Factors associated with poor sleep and health-related quality of life

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Key words: *poor sleep; self-evaluated sleep quality; health-related quality of life.*

Summary. *Objective. The aim of the study was to establish factors associated with poor sleep and to assess the relationship between self-evaluated sleep quality and health-related quality of life.*

Material and methods. Sleep complaints were evaluated using Basic Nordic Sleep Questionnaire, and health-related quality of life was assessed by SF-36. Subjective data about sleep quality were obtained from 1602 randomly selected persons: 600 males and 1002 females, aged 35–74 years. SF-36 was filled in by 1016 persons: 379 males and 637 females. Health status was evaluated by Perceived Health Questionnaire. The odds ratios of poor sleep were calculated using binary logistic regression analysis.

Results. Among males poor self-evaluated health, frequent stress events, regular nighttime awakenings, and sleep latency period longer than 15 min in workdays were significant predictors of poor sleep. Among females, duration of sleep shorter than 7 h, frequent stress events, poor self-evaluated health, sleep latency period longer than 15 min in workdays, and regular nighttime awakenings predicted poor sleep. Poor sleepers, as compared with good ones, had poorer health-related quality of life.

Conclusions. Poor perceived health, frequent stress events, regular nighttime awakenings, and sleep latency period longer than 15 min were indicated as significant predictors of poor sleep. Poor sleep worsened health-related quality of life in all domains of SF-36.

Introduction

The clinical symptoms of insomnia, as described by the classifications, apply to a large number of the general population. However, it is unlikely that all these individuals suffer from insomnia (1). Previous studies have noticed that dissatisfaction with sleep could be a better indicator of sleep pathology than insomnia (1–4), although none of these studies has examined the relative importance of the various factors related to dissatisfaction with sleep. Individuals with global sleep dissatisfaction (GSD) were two times more likely to report excessive daytime sleepiness and eight times more likely to have a diagnosis of sleep or mental disorder as compared with subjects satisfied with sleep. Furthermore, drivers with GSD were two times more frequently involved in traffic accidents as compared with drivers without GSD. Subjects dissatisfied with sleep were more than 10 times more likely to seek help because of their sleep problems and 5 times more likely to use sleeping pills as compared with persons without GSD (3).

Assessment of health-related quality of life may be the most accurate way to evaluate the effects of insomnia (5). There are very few studies specifically devoted to this subject (6–11). The World Health Organization Consensus report on sleep and health strongly recommended that more studies on health-related quality of life and insomnia should be carried out (12).

The aim of the study was to establish factors influencing dissatisfaction with sleep and to assess the relation between self-evaluated sleep quality and health-related quality of life in the population of Palanga, located in the west part of Lithuania.

Material and methods

Selection process and participants. A stratified random selection was performed among 35–74-year-old citizens of Palanga by the Residents' Register Service. The study was approved by Bioethics Committee of Lithuania. According to age and gender, participants were assigned to the following age groups by means of a stratified random selection: 35–44 years (N=806, 506 of them were females), 45–54 years

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(N=598, 349 females), 55–64 years (N=598, 349 females), 65–74 years (N=498, 299 females). In total, 2500 persons were selected. Questionnaires were sent by post. Subjective data about self-evaluated sleep quality were obtained from 1602 persons: 600 males and 1002 females, aged 35–74 years. The data on health-related quality of life were obtained from 1016 persons: 379 males and 637 females, aged 35–74 years. The response rates were 68.5% and 43.4%, respectively (160 selected citizens were not invited to participate in the study, because they were not found at the given addresses).

Questionnaires. According to Basic Nordic Sleep Questionnaire (13), respondents were classified to the groups of poor (785 subjects, 64.8% of them females) and good (817 subjects, 60.2% of females) sleepers. Poor sleepers considered their sleep quality in the period of last 3 months as fair, rather poor, or poor. Good sleepers considered their sleep as good or very good.

General Data Questionnaire (14) was used to collect the information about family status, education, employment, and income of respondents.

Self-Evaluated Health Questionnaire (14) contained questions about complaints, diseases respondents had had, and medicines they had used in the period of last year, frequency of stress events and visits to any doctor (14).

Short Form-36 (SF-36) (15) was used to assess health-related quality of life. SF-36 reflected eight health domains: physical functioning (PF), physical role limitations (RP), emotional role limitations (RE), social functioning (SF), mental health (MH), energy-vitality (EV), pain (P), and general health perception (GHP). Each domain was evaluated by points from 0 to 100. Maximum amount of points reflected undisturbed health-related quality of life.

