [1.80, 3.80], $p < .001$**	1.15 [.81, 1.64], $p = .421$
Fully adjusted, AOR [95% CI][2]	**1.95 [1.32, 2.87], $p = .001$**	1.02 [.71, 1.47], $p = .914$
Oversleeping		
Unadjusted, OR [95% CI]	**2.94 [2.05, 4.22], $p < .001$**	**1.65 [1.14, 2.40], $p = .008$**
Partially adjusted, AOR [95% CI][1]	**3.05 [2.12, 4.40], $p < .001$**	**1.74 [1.20, 2.54], $p = .004$**
Fully adjusted, AOR [95% CI][2]	**2.15 [1.47, 3.14], $p < .001$**	1.44 [.97, 2.13], $p = .072$

Note. CWS, child welfare services; FC, foster care; IHS, in-home services; OR, odds ratios; AOR, adjusted odds ratio; CI, confidence interval.
Bold fonts denote statistically significant differences ($p < .05$), compared with the general population (reference).
[1] Adjusted for age and sex.
[2] Adjusted for age, sex and adverse life events.

Adolescents in contact with the CWS differed on sleep patterns compared to their peers on weekdays, although youth in FC had similar bedtime and time in bed, in line with previous research on younger foster children.[8] The short sleep duration in the present study was largely a result of long SOL and WASO, also reflected in a low sleep efficiency. The long WASO is surprising given that this is unusual among adolescents. Similar findings have, however, also been found among foster care alumni[9] and could be a key characteristic of sleep in this group. The literature on short sleep duration in CWS is mixed,[5,7,9] and the present study indicates that short sleep duration as a result of wake time in bed may be a challenge during adolescence for this group. Disrupted and low-quality sleep is also a key feature of insomnia. In the present study, insomnia was more frequent in the IHS group, with a rate of 39%, while the FC group had similar rates to the general population. While no previous studies have investigated insomnia, it is in line with a high rate of sleep problems among foster children and adolescent.[10,11]

The present study may suggest that adolescents receiving IHS experience more sleep difficulties than adolescents living in FC, as the magnitude of the effect sizes was observably larger (except for rise time on weekdays) when comparing youth in IHS and the general population, than when comparing youth in FC with the general population. This could be related to the family situation, where foster parents have been through selection and supervision from the CWS-system over time and adolescents living in FC have often established supportive family environments. In comparison, adolescents in IHS still reside in often turbulent and nonresolved family conditions. The heightened risk for sleep problems in the IHS group may indicate that having a safe and stable home environment can affect sleep positively, as discussed by Dubois et al.[7] In this respect, youth in FC and adopted youth are similar as they have been disrupted from their biological families and established new family environments. Sleep patterns in the FC group were similar to internationally adopted adolescents in Norway, who reported shorter sleep duration in weekdays, lower sleep efficiency and longer WASO.[34] Future studies are needed to further disentangle the mechanisms involved in sleep problems in high-risk groups, including children and adolescents in the CWS. Future studies using larger samples are also needed in order to more robustly test for differences in sleep between youth receiving IHS and youth in FC.

Adverse life events attenuated the odds of oversleeping for both groups, as well as for insomnia and long SOL for the IHS group. Interestingly, after adjustment for adverse life events, no associations with sleep problems were significant in the FC group. These findings lend some support to previous literature that have linked adverse life events with long SOL among foster children[7] and in the general population.[24] Previous research has also pointed to a correlation between sleep disturbances and both sexual and physical abuse.[14] Further, marital aggression and parental problem drinking have been shown to be associated with sleep problems in children.[35,36] The importance of adverse life events for sleep is also reflected in diagnostic criteria for PTSD, where sleep disturbances and nightmares are included as symptoms.[29] Also, adults who reported trauma related thoughts, had higher somatic and cognitive arousal as well as longer SOL and worse sleep quality.[37] Pre-sleep arousal, including physiological and cognitive activation, is also known to be an important risk factor for sleep problems among children,[38] and this may be one of the mechanisms for sleep problems for this group. This could be related to stress activating the hypothalamic-pituitary-adrenal axis, which can influence both SOL and WASO.[39]

Strengths and limitations

The strengths of this study include the use of detailed sleep measures, the large sample size, and the ability to distinguish between 2 subgroups within the CWS. This study also has some limitations. Sleep and CWS-contact were measured by self-report, and we are unable to directly verify the accuracy of the adolescents' answers. However, national statistics of CWS-contact are only slightly higher than in the present study, lending some support to the representativeness of the sample.[22] Nevertheless, adolescents in school are somewhat overrepresented in the study, and it could be likely that adolescents in contact with CWS are less likely to attend school and thus that there is some underestimation of the true extent of CWS contact. Boys were overrepresented among the adolescents with missing responses on whether or not they had been in contact with CWS during the past year. This may have contributed to the high ratio of girls in the IHS group of the present study and should be taken into account when interpreting our results. Insomnia was based on questionnaire report and not on a diagnostic interview. Including nightmares would have strengthened the study, given the high rate of WASO, and the importance of nightmares in interrupted sleep, especially in relation to traumatic experiences[40] and PTSD.[29] Moreover, the IHS group was defined according to contact with the CWS during the past year, and we lacked information about the duration and number of interventions received from the CWS. Similarly, data on placement history (eg, the reason for- and number of placements) among youth in FC were not available. Also, to compare the FC group and IHS group would have strengthen the study, however this was not done due to a limited number of participants in the 2 groups. Additionally, in a larger scale study, potential gender interactions could be robustly tested. Adolescents living in residential care in contact with CWS were included in the IHS group. This decision was made due to a very small number of adolescents living in residential care, as well due to the unique role FC has within the Norwegian CWS (ie, to provide a lasting new family environment for the placed children and youth). In the present study we did not distinguish between different subtypes of adverse life events, due to lack of statistical power, something that adds as a limitation. Different adverse life events may have different potential for long-term harm.[41] It is likely that some of the assessed adverse life events (eg, death of someone close, catastrophe or serious accident) are less likely to lead

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to CWS-involvement compared (eg, encountering physical violence, witnessing violence). It is also possible that different adverse life events would be differentially related to sleep. Future studies are needed to explore this possibility. Finally, due to a response rate of 53%, we advise that caution should be used when generalizing the results of the present study.

Implications

The high rate of sleep problems among adolescents in contact with the CWS underlines the importance of interventions to improve sleep in this high-risk group. Nevertheless, screening and treatment directed to the CWS group should also be a focus for health and social workers in contact with the adolescents. In addition to improving sleep, interventions may have positive effects on mental health problems and reduce delinquency.[10] Since sleep problems are associated with low stigma, sleep interventions could be more appealing to adolescents than treatment for other mental health problems.[42] While there is little information on treatments available for adolescents in CWS, the high subscription rate of sleep medication indicates both an often used treatment as well as the need for treatments.[12] CBT-I has been documented to be effective in treating insomnia,[43] also for adolescents,[44] and should thus be offered to adolescents receiving IHS or living in FC who is suffering from insomnia. Co-occurring mental health problems and adverse life events may indicate that integrated treatment approaches are needed.

Conclusions

To conclude, our results suggest that adolescents receiving interventions from CWS are at high risk of experiencing sleep problems, over and beyond that of general population youth. Youth receiving IHS appear to be a particularly vulnerable group. Exposure to adverse life events emerged as an important factor explaining the increased risk of sleep problems among youth within the CWS. This study points to the importance of assessing and treating sleep problems in this group, and to give parents in contact with the CWS the knowledge they need to facilitate good sleep.

Declaration of conflict of interest

The authors have no conflicts of interest to declare.

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