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ORIGINAL PAPER

ASSESSING SUBJECTIVE SLEEP QUALITY IN SENIORS

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Abstract

Aim: The study aimed at assessing the quality of sleep in seniors. Another objective was to determine the impact of gender, age, type of residence and taking sleeping medication on the quality of sleep. *Design:* A cross-sectional study. *Methods*: Data were collected using the standardized Pittsburgh Sleep Quality Index (PSQI) questionnaire. The sample comprised 146 seniors living in the Moravian-Silesian Region, Czech Republic. The survey was conducted from January 2014 to the end of October 2014 in a long-term chronic care department of a selected hospital, two retirement homes and among seniors living in their own homes. *Results:* Thirty-five (24%) seniors had their global PSQI scores of 5 (i.e. the highest score indication good sleep quality) or less. The remaining 111 (76%) participants were shown to suffer from impaired sleep quality as their global PSQI scores were 6 or higher. There were statistically significant differences in component scores between seniors with the global PSQI scores of 5 or less and those with higher scores. The best quality of sleep was observed in females, seniors in the 65–74 age category and those sharing their own homes with their spouses or partners. *Conclusion*: Subjective sleep quality assessment varies significantly with respect to gender, age, type of residence and use of sleeping medication.

Keywords: sleep quality, PSQI, subjective assessment, senior.

Introduction

For people of any age, sleep is essential to life. It is a relatively complex process requiring a functioning central nervous system: intact central nervous system structures, neurotransmitter production and a balance between the internal and external environment – mental well-being and sleep hygiene (Borzová, 2008). Sleep disorders continue to increase in prevalence, both globally and in the Czech population. According to experts, there is also a rise in the number of senior citizens who, for various reasons, experience problems with sleep which in turn is reflected in its quality. Aging is associated with numerous changes affecting the quality of sleep. There is a higher prevalence of sleep disorders and health problems. Healthy individuals gradually adapt to the natural changes in sleep and are satisfied with their sleep. Persons with impaired sleep quality need to be further assessed; those are often seniors with comorbidities and polypharmacy, little social contact or limited activity during the day. These all impair the quality of sleep.

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Typical changes include reduced sleep efficiency, slightly prolonged sleep latency, fragmented sleep, lower awakening threshold, reduced sleep time but more overall time spent in bed, more night awakenings and latency of return to sleep (Lattová, 2011). Inadequate or poor-quality sleep is linked to impaired cognitive functioning, organ dysfunction, chronic illness, fall risk and mobility impairment. Poor sleep quality also reduces the chance of cure of the underlying disease and contributes to a higher mortality. The death rates are 1.6 to 2 times higher in the elderly suffering from poor sleep than in those with good-quality sleep. The higher mortality is seen in individuals with late-onset sleep difficulties (Edwards et al., 2010; Lattová, 2011). Good-quality sleep is important for the proper functioning of the organism and quality of the whole life. Perception of sleep and sleep quality is a subjective process, as is perception of impaired daytime alertness or tiredness. Therefore, self-reported or subjective scales are often used to assess these patients (Lattová, 2011). One of the instruments most frequently used to quantify excessive daytime sleepiness is the Epworth Sleepiness Scale used to assess the overall degree of sleepiness independent of short-term variations. It rates an individual's tendency to fall asleep in eight everyday situations (Johns, 1991). Excessive

sleepiness is indicated by a score of 10 points or more. A score of at least 14 points is suggestive of narcolepsy. Another tool for the assessment of daily sleepiness is the Stanford Sleepiness Scale. On a 1 to 7 scale, patients indicate how tired they feel during the day, with 1 being for full vitality and activity and 7 being for inability to stay awake and dream-like thoughts (Hoddes, 1972). Also used for subjective sleepiness rating is the 9-point Karolinska Sleepiness Scale, ranging from 1 for extreme alertness to 9 for extreme sleepiness (Åkerstedt, Gillberg, 1990). Another frequently used instrument is the Pittsburgh Sleep Quality Index (PSQI), measuring the subjective quality of sleep as a sum of seven components: sleep latency, sleep quality, sleep duration, sleep efficiency, sleep disturbances, use of sleeping medication and daytime dysfunction. A global sum of 5 or greater indicates a poor sleeper; sleep disorder is suggested by a total score of 10 or more (Buysse et al., 1989). The PSQI is simple to use in practice and takes 5 to 10 minutes to complete. In their systematic review, Mollayeva et al. (2016) reported that in 9 out of 12 studies on its reliability, Cronbach's alpha ranged from 0.7 to 0.83, suggesting good internal consistency of the instrument. Although the PSQI was not developed for patient samples with particular diseases, it is used in various patient populations (Mollayeva et al., 2016). This explains varied factor analysis results, with both two- and three-factor solutions being used.