Statistical analysis. Comparison of health variables between independent groups was performed using Student's t test. The χ^2 test or Fisher exact test was used to estimate association between categorical variables. The comparison of proportions between groups was performed using z test. Proportions were expressed as percentages with 95% confidence intervals (CI). Binary logistic regression analysis was used to determine the relative significance of poor sleep as a predictive variable according to sociodemographic and perceived health variables, and sleeping habits. Logistic regression analysis, using backward LR test, was employed to remove variables with P>0.05. Odds ratios (OR) of statistically significant predictors are presented (OR) with 95% CI. A P value of less than 0.05 was assumed to indicate significance. Computation was performed using SPSS 12.0 statistical software.

Results
Dissatisfaction with sleep and sociodemographic characteristics of the population
Females aged 45–54, 55–64, and 65–74 years were more often dissatisfied with sleep quality as compared with 35–44-year-old females (Fig. 1). Males aged 55–
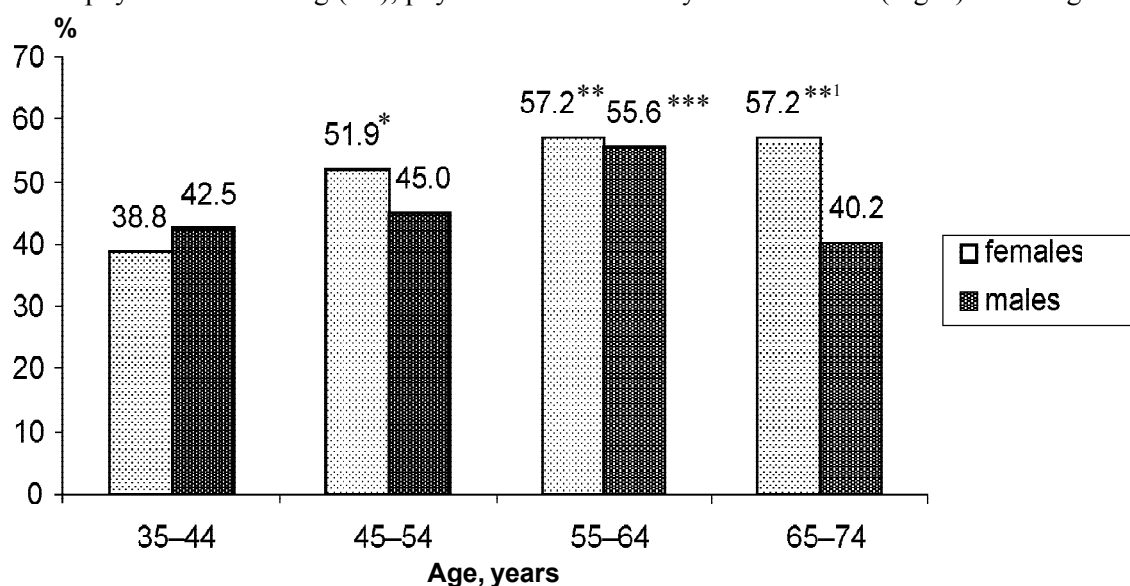
Fig. 1. Prevalence of "poor sleep" among 35–74-year-old citizens of Palanga
For comparison, Student's *t* test was used.
*P<0.05, as compared with females aged 35–44 years; **P<0.001, as compared with females aged 35–44 years;
***P<0.05, as compared with males aged 35–44 years;
[1]P<0.05, as compared with males aged 65–74 years.

64 years expressed dissatisfaction with sleep more often as compared with males aged 35–44 years (P<0.05). The prevalence of dissatisfaction with sleep was not different among females with respect to family status (Table 1). Among females with primary education, the dissatisfaction with sleep was more prevalent as compared with females who had university education (55.5% *vs.* 39.5%, respectively; P<0.05) (Table 1). Among males, the prevalence of "poor sleep" did not differ with respect to family status or education; however, the tendency to a greater prevalence of dissatisfaction with sleep among single males with primary education was noticed. Females with lower income (<143 €) per month were more often dissatisfied with sleep as compared with females with higher income per month (54.6% *vs.* 41.7% respectively; P<0.001) (Table 1). The same tendency was observed among males. Unemployed females (Table 1) were more often dissatisfied with sleep as compared with employed ones (59.0% *vs.* 44.5%, respectively; P<0.001). The prevalence of dissatisfaction with sleep among employed and unemployed males did not differ significantly. However, it was noticed that unemployed males considered their sleep poor more often as compared with employed ones.

