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Continuity of sleep problems from adolescence to young adulthood: results from a longitudinal study☆

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ABSTRACT

Background: Considering the lack of evidence on incidence and continuity of sleep problems from adolescence to young adulthood, this study explores sleep problems' incidence and their continuation rates from 14 to 21 years.
Methods: Sleep data from the 14-year (n = 4,924) and 21-year (n = 3660) follow-up of the Mater-University of Queensland Study of Pregnancy cohort were used. Sociodemographic, lifestyle, and psychological conditions were explored for their role in sleep problems. Modified Poisson regression with a robust error variance was used to identify predictors. Inverse probability weights were used to account for attrition.
Results: Of all subjects, 26.0% of the subjects at 14 years and 28.3% of the subjects at 21 years reported "often" sleep problems, with 41.7% of adolescent sleep problems persisting at 21 years. Perinatal and early-life maternal factors, for example, drug abuse (incidence rate ratio (IRR), 1.32; 95% confidence interval [CI], 1.02-1.71), smoking, depression, and anxiety, were significant predictors of adolescent sleep problems. Female sex (IRR, 2.13; 95% CI, 1.55-2.94), advanced pubertal stages, and smoking were the important predictors of sleep problems at 21 years. Adolescent depression/anxiety supported the continuity of sleep problems (IRR, 1.21; 95% CI, 1.05-1.40), whereas exercise was seen to exert a protective effect.
Conclusion: This study indicates high rates of sleep problems in young subjects, with around half of sleep problems originating in adolescence persisting in young adulthood. Therefore, early interventions are needed to manage sleep problems in young subjects and prevent further progression to other life stages. Future studies should explore if sleep problems in young adults also persist in later life stages and identify the factors supporting the continuity of sleep problems.

Introduction

Sleep problems in adolescents have multifactorial outcomes, as these are not only linked with concurrent behavioral and mood problems but also associated with subsequent cardiovascular and cognitive issues[1,2] and high persistence rates.[3] Therefore, detection and management of sleep problems in adolescence present an opportunity to reduce their further temporal propagation and decrease the risk for associated health issues.

Unfortunately, unlike children or older populations, prospective assessment of sleep problem incidence and persistence is considerably unexplored from adolescence to young adulthood.[4,5] Because the sleep behavior and patterns for this group are different from sleep behavior in other age groups, the results from children and older population should not be extrapolated to estimate sleep problems in young subjects.[6] Rather, evidence from the appropriate age group is needed to help in designing effective prevention and treatment strategies.

Among the risk factors for sleep problems, depression is a well-established factor, with many studies of a bidirectional association between depression and sleep problems.[7] Depressed patients are seen to exhibit alterations in sleep architecture and commonly complain of insomnia, and people with sleep problems experience elevated symptoms of affective disorders.[8] Therefore, further evidence

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from longitudinal studies is needed to ascertain the direction of depression–sleep problems association. Many studies also highlight the role of socioeconomic status as a major risk factor for sleep problems, as people with lower socioeconomic status have higher rates of self-reported sleep problems and poorer subjective sleep quality.[9] Along with the traditional factors, excessive electronic media exposure is also emerging as another significant risk factor associated with poor sleep in the young population.[10] Excessive electronic media exposure in children and adolescents is found to be strongly associated with later bedtime and shorter sleep duration, increasing the risk of developing sleep disturbances[10.]

However, there is little information on whether perinatal and early-life factors affect sleep problems in adolescents and young adults. Although few studies have explored the factors supporting the continuity of sleep problems from adolescence to young adulthood,[13] they fail to provide conclusive evidence of the role of significant predictors, for example, sex.[14,15] It is also known that factors that predict sleep problems can be different from the factors that support the continuity of sleep problems.[11] Therefore, only knowing about the predictors associated with sleep problem incidence will not be enough for sleep problem interventions, and these will require information on behaviors or risk factors that support the continuity of sleep problems as well.

This exploratory study, therefore, aims to examine the incidence and continuity of sleep problems from early adolescence (14 years) to young adulthood (21 years). Based on the evidence from the existing literature and postulations of the developmental origins of health and diseases approach,[16] potential psychosociodemographic and lifestyle risk factors will be probed for their impact on incidence and continuity of sleep problems from adolescence to young adulthood.

