Sleep Health xxx (2018) xxx–xxx

Contents lists available at ScienceDirect

Sleep Health

Journal of the National Sleep Foundation

journal homepage: sleephealthjournal.org

Relationship between sleep duration and self-reported health-related quality of life among US adults with or without major chronic diseases, 2014☆

Yong Liu, MD, MS *, Anne G Wheaton, PhD, Janet B Croft, PhD, Fang Xu, PhD, Timothy J Cunningham, ScD, SM, Kurt J Greenlund, PhD

Division of Population Health, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, Atlanta, USA

ARTICLE INFO

Article history:
Received 6 October 2017
Received in revised form 26 January 2018
Accepted 5 February 2018
Available online xxxx

Keywords:
Health-related quality of life
Sleep
Population-based survey
Cross-sectional study
Mental health
Activity limitations

ABSTRACT

Objectives: To assess the association between sleep duration and health-related quality of life (HRQOL) among adults with or without chronic conditions.
Methods: Using the 2014 Behavioral Risk Factor Surveillance System, we analyzed self-reported data from adult respondents aged ≥18 years with (n = 277,757, unhealthy group) and without (n = 172,052. healthy group) reported history of any of nine chronic conditions (coronary heart disease, stroke, cancer, chronic obstructive pulmonary disease, diabetes, asthma, arthritis, depression, chronic kidney disease). Multivariable logistic regressions were separately constructed to assess the associations between sleep duration and four self-reported HRQOL measures after adjustment for sociodemographics, leisure-time physical activity, body mass index, and smoking status among unhealthy and healthy adults.
Results: The prevalence of poor/fair health, frequent physical distress, frequent mental distress, frequent activity limitation, and short sleep duration was 27.9%, 19.3%, 17.0%, 13.6%, and 38.3% in the unhealthy group and 6.9%, 4.0%, 5.3%, 2.1%, and 31.0% in the healthy group, respectively. U-shaped relationships of sleep duration to all four HRQOL indicators were observed among the unhealthy group and to poor/fair health, frequent mental distress, and frequent activity limitation among the healthy group. The relationships further varied by sex, age, race/ethnicity, and BMI category among the healthy group.
Conclusions: Relationships between extreme sleep duration and HRQOLs were observed among both healthy and unhealthy groups. These results can help inform public awareness campaigns and physician-counseling regarding the importance of sleep for mental health and well-being.

Introduction

Health-related quality of life (HRQOL), a multi-dimensional measure that includes areas of physical, mental, emotional, and social functioning (https://www.cdc.gov/hrqol/concept.htm), provides a reliable approach to assess an individual's health status. Prior studies indicate that lower HRQOL is associated with chronic disease, short- and long-term disabilities, and sleep health.[1–4]

Sleep is an essential daily behavior. Sleep disorders such as restless legs syndrome and insomnia are known to impact patients' quality of life,[5,6] but recent studies have suggested that sleep duration may also be an important predictor of an individual's health status. For example, sleep duration, particularly short sleep duration (<7 hours sleep in a 24-hour period), may be associated with sociodemographics, mental health, risk behaviors, and chronic diseases.[7–15] Emerging evidence from longitudinal studies suggests that short sleep duration is more likely to be associated with chronic disease than sufficient sleep duration (≥7 hours/24 hours).[14] A U-shaped relationship was reported between sleep duration and self-rated health and quality of life among middle-aged and elderly Australians in one study.[16] Short sleep duration was found to be associated with poor self-rated health among college students aged 17-30 years in another study.[17] However, research on the relationship between sleep duration and HRQOL is scarce.

☆ Disclaimer: The conclusions, findings, and opinions expressed by authors do not necessarily reflect the official position of the Centers for Disease Control and Prevention.

* Corresponding author at: Division of Population Health, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, 4770 Buford Highway, MS F-78, Atlanta, GA 30341.
E-mail address: IKD8@CDC.GOV (Y. Liu).

https://doi.org/10.1016/j.sleh.2018.02.002
2352-7218/

Since both sleep duration and HRQOL are associated with chronic conditions, we hypothesized that the relationship between sleep duration and HRQOL in the healthy group without the nine chronic conditions would be different from that in the unhealthy group. We sought to assess the relationship between sleep duration and HRQOL among healthy adult respondents without a history of any of nine chronic conditions separately from adults with a history of any of those conditions. Furthermore, we examined the relationship among adults without any of the chronic conditions in groups defined by sex, age, race/ethnicity, and body mass index (BMI) categories.

Methods

The Behavioral Risk Factor Surveillance System (BRFSS) is an ongoing, state-based, random-digit-dialed telephone survey of noninstitutionalized persons aged 18 years or older in 50 states, the District of Columbia, and territories, which is supported by the Centers for Disease Control and Prevention. In 2014, BRFSS collected data on sleep duration, HRQOL, health-risk behaviors, chronic conditions, and sociodemographic characteristics. The survey sample was selected through a multistage sampling design of households with either landline or cellular telephones. Response rates for BRFSS are calculated using standards set by the American Association of Public Opinion Research (AAPOR) Response Rate Formula #4 (https://www.aapor.org/AAPOR_Main/media/publications/Standard-Definitions20169theditionfinal.pdf). The response rate is the number of respondents who completed the survey as a proportion of all eligible and likely-eligible persons. The median survey response rate from both landline and cellular phone interviews for all 50 states, the District of Columbia, and territories in 2014 was 47.0% and ranged from 25.1% to 60.1% (http://www.cdc.gov/brfss/annual_data/2014/pdf/2014_DQR.pdf). Additional information about the 2014 survey is available (http://www.cdc.gov/brfss/annual_data/annual_2014.html).

