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Sleep and use of alcohol and drug in adolescence. A large population-based study of Norwegian adolescents aged 16 to 19 years



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ABSTRACT

Background: Changes in sleep patterns and increased substance involvement are common in adolescence, but our knowledge of the nature of their association remains limited. The aim of this study was to examine the association between several sleep problems and sleep behaviours, and use and misuse of alcohol and illicit drugs using data from a large population-based sample.

Methods: A large population-based study from Norway conducted in 2012, the youth@hordaland study, surveyed 9328 adolescents aged 16–19 years (54% girls). Self-reported sleep measures provided information on sleep duration, sleep deficit, weekday bedtime and bedtime difference and insomnia. The main dependent variables were frequency and amount of alcohol consumption and illicit drug use, in addition to the presence of alcohol and drug problems as measured by CRAFFT.

Results: The results showed that all sleep parameters were associated with substance involvement in a dose–response manner. Short sleep duration, sleep deficit, large bedtime differences and insomnia were all significantly associated with higher odds of all alcohol and drug use/misuse measures. The associations were only partly attenuated by sociodemographics factors and co-existing symptoms of depression and ADHD.

Conclusions: To the best of our knowledge, this is the first population-based study to examine the association between sleep, and alcohol and drug use, by employing detailed measures of sleep behaviour and problems, as well as validated measures on consumption of alcohol and illicit drug use. The findings call for increased awareness of the link between sleep problems and alcohol and drugs use/misuse as a major public health issue.

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1. Introduction

Adolescence is a transitional period characterized by both changes in sleep patterns and increased substance involvement (Carskadon, 2011; Hasler et al., 2014b; Pedersen and Skrandal, 1998; Skogen et al., 2014). A recent population-based study from 2012 showed that adolescents aged 16–19 receive less than 6.5 h of sleep per night, and nearly one in five adolescents fulfil the DSM-5 diagnostic criteria for insomnia disorder (Hysing et al., 2013). Adolescent sleep problems have been linked to both higher rates of

depressive symptoms (Sivertsen et al., 2014), poor academic performance (Dewald et al., 2010), as well as increased risk for school non-attendance (Hysing et al., 2014). Similarly, alcohol and illicit drug use among adolescents have been linked to a range of deleterious consequences, including higher risk of frequent intoxication, abuse and dependence, in addition to violence, injuries (Jacobs et al., 2001), and several adverse health outcomes (Ellickson et al., 2003; Roebuck et al., 2004; Skogen et al., 2014; Townsend et al., 2007).

The relationship between sleep problems and alcohol use has been thoroughly demonstrated in adult samples (Roehrs and Roth, 2001). A recent review in adolescents showed that several aspects of sleep problems and sleep behaviours were significantly associated with increased alcohol use (Hasler et al., 2014b). However, the majority of the included studies were conducted on small or clinical samples (Clark et al., 2001; Hasler et al., 2014a; Kenney et al.,

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2012, 2013), and only a few population-based studies have examined the link between sleep and use of alcohol and illicit drugs in adolescence. One exception is a large Hong Kong study of 33,000+ adolescents aged 11–18 that demonstrated that weekly alcohol use assessed with a single item was associated with increased rate of insomnia symptoms (difficulties initiating/maintaining sleep, and early morning awakenings; Huang et al., 2013). However, the list of adjustment variables in that study was limited. Further, in a US study of 13,000+ adolescents aged 12–17, the item “trouble sleeping during the past 6 months” was significantly associated with several variables assessing use of alcohol and illicit drugs, even after adjusting for comorbid mental health problems (Johnson and Breslau, 2001). Similarly, a study of 12,000+ US high school students found that short sleep duration (<8 h, assessed with a single item), was associated with increased use of marijuana and alcohol, after adjusting for demographical factors (McKnight-Eily et al., 2011). To the best of our knowledge, no large-scale studies have examined this association by employing detailed measures of both sleep behaviour and problems, as well as validated measures on alcohol and drug problems, and consumption of alcohol and illicit drug use.

Thus, the main objective of the current study was to examine the association between a range sleep problems and sleep behaviours, and use and misuse of alcohol and illicit drugs using data from a large population-based sample. We expected short sleep duration and insomnia to be related to both alcohol consumption and problematic alcohol and drug use. We also wanted to investigate if the associations could be explained by potential co-occurring mental health problems, such as symptoms of depressive symptoms and attention-deficit/hyperactivity disorder (ADHD), both of which have been linked to sleep problems and alcohol use (Owens et al., 2013; Sivertsen et al., 2014; Skogen et al., 2014).