Summarizing the results, dissatisfaction with sleep was related to older age and especially among females to primary education, lower income, and unemployment.

Dissatisfaction with sleep and sleeping habits

Dissatisfaction with sleep was more prevalent among females; their sleep latency period was 15–30 min or greater than 30 min as compared with females who felt asleep sooner than in 15 min (65.0% (95% CI, 57.8–71.3) and 82.0% (95% CI, 76.4–87.6) *vs.* 36.0% (95% CI, 32.1–39.8), respectively; P<0.001) as well as among males (66.5% (95% CI, 59.1–73.8) and 75.5% (95% CI, 63.2–87.9) *vs.* 33.8% (95% CI, 29.1–38.6), respectively; P<0.001).

The prevalence of dissatisfaction with sleep was statistically significantly higher among the females who woke up before 5 AM as compared with females who woke up from 6 to 7 AM (61.6% (95% CI, 53.0–70.2) *vs.* 42.0% (95% CI, 37.1–46.8), respectively; P<0.001). Dissatisfaction with sleep was more prevalent among male persons who woke up before 5 AM as compared with respondents who woke up in the morning from 5 to 6 AM, from 6 to 7 AM, and from 7 to 8 AM (57.9% (95% CI, 47.8–68.0) *vs.* 44.8% (95% CI, 38.7–51.0), 44.3% (95% CI, 37.2–51.3), and 37.2% (95% CI, 23.7–50.8), respectively; P<0.05).

Females who were taking a nap during the daytime

Table 1. **Prevalence of poor sleep according to sociodemographic variables**

Variable	Females (n=1002)		Males (n=600)	
	n	rate, % (95% CI)	n	rate, % (95% CI)
Family status				
Single	48	52.1 (37.6–66.6)	11	54.5 (21.1–87.9)
Married/living with someone	653	50.1 (46.3–53.9)	538	45.2 (41.0–49.4)
Divorced/widowed	301	52.1 (46.4–57.8)	51	51.0 (37.0–65.0)
Education				
Primary	62	55.5*(43.9–69.0)	46	54.3 (39.5–69.4)
Not finished secondary	115	64.0**(55.5–73.2)	90	54.4 (44.0–64.8)
Secondary/college	564	52.7**(48.5–56.8)	299	44.1 (38.5–49.7)
University	261	39.5 (33.5–45.4)	165	41.8 (34.2–49.4)
Income[1] per month				
<143 €	700	54.6**(50.9–58.3)	362	47.8 (42.6–53.0)
≥143 €	285	41.7 (36.0–47.5)	220	41.8 (35.3–48.3)
Employment status				
Unemployed	440	59.0**(54.3–63.5)	219	47.7 (41.0–54.4)
Employed	562	44.5 (40.4–48.6)	381	44.9 (39.9–49.9)

CI – confidence interval. The χ^2 test was used to estimate association between gender and sociodemographic variables. The comparison of proportions between females and males was performed using *z* test.

*P<0.05, as compared with persons who had university education; **P<0.001, as compared with persons who had university education and higher income, and were employed; [1]35 respondents did not answer to the question about the income per month.

several times per week were more often dissatisfied with sleep as compared with females who were taking a nap once per month (62.2% (95% CI, 54.9–72.0) *vs.* 51.0% (95% CI, 47.0–54.9), respectively; P<0.05).

Summarizing the results, dissatisfaction with sleep among citizens of Palanga was related to sleep latency period longer than 15 min, waking up before 5 AM, and frequent naps during daytime.

Dissatisfaction with sleep and perceived health

Females who rated their health as fair, rather poor, or poor during the last 3 months were more often dissatisfied with sleep as compared with females who rated their health as good (56.2%, 75.9%, 78.6% *vs.* 25.5%, respectively; P<0.001) (Table 2). Among males, dissatisfaction with sleep was more prevalent among respondents who reported their health as being fair, rather poor, or poor as compared with males who were satisfied with their health (P<0.05) (Table 2).

