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Original Article

Association of socioeconomic status with sleep disturbances in the Swiss population-based CoLaus study

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ABSTRACT

Objective: To examine the association of socioeconomic status (SES) with subjective and objective sleep disturbances and the role of socio-demographic, behavioural and psychological factors in explaining this association.
Methods: Analyses are based on 3391 participants (53% female, aged 40–81 years) of the follow-up of the CoLaus study (2009–2012), a population-based sample of the city of Lausanne, Switzerland. All participants completed a sleep questionnaire and a sub-sample ($N = 1569$) underwent polysomnography.
Results: Compared with men with a high SES, men with a low SES were more likely to suffer from poor sleep quality [prevalence ratio (PR) for occupational position = 1.68, 95% Confidence Interval (CI): 1.30–2.17], and to have long sleep latency (PR = 4.90, 95%CI: 2.14–11.17), insomnia (PR = 1.47, 95% CI: 1.12–1.93) and short sleep duration (PR = 3.03, 95% CI: 1.78–5.18). The same pattern was observed among women (PR = 1.29 for sleep quality, 2.34 for sleep latency, 2.01 for daytime sleepiness, 3.16 for sleep duration, 95%CIs ranging from 1.00 to 7.51). Use of sleep medications was not patterned by SES. SES differences in sleep disturbances were only marginally attenuated by adjustment for other socio-demographic, behavioural and psychological factors. Results from polysomnography confirmed poorer sleep patterns among participants with low SES ($p < 0.05$ for sleep efficiency/stage shifts), but no SES differences were found for sleep duration.
Conclusions: In this population-based sample, low SES was strongly associated with sleep disturbances, independently of socio-demographic, behavioural, and psychological factors. Further research should establish the extent to which social differences in sleep contribute to socioeconomic differences in health outcomes.

1. Introduction

Sleep is an essential state allowing restoration and recovery of brain functions, with a major impact on human health and functioning. Insufficient sleep has been related, among others, to an increased risk of cardiovascular and metabolic disorders, vehicle accidents, and workplace injuries, and to poorer cognitive performances and mental health [1–9]. In high-income countries, about half of the population reports suffering from sleep disturbances [10,11]. The prevalence of sleep complaints has risen steadily over the last decades [12–14] and is expected to increase further in response to population ageing, raising prevalence of obesity, and changes in the labour market (including higher female employment rates, increasing working hours, and demand for shift works [15]). As a consequence, sleep disorders and deprivation are growingly being recognized as major public health issues and the identification of their determinants as a research priority [16,17].

The prevalence of sleep disturbances generally increases with age [18] and is higher among women than men [19–21]. Other common determinants include heavy drinking and obesity, stress,

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anxiety and several psychiatric disorders [21–23]. As the prevalence of these risk factors is higher in people with low socioeconomic status (SES), individuals with low SES are potentially more likely to suffer from poor sleep. Indeed, a strong social patterning of sleep has been observed in many studies [24–29], with some exceptions [30,31]. Some studies have even suggested that socioeconomic differences in sleep disturbances might explain part of the socioeconomic gradient in other health outcomes [30,32,33].

While social differences in sleep disturbances are frequently reported, studies assessing the social patterning of sleep are very heterogeneous regarding the indicators of SES examined and the sleep characteristics considered [24–29,31]. In particular, previous studies have generally associated a single indicator of SES with a single indicator of sleep. However, both SES and sleep have multiple dimensions, and various aspects of low SES are likely to impact sleep correlates differently. Moreover, the majority of studies have used self-reported assessments of sleep characteristics only, and results might have been biased by social differences in the subjective evaluation of sleep. Finally, very few studies have formally assessed the contribution of other risk factors to the association between SES and sleep disturbances.

The objective of this study was therefore to assess the association between two indicators of SES (education and occupational position) and a variety of subjectively and objectively measured sleep disturbances after adjustment for other socio-demographic, behavioural, and psychological factors. We hypothesize that sleep disturbances are patterned by SES. Moreover, we expect that socio-demographic, behavioural, and psychological factors account for a substantial part of socioeconomic differentials in sleep.