The unhealthy group was defined as adults with any of nine chronic conditions (coronary heart disease [CHD], stroke, cancer, chronic obstructive pulmonary disease [COPD], diabetes, asthma, arthritis, depression, chronic kidney disease). The healthy group was defined as adults without any of the nine chronic conditions. Chronic disease status was determined based on responses to several questions. Respondents were asked whether a health professional had ever told them they had any of a series of conditions. CHD was defined as "heart attack also called a myocardial infarction" or "angina or coronary heart disease." Cancer included skin cancer or any other type of cancer. COPD was defined as "chronic obstructive pulmonary disease or COPD, emphysema, or chronic bronchitis." Diabetes included respondents who had ever been told they had diabetes, but did not include gestational diabetes, borderline diabetes, or prediabetes. Arthritis included any "form of arthritis, rheumatoid arthritis, gout, lupus, or fibromyalgia." Depression was defined as "a depressive disorder, including depression, major depression, dysthymia, or minor depression." For chronic kidney disease, respondents were asked if they had been told they had kidney disease, but not to include kidney stones, bladder infection, or incontinence.

Sleep duration was categorized into ≤5, 6, 7 (referent group), 8, 9, ≥10 hours based on a response to "On average, how many hours of sleep do you get in a 24-hour period?" Short sleep duration was defined as those who reported <7 hours.

The validity and reliability of the four individual-level HRQOL questions were previously established for population health surveillance.[18] Self-rated health was assessed by asking respondents to rate their health status on a five-point scale from excellent to poor, which was dichotomized into poor/fair vs. good/very good/excellent. The other three HRQOL questions about physical health, mental health, and activity limitation were: "Now thinking about your physical health, which includes physical illness and injury, for how many days during the past 30 days was your physical health not good?", "Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?", and "During the past 30 days, for about how many days did poor physical or mental health keep you from doing your usual activities, such as self-care, work, or recreation?" Responses to each question were dichotomized into <14 (referent group) and ≥14 (defined as unfavorable HRQOL) unhealthy days. As in previous research, frequent physical distress was defined as ≥14 physically unhealthy days, frequent mental distress was defined as ≥14 mentally unhealthy days, and frequent activity limitation was defined as ≥14 days of activity limitation.[19] HRQOL measures were analyzed separately in our study because these measures reflected different aspects of health status. In addition, there was only a small or moderate correlation between the HRQOL measures (Pearson's correlation coefficient ranged from 0.2 to 0.6).

Covariates included age group (18-24, 25-34, 35-44, 45-64, or ≥65 years), sex, race/ethnicity (non-Hispanic White, non-Hispanic Black, Hispanic, non-Hispanic American Indian/Alaska Native, non-Hispanic Asian, or non-Hispanic other, which included Native Hawaiian/Pacific Islander, multiracial, or other), education (less than high school, high school diploma or GED, some college or technical school, or college graduate), marital status (married; divorced, separated, or widowed; never married; or a member of an unmarried couple), employment status (employed, unemployed, unable to work, retired, or homemaker or student), and household income (categorized as 0-< $25,000, $25,000-<$50,000, ≥$50,000, or missing, due to the large proportion of respondents who did not report their income). There was no collinearity of education, employment, and household income, so these three socio-economic variables were included in the analysis. Any leisure-time physical activity was defined based on the response of 'yes' or 'no' to a single question "During the past month, other than your regular job, did you participate in any physical activities or exercises such as running, calisthenics, golf, gardening, or walking for exercise?" BMI was calculated from self-reported height and weight (underweight: BMI<18.5 kg/m^2, normal weight: BMI = 18.5-24.9 kg/m^2, overweight: BMI = 25.0-29.9 kg/m^2, or obese: BMI ≥30.0 kg/m^2). Smoking status was defined by two questions: "Have you smoked at least 100 cigarettes in your entire life?" and "Do you currently smoke every day, some days, or not at all?" Respondents were current smokers if they reported having smoked at least 100 cigarettes during their lifetime and currently smoke every day or some days. Former smokers were defined as those who reported having smoked at least 100 cigarettes during their lifetime but did not currently smoke. Never smokers were defined as those who reported not having smoked at least 100 cigarettes during their lifetime.

Of 464,664 adult respondents who participated in the 2014 BRFSS survey, 286,381 adult respondents (52.1%, unhealthy group) reported a history of any of the nine chronic conditions (CHD, stroke, cancer, COPD, diabetes, asthma, arthritis, depression, chronic kidney disease) and 176,558 adult respondents (47.9%, healthy group) reported none of the nine chronic conditions. Because of significant interactions between sleep duration and chronic conditions ($p<0.1$), we separately analyzed data on the unhealthy group (n = 277,757) and the healthy group (n = 172,052) after excluding those who had missing values on age, sleep duration, and self-reported health status (n = 8,624 in unhealthy group and n = 4,506 in healthy group).

Statistical analysis

First, we calculated the distribution of selected characteristics including sociodemographics, risk factors, sleep duration, and HRQOL in the healthy and unhealthy groups. Second, the crude and age-adjusted prevalence of four HRQOL measures and short sleep

Please cite this article as: Liu Y, et al, Relationship between sleep duration and self-reported health-related quality of life among US adults with or without major chronic..., Sleep Health (2018), https://doi.org/10.1016/j.sleh.2018.02.002