Females who had experienced stress events more often than usually in the period of the last month (Table 2) were dissatisfied with sleep more often as compared with females who had not experienced stress (67.6% *vs.* 39.7%, respectively; P<0.001). Associations between frequency of stress events and dissatisfaction with sleep were also noted among males (Table 2).

Respondents who had visited any doctor more than once during the last 12 months expressed dissatisfaction with sleep more often as compared with persons who had not had a single visit (among females 54.4% *vs.* 40.7%, respectively, and among males 51.1% *vs.* 37.7%, respectively; P<0.001) (Table 2).

Females as well as males who had any disease diagnosed or treated in the period of last year were dissatisfied with sleep more often as compared with healthy persons (among females 56.4% *vs.* 39.8%, respectively, and among males 52.9% *vs.* 36.4%, respectively; P<0.001) (Table 2).

Dissatisfaction with sleep among the citizens of Palanga was related to poor self-evaluated health, often experienced stress events, frequent visits to any doctor, and higher number of diseases treated or medications used.

Table 2. **Prevalence of poor sleep according to perceived health variables**

Variable	Females (n=1002)		Males (n=600)	
	n	rate, % (95% CI)	n	rate, % (95% CI)
Self-evaluated health				
Good	105	25.5 (16.1–32.5)	82	28.0 (18.8–38.4)
Rather good	138	26.8 (19.3–34.3)	112	22.3 (14.5–30.1)
Fair	659	56.2**(52.4–60.0)	363	54.5**(49.7–60.0)
Rather poor	58	75.9**(63.8–86.1)	25	64.0*(43.6–83.1)
Poor	42	78.6**(64.6–89.8)	18	72.2*(48.2–90.9)
Frequency of stress events during last month				
Very seldom	257	39.7 (33.7–45.7)	201	35.3 (28.7–42.0)
Moderate	483	47.7*(43.2–52.1)	302	45.4*(39.7–51.0)
Often	262	67.6**(61.9–73.3)	97	70.1**(60.9–79.3)
Frequency of visits to a doctor during last year				
<1	258	40.7 (34.7–46.7)	236	37.7 (31.5–43.9)
≥1	744	54.4**(50.7–58.0)	364	51.1**(46.2–56.5)
Number of diagnosed or treated diseases during last year				
<1	337	39.8 (34.5–45.0)	250	36.4 (30.4–42.4)
≥1	665	56.4**(52.6–60.2)	350	52.9**(47.6–58.1)

CI – confidence interval. The χ^2 test was used to estimate association between gender and prevalence of poor sleep variables.

The comparison of proportions between females and males was performed using *z* test.

*P<0.05, as compared with persons who evaluated their health as good and experienced stress events very seldom.; **P<0.001, as compared with persons who evaluated their health as good, experienced stress events very seldom, did not visit a doctor, and had no diagnosed or treated diseases during the last year.

Predictors of poor sleep

In order to identify the factors significantly associated with poor sleep, variables of sociodemographic and sleeping habits and perceived health were introduced to a multivariate model.

The results have demonstrated that poor perceived health (OR=2.32), frequent stress events (OR=2.53), regular nighttime awakenings (OR=3.03), and sleep latency period longer than 15 min in workdays (OR=4.15) were significant predictors of poor sleep among males (Table 3).

Among females (Table 3), duration of sleep shorter than 7 h (OR=1.68), frequent stress events (OR=1.99), poor perceived health (OR=2.77), sleep latency period

longer than 15 min in workdays (OR=3.55), and regular nighttime awakenings (OR=3.59) were significantly associated with the presence of dissatisfaction with sleep.

Relation between dissatisfaction with sleep and health-related quality of life

Persons dissatisfied with sleep, as compared with satisfied ones, had lower PF, RP, RE, SF, MH, EV, P, and GHP scores, which reflected poorer health-related quality of life (69.7 *vs.* 80.1, 55.4 *vs.* 72.7, 57.2 *vs.* 74.5, 66.8 *vs.* 80.1, 59.4 *vs.* 69.7, 54.8 *vs.* 64.4, 59.8 *vs.* 73.5, 44.8 *vs.* 53.1, respectively; P<0.05) (Fig. 2).