2. Methods

2.1. Study population

The CoLaus Study is a prospective study conducted in Lausanne, a French-speaking Swiss city of approximately 120,000 inhabitants. The study was approved by the Institutional Ethics Committee of the University of Lausanne [34]. The initial recruitment took place between June 2003 and May 2006 and enrolled 6733 participants (3544 women) aged 35–75 years, with a participation rate of 41%. The present study is based on the first follow-up of the CoLaus study, which was conducted between April 2009 and September 2012 and included all CoLaus participants willing to be re-contacted ($N = 5064$). Average follow-up time was 5.5 years. At follow-up, participants attended a single visit which included, as in the baseline assessment, an interview, a physical exam, and blood and urine collections in the fasting state. Information on demographic data, socioeconomic and marital status, lifestyle factors, personal and family history of disease, cardiovascular risk factors, and treatment was collected through questionnaires. Supplementary Fig. S1 shows the selection flow of participants included in the present study. Of the 5064 participants included in the CoLaus follow-up, 1673 were excluded from the present analysis because they had missing data on sleep disturbances ($N = 986$ for sleep quality, 433 for sleep latency, 646 for sleepiness, 405 for sleep duration, 549 for insomnia, 473 for sleep medications), on indicators of socioeconomic status ($N = 19$ for education) or on mediating factors ($N = 883$ for physical activity, 57 for smoking, 65 for obesity, 72 for employment status, 93 for coffee consumption, 642 for psychological factors), categories not mutually exclusive. The analysis was based on the remaining 3391 participants (53% female). Those excluded tended to have a lower educational level (60.3% versus 49.2% in the lowest educational group, $p < 0.001$) and had a higher prevalence of sleep disturbances (42.4% vs 33.6% reporting poor sleep quality). Excluded participants were older than those included (59.1 years vs 56.3 years, $p < 0.001$). Analysis on occupational position were further restricted to 2184 participants (49% female) who were currently employed at study examination.

2.2. Measures

2.2.1. Subjective sleep assessment

Sleep habits were collected for all CoLaus participants through validated questionnaires assessing sleep duration and quality [35,36]. Sleep quality was derived from the Pittsburgh Sleep Quality Index (PSQI) [35], a 19-item questionnaire evaluating sleep patterns over the previous month. Items are used to derive seven clinically based sub-scales (sleep quality, latency, efficiency, duration, disturbances, daytime dysfunction, and use of sleep medications). Subscales ranging from 0 to 3 are then summed to obtain the global PSQI score (range: 0–21). High PSQI score values represent poorer sleep quality. For bivariate analysis, we dichotomized the score and defined “poor sleep quality” as a PSQI score >5.

Sleep latency represents the self-reported average length of time before falling asleep in minutes (in the previous month). “Long sleep latency” was defined as sleep latency >30 minutes.

Daytime sleepiness was derived from the Epworth Sleepiness Scale [36]. Participants rated how likely they were to doze off in different daily situations using a scale from 0 to 3. Items were then summed to obtain the total daytime sleepiness score (range: 0–24). Scores >10 were considered as “excessive daytime sleepiness”.

Sleep duration represents the self-reported average hours of sleep in the previous month. A sleep duration <5 hours/night was considered as “short sleep duration.”

Insomnia was assessed using two items from the PSQI, “sleep latency of more than 30 minutes” or declaring “waking up in the middle of the night or too early in the morning.” Insomnia was considered if participants reported to suffer from one of the two disturbances at least three to four times a week.

Use of sleep medications was assessed using the PSQI item “During the past month, how often have you taking medicine to help you sleep?” and was coded as “no” if participants reported not having used sleep medications over the previous month, and “yes” otherwise.

2.2.2. Objective sleep assessment

Overall, 3051 consecutive CoLaus participants were invited to undergo a complete full night in-home polysomnographic (PSG) recording (HypnoLaus nested study). A total of 2162 participants (71%) accepted and underwent the PSG between 2009 and 2013. In the present analysis, only 1569 participants with complete data are included (Supplementary Fig. S1). Analysis on occupational position were further restricted to 1011 participants who were currently employed at study examination.

During a visit at the Center for Investigation and Research in Sleep (Lausanne University Hospital, Switzerland), certified technicians equipped the participants with a PSG recorder (Titanium, Embla® Flaga, Reykjavik, Iceland). The recorder was set between 5 and 8 pm before the participants returned home. All sleep recordings took place in the patients’ home environment and included a total of 18 channels: six for electroencephalography (F3/M2, F4/M1, C3/M2, C4/M1, O1/M2 and O2/M1), two for electrooculography, three surface electromyography channels (one submental region, two anterior tibialis muscle), one for electrocardiogram, nasal pressure, thoracic and abdominal belts, body position, oxygen saturation, and pulse rate in accordance with the AASM 2007 recommended setup.

All PSG recordings were manually scored by two trained sleep technicians using Somnologica software (Version 5.1.1, by Embla® Flaga) and reviewed by an expert sleep physician. Random quality checks were performed by a second sleep physician. Sleep stages and arousals were scored according to the American Association of Sleep Medicine (AASM) 2007 recommendations [37]. For the purpose