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Original Article

Sleep quality and health service utilization in Chinese general population: a cross-sectional study in Dongguan, China

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ABSTRACT

Objectives: The aims of this study were to explore the Pittsburgh Sleep Quality Index (PSQI) and health service utilization in Chinese general population, to investigate the association between PSQI and health service utilization and to identify the independent contributions of social demographic variables, health related factors and PSQI to health service utilization.
Methods: In a cross-sectional community-based health survey using a multi-instrument questionnaire, 4067 subjects (≥15 years old) were studied. The Chinese version of the PSQI was used to assess sleep quality. Health service utilization was measured by recent two-week physician visit and annual hospitalization rates.
Results: Higher PSQI scores were associated with more frequent health service utilization. Higher scores in subjective sleep quality were associated with higher rate of recent two-week physician visit (adjusted OR = 1.24 per SD increase, P = 0.015). Higher scores in habitual sleep efficiency (adjusted OR = 1.24 per SD increase, P = 0.038) and sleep disturbances (adjusted OR = 2.09 per SD increase, P < 0.001) were associated with more frequent annual hospitalization. The independent influence of PSQI on the risk of recent two-week physician visit was 0.7%, and that of annual hospitalization 31.4%.
Conclusions: Poorer sleep quality predicted more frequent health service utilization. The independent contribution of PSQI on health service utilization was smaller than social demographic variables.

1. Introduction

Decreased sleep quality has been a problem not only amongst medically ill patients, but also the general population in China [1–6]. Severely decreased sleep quality is associated with absenteeism, frequent accidents, memory impairment, depression, and poor physical health [12,17]. Several studies have reported that poor sleep quality was associated with increased morbidity and mortality [6,7]; such increased morbidity would result in increased utilization of health services. Thus, we hypothesize that decreased sleep quality, as assessed by standard questionnaire, is associated with increased health service utilization.

Since health service resources are limited, particularly in developing countries, optimizing distribution of health services is crucial. To accomplish the optimized distribution of health service resources, it is important for both policy makers and health service providers to identify and understand the determinants of health service utilization [8]. Several studies have unraveled these determinants of health services utilization, such as social demographic variables, disease factors and health-related quality of life factors [9,10]. Limited studies have also reported the association between sleep quality and health service utilization [11–16]. One study reported that many insomnia symptoms were associated with a greater odds of hospitalization, use of home health care services, nursing home use (and use of any of these services after controlling for demographic characteristics) [11]. Daly et al. found that insomnia was associated with significantly increased

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morbidity and health-care utilization in the general population [12]. A study from Gregory et al. indicated that insomnia among primary care patients was associated with greater functional impairment, lost productivity, and excessive health care utilization [14].

However, there is no data on the relationship between sleep quality and health service utilization in the Chinese general population. Therefore, the main goal of this study was to assess the association between sleep quality and health service utilization in the Chinese general population. In addition, most studies employed ad hoc non-standardized measures to assess sleep quality, such as "Do you have difficulty in falling asleep?" and "How long do you take to fall asleep?" [11,12,16]. These measurements are somewhat problematic due to inadequate reliability. Thus, we used the Pittsburgh Sleep Quality Index (PSQI), a validated and standard method, to measure sleep quality.

2. Methods

2.1. Patients

This study was based on a cross-sectional health survey in Dongguan municipality of Guangdong province, China. With an estimated poor sleep rate of about 20%, the minimal sample size required was 3919, allowing a maximal deviation of 1.25% and type one error of five percent. The cohort in this survey consisted of family members drawn from five percent of total households in this municipality using the household registration system via a simple random sampling method. A total of 1476 households were randomly selected, 152 households refused to participate, and 1324 households including 4086 residents aged above 15 years accepted to participate. After excluding three subjects with mental diseases (senile dementia, schizophrenia, hysteria and other psychiatric disorders, according to self-reports and health records in community health service centre), and 16 subjects who did not complete the PSQI scale, 4067 individuals were included in the final analysis. The study was approved by the Research Ethics Board of Guangzhou Medical University (Project identification number: GZMU-2014024). All participants provided written informed consent.

