*TITLE: Sleep Disorders as a Mediator Between Socioeconomic Status and Health Outcomes: A Review of Differents Theories*

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**SUMMARY**

The variations in SES between different social class of a population correspond to differences in accessibility to all resources available and able to improve global health. While SES is now known as one of the main determinants for a good health and a good aging, its influence on SD is not well understood. SES is a concept, not directly observable but estimated using indicators like income, education, occupational status and area of living. This theoretical review explores some theories linking environment of people with occurrence of SD, with different patterns associated to SES. A model of interaction is proposed to summarize and conceptualizes these interactions and to promote more research on the topic.

**Keywords:** sleep, sleep disorders, socioeconomic status, stress, allostatic load, mood disorder, social class

## INTRODUCTION

The sleep disorders are among the most studied neurological outcomes since the last 20 years. They have many psychosocial aetiologies like lifestyle, night shift, sporadic daily stressors or environmental stress; and obviously they are linked to physiological dysfunctions of internal clock, circadian cycle or hormonal systems involved like dopaminergic system and melatonin [1-5]. Sleep disturbances also called sleep disorders are often associated with comorbidities depending of age. For children and adolescents, they are associated for example with poor school performance and breathing abnormalities [6-8], for adolescents it was reported an association between sleep disorders and anxiety [9]; and for adult literature on sleep found a strong association between sleep disturbances and other neurological outcomes like depression, cognitive impairment and circadian disruption [10-12]. Current literature did not really focus on socioeconomic factors associated with the trajectory of sleep disorders. Actual literature have a lake of data on the interaction between macroenvironment of the individual and his effect of health outcomes, even if health inequities existed and are described in many situations. Socioeconomic status and his different indicators (i.e. income, household, education, neighborhood, lifestyle) affects global health prognostic of a community, city or country, like reported by few authors [13-16]. That may also mean that socioeconomic status can silently and progressively influence the development of sleep disorders in the same community. The variations in socioeconomic status between different social class of a population correspond to differences in accessibility to all resources available and able to improve global health [13,17]. While socioeconomic status is now known as one of the main determinant for a good health and a good aging, its influence on sleep disorders is not well understood. The impact of socioeconomic status can not be observed or measure directly, it is estimated by different markers like incomes, socioeconomic position and occupational status [13]. This characteristic of socioeconomic status made it difficult to predicts on a quantitative basis, his influence on clinical outcomes such as sleep impairment. This theoretical review explores some theories linking environment of people with

occurrence of sleep disorders, with different patterns associated to socioeconomic status and specifically the socioeconomic gradient. A model of interaction is proposed to summarize and conceptualizes these interactions and to promote more research on the topic.

### 1- Influence of objective and perceived low socioeconomic status on sleep disturbances

Previously we talked about influence of socioeconomic gradient existing and driving the development of social inequalities, but also health inequalities. Few researchers explored this theories in the last decade and tried to understand if an association exists and when this association became deleterious for the individual or the community. While assessing psychological and socioeconomic health status of community-dwelling older adults in Taiwan and comparing the psychological and socioeconomic health inequalities among people of different age, gender, marital status, and exercise habits; Chen et Al. in 2013 found that the major psychological and socio-economic health concerns were sleep disturbances and financial burden for all the groups where they performed their investigation [18]. Younger old adults had better psychological and sociological health, but findings did not clearly establish why. It may be because they just started their adult life, or they did not have too many burden like a credit for a house or expenditures for children. Their findings were in line with those initiated by Van Cauter and Spiegel who discussed in 1999, the hypothesis that the adverse impact of low socioeconomic status on health may be partly mediated by decrements in sleep duration and quality [19]. Van Cauter and Spiegel also thought that chronic sleep debt caused by low socioeconomic status is partially associated with metabolic diseases that increase comorbidity. Their theories merged with those of Hall M. and Bromberger J., who published the same year an investigation on the first piece of the stress–sleep–health relationship, that is, the impact of the chronic stress of lower socioeconomic status on subjective sleep complaints [20]. Hall and Bromberger found that poverty is associated with