2. Materials and methods

In this population-based study, we used data from the youth@hordaland survey of adolescents in the county of Hordaland in Western Norway. The youth@hordaland survey is the fourth wave of the Bergen Child study, where children born 1993–1995 are followed from elementary to upper secondary school age. All adolescents and students attending secondary education during spring 2012 were invited to participate. The main aim of the survey was to assess the prevalence of mental health problems and service use in adolescents. Data were collected during spring 2012. Adolescents in upper secondary education received information via their official school e-mail address, and one classroom school hour was allocated for them to complete the questionnaire.

2.1. Sample

Of the 19,430 invited to take part, 10,200 agreed, yielding a participation rate of 53%. All sleep variables were manually checked for validity and data from subjects providing obvious invalid responses were omitted for further analyses. Invalid responses included (1) sleep onset latency (SOL)+wake after sleep onset (WASO) > time in bed (TIB), and (2) negative values of sleep duration and sleep efficiency. This resulted in data from 374 subjects being omitted.

2.2. Instruments

Sleep variables: The adolescents' typical self-reported bedtime and rise time were indicated in hours and minutes and were reported separately for weekdays and weekends. Bedtime difference was defined as the difference in hours and minutes in bedtime between weekdays and weekends. Typical time in bed

(TIB) was calculated by subtracting bedtime from rise time. Sleep onset latency (SOL) and wake after sleep onset (WASO) were indicated in hours and minutes, and sleep duration was defined as TIB minus (SOL + WASO). Subjective sleep need (each individual's own perceived sleep need) was reported in hours and minutes and the phrasing of the question was “How much sleep do you need to feel rested?” Sleep deficit was calculated separately for weekends and weekdays, subtracting total sleep duration from subjective sleep need. For the purpose of the present study, sleep duration was split into 6 categories (<5 h, 5 to <6 h, 6 to <7 h, 7 to <8 h, 8 to <9 h, ≥9 h). Only weekday data for sleep duration and sleep deficit are presented in the current paper.

Insomnia was operationalized according to the DSM-5 criteria for insomnia (American Psychiatric Association, 2013). Difficulties initiating and maintaining sleep (DIMS) were rated on a three point Likert-scale with response options “not true”, “somewhat true” and “certainly true”. Given a positive response (“somewhat true” or “certainly true”), the participants were then asked how many days per week they experienced problems either initiating or maintaining sleep. The participants also provided information on the duration of DIMS. A joint question on tiredness/sleepiness was rated on a three point Likert-scale with response options “not true”, “somewhat true” and “certainly true”. If confirmed (“somewhat true” or “certainly true”) participants reported the number of days per week they experienced sleepiness and tiredness, respectively. To fulfil the DSM-5 criteria for insomnia, the adolescents had to report DIMS for at least three times a week, with a duration of three months or more, as well as tiredness or sleepiness on at least three days per week.

Alcohol problems and illicit drug use: Frequency and amount of alcohol consumption and illicit drug use were included as main outcome. We included a binary measure of alcohol lifetime prevalence “Have you ever tried alcohol?” (Yes/No), and illicit drug-use: “Have you ever tried hashish, marihuana or other narcotic substances?” (Yes/No). Alcohol use was measured using the self-reported units of beer, cider, wine, spirits and illegally distilled spirits usually consumed during the past 14 days. Based on this information about consumption and alcohol debut, a summed variable on gender-specific distributions was constructed: ‘Never tried’, ‘Non-consumption’ (if reported consumption was ‘0’), ‘0.1–19.9th’, ‘20.0–79.9th’, ‘80.0–89.9th’, ‘90.0–100th’. Excessive alcohol consumption was defined as above the 90th centile sum (Skogen et al., 2009, 2011). Frequent intoxication was defined as drinking so much that one was clearly intoxicated more than 10 times, based on the question: “Have you ever consumed so much alcohol that you were clearly intoxicated (drunk)?”, with five categories ranging from ‘No, never’ to ‘Yes, more than 10 times’. In addition, potential alcohol and drug problems were identified using the CRAFFT. The CRAFFT-questionnaire is a screening tool developed specifically to identify problematic alcohol and drug use among adolescents (Knight et al., 1999). The questionnaire consists of 6 questions with the response categories “yes” or “no”. Each question contributes to the acronym CRAFFT:

- (1) Have you ever ridden in a car driven by someone (including yourself) who was “high” or had been using alcohol or drugs?
- (2) Do you ever use alcohol or drugs to relax, feel better about yourself, or fit in?
- (3) Do you ever use alcohol or drugs while you are by yourself, alone?
- (4) Do you ever forget things you did while using alcohol or drugs?
- (5) Does your family or friends ever tell you that you should cut down on your drinking or drug use?
- (6) Have you ever gotten into trouble while you were using alcohol or drugs?

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