2.2. Procedures of interviews

The interviewers (healthcare staff from local Community Health Service Agencies) underwent specific training on introduction of the survey, questionnaire content, communication skills, and confidentiality. They were provided a full set of written instructions to standardize the data collection and recording procedures. All interviews were conducted in the participants' homes. All research data were collected through face-to-face interviews using structured study questionnaires. Initially, each group was accompanied by a supervisor to ensure that the interviews were properly conducted, then routine supervision was randomly performed.

2.3. Measurement of sleep quality

We used the Chinese version of Pittsburgh Sleep Quality Index (PSQI), which was translated from the standard English version of PSQI, to assess subjective sleep quality. Currently, this scale is regarded as the most comprehensive and extensively used sleep questionnaire [21]. The sensitivity, accuracy, comprehensibility, and reproducibility of PSQI has been previously examined and confirmed [22,23]. The Chinese version of the PSQI also had similar high quality as the English PSQI ($r = 0.82–0.83$) in test-retest reliability ($r = 0.77–0.85$) [24].

The PSQI evaluates multiple dimensions of sleep retrospectively which consisted of 19 items [21]. These items could be grouped into seven quality domains, including subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. These seven domain scores are then summed to yield a global PSQI score (normal range 0–21). Higher scores indicate worse sleep quality.

2.4. General study questionnaire

The general study questionnaire included information on social-demographic characteristics, health-related factors and health service utilization. Socio-demographic variables included age, gender, marital status, education, employment status and medical insurance. Health-related variables included smoking, drinking, exercise, hypertension and body max index (BMI). Smoking was defined as having smoked at least 100 cigarettes in their lifetime. Drinking was defined as the consumption of at least 30 g of alcohol per week for the past year. Exercise was assessed in the question, "How many times do you take exercise every week?" and the answer was divided into "more than three times/week", "one to two times/week" and no exercise. Hypertension was assessed with the question: "Have you ever been diagnosed with hypertension by a doctor?" BMI was calculated as weight/height^2 (kg/m^2). Health service utilization variables included recent two-week physician visit and annual hospitalization. Record of a recent two-week physician visit was obtained in the question: "Have you ever visited a doctor in the past two weeks?" Record of annual hospitalization was obtained in the question: "Have you been hospitalized in the last year?"

2.5. Statistical analysis

All analyses were conducted using the statistical analysis software SPSS version 13.0. Mean and standard deviation (SD) were presented for continuous variables. Frequency and percentage were presented for categorical variables. The two dependent (outcome) variables were recent two-week physician visits and annual hospitalization. Logistic regression was used to calculate the odds ratios (OR) and 95% confidence interval (95%CI) for the associations of PSQI variables with health service utilization. Clustered logistic regression [25] was employed to explore the impact of socio-demographic characters, health related factors and PSQI variables (three clusters) on health service utilization. The independent effect of each cluster was assessed by the corresponding R^2 value, which was similar to the classical R^2 in linear regression models [25]. The independent contribution share of each cluster was calculated as individual R^2 change/total R^2 change in the final model $\times$ 100%. The associations between variables were considered statistically significant at the level of $P < 0.05$.

3. Results

3.1. Participant characteristics

Descriptive statistics of study subjects are presented in Table 1. Subjects were aged between 15 and 100 years, with an average of 40.5 ± 18.5 (SD) years. Most participants were male (56.5%) and married (62.3%), had completed middle school education (40.5%) and had medical insurance (79.1%); most were employed (70.5%), non-smokers (70.1%), non-drinkers (75.6%), taking exercise every week (61.8%), and without hypertension (87.8%). The average BMI of the participants was 22.4 ± 3.9 kg/m^2. PSQI scores in the seven domains varied from 0.2 ± 0.5 to 1.1 ± 0.7. Among the seven domains of PSQI, habitual sleep efficiency scored the lowest, while