subjective sleep complaints in middle-aged irrespective of age, race and education. Chronic stress associated with lower socioeconomic status mediate the association of poverty with poor sleep. A gradient of health exists and is impact by the perceived or the contextual low socioeconomic status of an individual or a category of people. The manifestation of this gradient may be physical, psychological or cultural. Associations between objective and subjective socioeconomic status were compared with psychological and physical variables by Adler et al in 2000, who concludes that psychological perceptions of lower social status contribute to the SES-health gradient and have significant relationships with stress, sleep disturbances and metabolic diseases [21]. At the end, regardless if the low socioeconomic status is a perception of an individual or an objective evidence, low socioeconomic status drive a global decrease of health. The future studies on the subject just confirmed this theory. Friedman et al in 2007 tested the hypothesis that socioeconomic status would be associated with objectively measured sleep quality, even after controlling for related covariates (health status, psychosocial features) [22]. They found that, there are behavioral and biological implications of social ladder and sleep quality in health processes, and a negative association exists among sleep disorders, low socioeconomic status and chronic morbidities. Confirmation comes later with Goodin et al in 2010, Chen et Al in 2013 and Okun et Al. in 2014. Goodin et Al showed that low perceived low social status, often associated in some societies like USA with ethnicity, has a negative influence on sleep quality in poorer social class mainly represents in his study by African and Asian Americans [23]. His results was verified by Green et Al. in 2012 who study longitudinally patterns of insomnia symptoms as people age and examines how they vary according to gender and profession. Green et Al. found that chronic symptoms of stress expressed by difficulties in maintaining and initiating sleep are influenced by social factors [24]. Okun et Al. completed the reflexion when they evaluated the effect of socioeconomic status on measures of sleep quality, continuity, and quantity in a large cohort of one hundred and seventy pregnant women at 10-20 weeks gestation. Okun et Al. concluded that low socioeconomic status

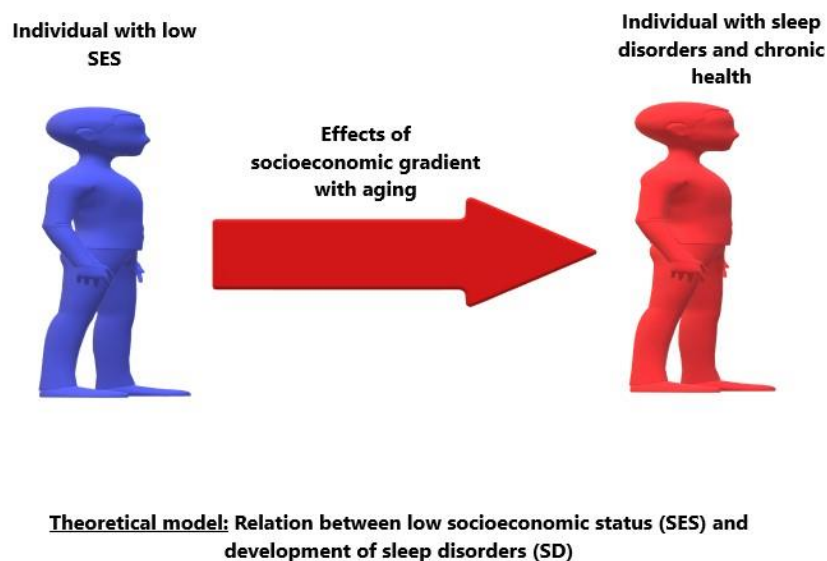
was associated with poorer sleep quality and fragmented sleep [25]. In summary, when you are at the bottom of the social ladder with lower incomes, difficulty to assess health resources and you becomes old; low socioeconomic status increased the risks of sleep disturbances.