Participants and methods

This study is based on the sleep problems data from the Mater-University of Queensland Study of Pregnancy (MUSP) cohort obtained from the 14- and 21-year follow-up. Data were obtained from the 7223 mothers and their offspring who participated between 1981 and 1984.[12] These mothers and their offspring have been followed up prospectively, with assessments done when the offspring were 6 months and 5, 14, and 21 years of age. Written informed consent from the mothers was obtained at all data collection phases and from the young adults at the 21-year follow-up of the study. Ethics committees at the Mater Hospital and the University of Queensland approved each phase of the study. Full details of the study participants and measurements have been previously reported.[12] Detailed information on each follow-up and the information collected is provided in the supplementary information (S-1).

Sleep problem assessment

At 14 and 21 years, the offspring completed the 4 sleep items from the Youth Self-Report (YSR)[13] and Young Adult Self-Report (YASR),[14] respectively. For both time points, the common questions related to sleep problems in the past 6 months were as follows:

- nightmares
- sleep more than others during the day and/or night
- trouble sleeping
- feeling overtired

At age 14 and 21 years, the questionnaire also had 1 additional item: "sleeps less than others" and "restless sleep," respectively. Each question was rated as often (score = 2), sometimes (score = 1), or rarely/never (score = 0). We developed a composite sleep scale using sleep items that were present in YSR and YASR. Although the composite score had low internal consistency for both 14-year (Cronbach $\alpha = .48$) and 21-year data (Cronbach $\alpha = .66$), nonetheless, using such a composite score is justifiable given that this approach has been used in prior research and a composite score taps multiple aspects related to sleep problems.[15]

The criteria to categorize sleep problems from the composite sleep problem score were done using an approach used in a previous study which reported data from the Diagnostic Interview for Children and Adolescents.[16] If the study subject reported "often" on any of the sleep problems items or "sometimes" on all items, it was considered as "often" occurring sleep problem. A report of "sometimes" on 2 to 4 items was considered as "sometimes" occurring sleep problems. In all other cases, sleep problems were considered as "absent."

We did not have information on the similar sleep items at 5- and 14-year follow-up; therefore, we could not explore sleep problem persistence and remission from 5 to 14 years.

Predictors of sleep problem incidence and continuity

The following variables from different life stages were explored for their role in sleep problem incidence and persistence in adolescence and young adulthood.

Perinatal variables: maternal age at first clinical visit ("13-19 years," "20-35 years," ">35 years"), maternal anxiety depression during the last trimester of pregnancy assessed with the Delusions-Symptoms-States Inventory[17] (mothers were classified as anxious/depressed if they reported 4 or more of 7 symptoms related to depression), maternal smoking during the last trimester of pregnancy (none, 1-9 cigarettes per day, or 10 or more cigarettes per day), maternal drinking during the last trimester of pregnancy ("abstainer," "light drinker," "moderate drinker," "heavy drinker").

Birth and early-life familial and individual variables: sex, race ("white," "Asian," and "Aboriginal-Islander"), overactivity at 6 months ("almost every day," "few times a week," "few times a month," and "rarely/never"), duration of breastfeeding recorded at 6-month follow-up ("never," "<4 months," and "≥4 months"), maternal satisfaction with life ("very satisfied," "satisfied," "dissatisfied"), maternal postnatal anxiety ("nonanxious," anxious"), and depression ("not depressed," "depressed") assessed with the Delusions-Symptoms-States Inventory.[17]

Childhood familial and individual variables: family income at childhood (≥$15,600/annum, ≤$15,599/annum, selecting the 25th percentile as the cutoff below which family income was defined as low), health at age 5 years ("excellent/good," "fair," "poor"), hyperactivity at childhood ("often," "sometimes," "never"), "maternal satisfaction with life ("very satisfied," "satisfied," "dissatisfied").

Adolescence familial and individual variables: total family income at adolescence (≥$20,800/annum, ≤$20,799/annum), adolescent health ("excellent/good," "fair," "poor"), adolescent smoking ("no," "yes"), alcohol consumed in adolescence ("rarely-never," "sometimes-often"), adolescent TV hours ("<1 h/d," "1-3 h/d," "3-5 h/d," ">5 h/d"), adolescent exercise ("no- < 1 d/wk," "2-3 d/wk," "4-5 d/wk," "6-7 d/wk"), body mass index (BMI) category ("normal," overweight," "obese"),[18] pubertal development using Tanner drawings ("one and two," "three," "four," and "five"),[19] adolescent anxiety-depression problems (top 10%) assessed by using the anxiety-depression subscales from YSR.[20]

Statistical analysis

Categorical variables were examined using the χ^2 test. An inverse probability weighted Poisson regression with a robust error variance