Aim

The study aimed at assessing the quality of sleep in seniors. Another objective was to determine the impact of gender, age, type of residence and taking sleeping medication on the quality of sleep.

Methods

Design

A cross-sectional study.

Sample

The study comprised 146 seniors living in the Moravian-Silesian Region, Czech Republic. The sample consisted of three groups: (1) seniors living in long-term chronic care facilities, (2) seniors living in retirement homes, and (3) seniors living in their own homes. The inclusion criteria were age over 65 years, orientation to place, time and person, and consent to participation in the study.

Data collection

Data were collected using the PSQI. A Czech version of the standardized questionnaire was obtained from and used with the permission of the University of Pittsburgh's Office of Technology Management. In addition to the use of the PSQI, basic demographic and clinical data were collected. The standardized PSQI instrument (Buysse et al., 1989) includes 19 items. It is a self-reported questionnaire for subjective assessment of sleep quality and quantity over a period of 30 days. The questionnaire was developed with the following goals: (1) to provide a reliable, valid and standardized measure of sleep quality, (2) to identify individuals with good vs. poor sleep quality, (3) to provide a clear index that may be used for interpretation and assessment, and (4) to identify sleep-disturbing factors. The reliability of the PSQI as measured with Cronbach's alpha is 0.83 (Buysse et al., 1989). The PSQI contains 19 self-rated questions and 5 additional questions rated by the bed partner or roommate. The latter questions are used for clinical information only and are not included in the global score. The 19 self-rated items are combined into seven component scores ranging from 0 (no difficulty) to 3 (severe difficulty). The components are subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication and daytime dysfunction. These seven component scores are summed to produce the global score ranging from 0 to 21. The higher the global score, the poorer the quality of sleep. A score greater than 5 is suggestive of impaired sleep quality (Buysse et al., 1989). A pilot study was carried out in December 2013. The survey itself was conducted from January 2014 to the end of October 2014 in the Moravian-Silesian Region. The questionnaires were distributed to seniors staying in a long-term chronic care department of a selected hospital, those living in two retirement homes and those living in their own homes. A total of 160 questionnaires were distributed. It took approximately 10 to 15 minutes to complete the questionnaire. Some seniors needed help from another person when filling out the questionnaire. The final analysis included 146 questionnaires.

Data analysis

For statistical analysis of the results, the sample was characterized using basic descriptive statistical methods (mean, standard deviation, range, median, absolute and relative frequencies). The discrete variables were statistically compared with the Kruskal-Wallis test, Wilcoxon rank-sum test, Pearson's chi-squared test and two-sample t-test. Internal consistency of PSQI was established by calculating the Cronbach's alpha coefficient. The statistical tests were performed at the significance

level of 0.05 (5%). The data were processed with the NCSS 2007 statistical software.

Results

Included in the study were 146 seniors aged 65 to 91 years, with a mean age of 73.79 years (SD = 7.02) and a median of 72 years. Of those, 52 (36%) lived in a retirement home, 22 (15%) lived alone in their own homes, 28 (19%) shared their homes with their spouses or partners, and 44 (30%) stayed in long-term chronic care facilities. Most frequently, the participants suffered from the following conditions: cardiovascular diseases (84 persons; 58%), musculoskeletal disorders (65; 45%), diabetes mellitus (44; 30%) and urologic diseases (40; 27%). One-half of the seniors (73 persons; 50%) took no sleeping medication, 52 (36%) sometimes took sleeping pills and 21 (14%) were daily users of sleeping medication (Table 1).