## 2- **Mediation of sleep disturbance between socioeconomic status and health outcomes**

Like many other concepts, socioeconomic status and his impacts on health outcomes have different expression and different timeline from an individual to another, even if they are members of the same community or part of the same social class [13,26-31]. In some cases, personal and cultural behaviour induces a lifestyle affecting trajectory and conditions of a good health [32-34]. In his previous researches, Etindele et Al. presented brains disorders as a complex combination resulting from a diversity of psychosocial, physiological and environmental risk factors modifying neuronal networks, and leading to cognitive impairment, suicidality and associated outcomes such as mood disorders and sleep disorders [11,12,35,36]. According to previous reports, these factors reveal systematic trends in the distribution of health facilities each person is exposed from birth to death; leading to chronic conditions during aging or financial burden increasing comorbidities from middle-age and elderly [13,37,38]. Tomfohr et al in 2010 explored this theory by measuring the association between socioeconomic status in childhood and adult sleep and analyzing adult sleep according to race [39]. Tomfohr et Al. also evaluated if associations between socioeconomic status, race and sleep are influenced by factors such as health practices and current social status. The experimental design was mixed with a combination of interviews and polysomnography; allowing researchers to obtain perceived or self-reported measures and quantitative measures during the same project. They found that participants with lower childhood socioeconomic status spent more time in Stage 2 sleep and less time in slow-wave sleep than those with higher childhood socioeconomic status. Their findings showed that women

from low childhood socioeconomic status had more difficulties to fall asleep compared with women with high socioeconomic status. Their sample was representative with women from different social class or ethnicity, and black participants spent less time in slow-wave sleep than white participants. An interaction Age X Race was identified in the prediction of subjective sleep quality, confirming the influence of age in the relation socioeconomic status and sleep disorders. Kumari et Al. in 2010 and Hawkley et al in 2011, investigated more deeply the direct association between socioeconomic status and clinical outcomes such as hypothalamic-pituitary-adrenal axis and sleep disorders. Kumari et Al. studied if dysregulation of the hypothalamic-pituitary-adrenal axis associated with disadvantaged social position in working populations also occurs in retired old people; and they found that poorer health, sleep behaviors and unstable income mediate the effect of occupational status and wealth on cortisol secretion [40]. Hawkley et Al. investigated implications of socioeconomic status over physiological dysregulation. Their conclusion stated that the effects of socioeconomic status are specific to certain systems in a middle to early old-age population, creating and worsening the association between allostatic load and sleep disturbances [41]. All these findings mixed together reveals implication and mediation influence that social conditions and their determinants exerts on global health in the life course in general, and specifically on sleep disorders [24,26,27,42-44]. This is true for every society, developing country or low- and middle- incomes countries. Epidemiology of populational health demonstrated that, influence of socioeconomic status is present for children, adolescents and old people; whenever you lived in developing country like USA or low-income region like Sub-Saharan Africa [24,26,27,42-44]. The main confounding factor in this relation is age, which increase for every human and create conditions for chronic diseases, regardless of socioeconomic status [43,45]. Lo and Lee in 2012 explore sleep disorders among seniors by investigating the prevalence of poor sleep quality, the relationship between sleep quality and health-related quality of life, and associated factors of good sleepers in different age group. They concludes on a negative association between poor quality and short-term sleep with a healthy quality

of life and stated that such association worsens with aging [46]. Similar conclusions for Green et Al. who studied patterns of insomnia symptoms as people age and examines how they vary according to gender and profession, using data of three cohorts followed for 20 years. Green et Al. found that chronic symptoms of insomnia -expressed by difficulties in maintaining and initiating sleep- are influenced by social factors [24]. Sleep disturbances appears regardless of context, associated to SES. Sleep disorders is the result of allostatic load and in the same time the predicting sign that an individual reach his social resilience limit, like shows with the following model.

**Theoretical model:** Relation between low socioeconomic status (SES) and development of sleep disorders (SD)

### 3- <u>**Conclusions and future research**</u>

SD mechanisms remains unknown, and external stimuli originating from our environment complicated our general understanding. The existence of a socioeconomic gradient was newly recognized as a determinant of health, but sleep medicine did not link until now SES with clinical outcomes related to sleep impairment. More than the other stressors, the relation between SES and SD should be investigated. Living conditions and social class influences the development of health outcomes like SD by inducing allostatic load from the

childhood until aging. Mood disorders like metabolic diseases may be associated to this progressive decrease

of global health of people, and sleep seems to be a good indicator of this degradation. Until now SES is a

concept indirectly observable, but with a clear definition and use of quantitative measures like

polysomnography and hormonal controls, future investigations will improve our comprehension of this

socioeconomic gradient; and will clearly link the clinical outcomes observed with a direct or indirect effect

of SES.

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