Table 1 Characteristics of the sample (n = 146)

Characteristic	n	%
Gender		
Female	86	59
Male	60	41
Residence		
Alone in one's own home	22	15
Together with a spouse or partner	28	19
In a retirement home	52	36
In a long-term chronic care facility	44	30
Sleeping medication		
None	73	50
Sometimes	52	36
Daily	21	14
Comorbidities		
Yes	134	92
No	12	8

The mean duration of sleep was 7 hours per night (median = 7; SD = 1.37; min. = 1; max. = 10). It took the participants a mean of 25 minutes to fall asleep (median = 20; SD = 24.12; min. = 2; max. = 120).

Table 2 shows the PSQI's component scores for subjective sleep quality (CS1), sleep latency (CS2), sleep duration (CS3), habitual sleep efficiency (CS4), sleep disturbances (CS5), use of sleeping medication (CS6), and daytime dysfunction (CS7).

Component 1: subjective sleep quality

Component 1 rates the overall sleep quality.

Component 2: sleep latency

Thirty-one (21%) seniors took 15 minutes or less to fall asleep; a sleep latency of 16 to 30 minutes was reported by 59 (40%) participants.

Component 3: sleep duration

The minimum sleep duration was established at 7 hours. As seen from Table 2, this was achieved by 45 (31%) seniors. Another 43 (29%) seniors got 6 to 7 hours of sleep at night.

Table 2 Scores for individual components

	n (%)
Subjective sleep quality (CS1)	
Very good	20 (14%)
Fairly good	76 (52%)
Fairly bad	43 (29%)
Very bad	7 (5%)
Sleep latency (CS2)	
≤ 15 minutes	31 (21%)
16–30 minutes	59 (20%)
31–60 minutes	39 (27%)
> 60 minutes	17 (12%)
Sleep duration (CS3)	
> 7 hours	45 (31%)
6–7 hours	43 (29%)
5–6 hours	52 (36%)
< 5 hours	6 (4%)
Habitual sleep efficiency (CS4)	
> 85%	43 (29%)
75–84%	29 (20%)
65–74%	27 (19%)
< 65%	47 (32%)
Sleep disturbances (CS5)	
Not during the past month	0
Less than once a week	69 (47%)
Once or twice a week	71 (49%)
Three or more times a week	6 (4%)
Use of sleeping medication (CS6)	
Not during the past month	73 (50%)
Less than once a week	21 (14%)
Once or twice a week	25 (17%)
Three or more times a week	27 (19%)
Daytime dysfunction (CS7)	
0	18 (12%)
1	63 (43%)
2	61 (35%)
3	14 (10%)

Component 4: habitual sleep efficiency

Habitual sleep efficiency is the number of hours slept divided by the number of hours spent in bed and multiplied by 100. Rates greater than 85% suggest very good efficiency while less than 65% means rather low efficiency. In the present study, 43 (29%) seniors had more than 85% sleep efficiency.

Component 5: sleep disturbances

Sleep disturbances due to various causes observed less than once a week during the past month were reported by 69 (47%) of seniors; disturbances occurring once or twice weekly were reported by 71 (49%) of seniors.

Table 3 Correlation analysis of the PSQI component and global scores

Correlations	CS1	CS2	CS3	CS4	CS5	CS5	CS7
CS2	**0.61**						
p-value	0.000						
CS3	**0.28**	**0.28**					
p-value	0.001	0.001					
CS4	**0.28**	**0.20**	**0.54**				
p-value	0.001	0.014	0.000				
CS5	**0.35**	**0.29**	**0.16**	**0.18**			
p-value	0.000	0.000	0.051	0.027			
CS6	**0.55**	**0.44**	**0.28**	**0.29**	**0.21**		
p-value	0.000	0.000	0.001	0.000	0.012		
CS7	**0.63**	**0.45**	**0.32**	**0.24**	**0.47**	**0.41**	
p-value	0.000	0.000	0.000	0.003	0.000	0.000	
PSQI	**0.76**	**0.69**	**0.64**	**0.64**	**0.49**	**0.71**	**0.71**
p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000

CS1 – Component 1 score (subjective sleep quality); CS2 – Component 2 score (sleep latency); CS3 – Component 3 score (sleep duration); CS4 – Component 4 score (habitual sleep efficiency); CS5 – Component 5 score (sleep disturbances); CS6 – Component 6 score (use of sleeping medication); CS7 – Component 7 score (daytime dysfunction); PSQI – global Pittsburgh Sleep Quality Index score

Component 7: daytime dysfunction

To determine daytime dysfunction resulting from sleepiness, participants were asked how often they had had trouble staying awake while performing everyday activities (Question 8: never = 0, less than once a week = 1, once or twice a week = 2, three or more times a week = 3) and how much of a problem it had been for them to keep up enough enthusiasm to get things done (Question 9: no problem at all = 0, only a very slight problem = 1, somewhat of a problem = 2, a very big problem = 3). After adding the scores for the two questions, the component scores were as follows: 0 for a sum of 0, 1 for a sum of 1 or 2, 2 for a sum of 3 or 4, and 3 for a sum of 5 or 6. The minimum component score was achieved by 18 (12%) seniors; a score of 1 was calculated for 63 (43%) participants.

The global PSQI score is a sum of CS1 through CS7. As seen from Table 3, the global PSQI score was mainly affected by CS1 (subjective sleep quality), CS6 (use of sleeping medication) and CS7 (daytime dysfunction). A correlation greater than 0.75 is considered a very significant relationship. In the present study, this was only the case for the pair CS1 (subjective sleep quality) and the global PSQI score. Moreover, strong correlations were observed between the global PSQI score and CS6 (use of sleeping medication) or between the global PSQI score and CS7 (daytime dysfunction).

The computed value of Cronbach's alpha statistic for the PSQI is 0.77.

Table 4 shows the results of comparison of median PSQI scores with respect to gender, age, type of residence and use of sleeping medication. First, median PSQI scores were compared with respect to gender. Due to the non-normal distribution of PSQI scores, nonparametric two-sample Wilcoxon test was used. The results showed a significant difference with respect to gender ($p = 0.0152$). In the present study, males had worse quality of sleep.

Further, the mean rank of scores by age groups showed statistically significant differences in the global PSQI score assessment ($p = 0.0001$). As seen from Table 4, the lowest median value as well as the lowest mean rank were noted for the 65-74 age group. These seniors had the best sleep quality whereas the worst quality of sleep was observed in those aged 85 years or more. Statistically significant results were also seen when the quality of sleep was compared with respect to the type of residence. Participants sharing their homes with their spouses or partners had the highest sleep quality. To test the effect of sleeping medication on the quality of sleep, nonparametric Kruskal-Wallis test was used. The results confirmed statistically significant differences in sleep quality, with the best quality of sleep in seniors taking no medication. As many as 111 (76%) participants were shown to suffer from impaired sleep quality as their global PSQI scores were 6 or higher. The remaining 35 (24%) seniors had scores of 5 (i.e. the highest score indication good sleep quality) or less. There were statistically significant differences in component scores between seniors with the global PSQI scores of 5 or less and those with higher scores (Table 5).

Table 4 Sleep quality assessment with respect to selected demographic characteristics

Demographic characteristics	Group	n	median PSQI	mean rank	P-value
Gender	Males	60	10.5	-	0.0152*
	Females	86	8	-	
Age	65–74 years	89	7	62.47	0.0001**
	75–84 years	43	10	84.28	
	85 years or more	14	14	110.50	
Type of residence	Home shared with a spouse/partner	28	5.5	50.80	0.0001**
	Alone in one's own home	22	7	58.52	
	Retirement home	52	8.5	72.85	
	Long-term chronic care facility	44	11	96.20	
Use of sleeping medication	No use	73	6	48.31	0.001**
	Occasional use	52	11	91.13	
	Daily use	21	15	117.43	

**nonparametric Wilcoxon rank-sum test; **nonparametric Kruskal-Wallis test*

Table 5 The Pittsburgh Sleep Quality Index and differences in component scores

Components	Total (n =146) mean (SD)	PSQI > 5 (n = 111) mean (SD)	PSQI ≤ 5 (n = 35) mean (SD)	P-value
Subjective sleep quality	1.25 (0.75)	1.47 (0.69)	0.57 (0.5)	< 0.001
Sleep latency	1.29 (0.93)	1.52 (0.89)	0.54 (0.61)	< 0.001
Sleep duration	1.13 (0.9)	1.35 (0.87)	0.43 (0.61)	< 0.001
Habitual sleep efficiency	1.53 (1.22)	1.88 (1.13)	0.43 (0.78)	< 0.001
Sleep disturbances	1.57 (0.57)	1.69 (0.57)	1.17 (0.38)	< 0.001
Use of sleeping medication	1.05 (1.18)	1.35 (1.2)	0.11 (0.32)	< 0.001
Daytime dysfunction	1.42 (0.83)	1.64 (0.78)	0.71 (0.52)	< 0.001
Global PSQI	9.25 (4.29)	10.91 (3.5)	3.97 (1.07)	< 0.001

n – absolute frequency, SD – standard deviation

Discussion

The study was concerned with assessing the quality of sleep in seniors. As many as nearly three-quarters of the participants had impaired sleep quality as shown by their global PSQI scores. Older age is associated with changes in sleep structure. Good-quality sleep is important for the proper functioning of the organism and quality of life. Poor sleep has a negative impact on the overall well-being and mental performance and therefore should not be underestimated. Impaired sleep quality may result from physical discomfort, drug side effects and other aspects of disease; it may also be related to psychiatric conditions such as depression, anxiety or schizophrenia. Asplund (2006) claims that there are some clear differences in sleep between males and females. While females tend to present with difficulties initiating and maintaining sleep, males more frequently suffer from sleep-disordered breathing. Similarly, gender-related differences in sleep quality were reported by Baker (2012). Impaired sleep is partly associated with depression and anxiety disorders affecting females more frequently than males. A US longitudinal study also confirmed lower sleep quality in females than males, with poor sleep being a significant predictor of low mood (Saunders et al., 2015). Lower sleep quality in females with rheumatoid arthritis proved Czech study (Kaas, Tóthová, 2015). In the present study, however, males reported lower sleep quality than females.

The study also showed that the older seniors were, the more sleep problems they had. This is consistent with results from a 2014 Brazilian study on the effect of ageing on sleep structure. The study, comprising 1,024 individuals aged 20 to 80 years, showed that aging was associated with impaired sleep quality, reduction in the percentage of REM sleep and increased periodic limb movement in both males and females (Moraes et al., 2014). By contrast, Plháková (2013) stated that poor sleep is linked not with chronological old age but with age-related physical decline and comorbidities. Aging is associated with degenerative changes in structures involved in controlling the circadian sleep rhythm, increased use of medication potentially causing sleep problems, and changes in social roles that may have a negative impact on the quality of sleep (Borzová et al., 2009). The present study showed the highest quality of sleep in seniors living in their own homes with their spouses or partners and, conversely, poor sleep in hospitalized participants. A Canadian study by Little

et al. (2012) confirmed that hospitalized patients rated their sleep quality as poor compared with home-sleep. The reasons for impaired sleep quality in the hospital were noise, bright lights and pain. In their study of hospitalized medical patients in Korea, Park et al. (2014) found that sleep disturbances were contributed to by increased noise levels. As many as 86% of 103 participants had bad sleep as assessed by the PSQI (a cut-off score of 5). The authors explain that in Korea, most hospitals have five to six patients in one room. The environment has a substantial impact on sleep quality in seniors. Sleep problems are more frequent in institutionalized individuals, that is, those staying in retirement homes, nursing homes or hospitals than in those living in their homes (Kalvach et al., 2004).

Conclusion

The study showed impaired sleep quality in participating seniors. Subjective sleep quality assessment varies significantly with respect to gender, age, type of residence and use of sleeping medication. Sleep quality assessment is important due to the fact that poor sleep may have an impact on the quality of life and may be associated with physical diseases as well as emotional problems. Apart from sleep assessment, nurses may implement sleep-promoting interventions aimed at improving the quality of sleep in seniors both staying in hospital or long-term chronic care facilities and living in their homes.

Ethical aspects and conflict of interest

The survey was carried out with the consent from the deputy director of a selected hospital, retirement home managers and seniors living in their own homes. All participants were informed about the study's purpose and were assured that their data will be kept anonymous. The survey was a part of a diploma thesis at the University of Ostrava. The authors are not aware of any conflict of interest.

Author contribution

Concept and design (IK, RZ), data collection (IK), analysis and interpretation of data (IK, RZ, PB), the drafting of the manuscript (RZ, IK), a critical revision of the manuscript (RZ, IK, PB), the final completion of the article (RZ, PB).

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