Persons who were dissatisfied with sleep, indepen-

Table 3. **Binary logistic regression model to predict poor sleep among the citizens of Palanga**

Variable	B	OR (95% CI)	*P* value
Males (n=600), R^2=0.478			
Poor self-evaluated health	0.842	2.32 (1.44–3.72)	0.001
Frequent stress events	0.930	2.53 (1.40–4.60)	0.002
Regular nighttime awakenings	1.108	3.03 (2.00–4.66)	<0.001
Sleep latency period (in workdays) >15 min	1.423	4.15 (2.65–6.50)	<0.001
Females (n=1002), R^2=0.513			
Duration of sleep <7 h	0.516	1.68 (1.11–2.53)	<0.001
Frequent stress events	0.689	1.99 (1.36–2.92)	<0.001
Poor self-evaluated health	1.018	2.77 (1.84–4.15)	<0.001
Sleep latency period (in workdays) >15 min	1.266	3.55 (2.51–5.02)	0.014
Regular nighttime awakenings	1.277	3.59 (2.56–5.03)	<0.001

OR – odds ratio; CI – confidence interval. Reference groups: good or rather good self-evaluated health, seldom experienced stress, not regular awakenings, sleep latency period shorter than 15 min, sleep duration longer than 7 h.
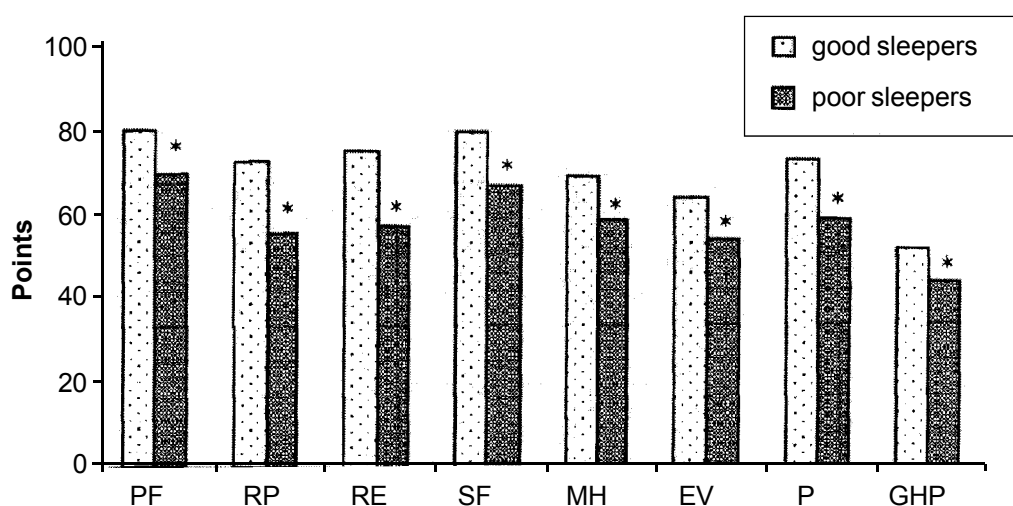
Fig. 2. **Self-evaluated sleep quality and health-related quality of life**
For comparison, Student's *t* test was used.
*P<0.05, as compared with good sleepers. PF – physical functioning; RP – physical role limitations; RE – emotional role limitations; SF – social functioning; MH – mental health; EV – energy/vitality; P – pain; GHP – general health perception.

dently of gender, had poorer health-related quality of life in every aspect as compare to respondents satisfied with their sleep quality (P<0.05).

Discussion

Almost half (49.0%) of citizens of Palanga have evaluated their sleep quality as fair, rather poor, or poor. Dissatisfaction with sleep among citizens of west part of Lithuania was more prevalent as compared with other European countries (16.1% in Great Britain, 15.5% in Germany, 10.1% in Italy, 2.4% in Spain (16), and 11.9% in Finland (17)). Different prevalence could be influenced by different methodology and the age of investigated persons. The prevalence of dissatisfaction with sleep in the population of Palanga was higher among females as compared with males, and it increased with age. These results did not contradict the data collected in other countries (18, 19).

The main factors associated with dissatisfaction with sleep in the population of Palanga were sleeping habits, such as sleep latency period longer than 15 min (OR=3.55 for females and OR=4.15 for males) and regular nighttime awakenings (OR=3.59 for females and OR=3.03 for males). Similar results were obtained in the study among the citizens of Germany – poor sleep was associated with sleep latency period longer than 30 min (OR=4.0) (3); however, the factor most associated with poor sleep was older age (65–74 years) (OR=6.7).

Other factors associated with poor sleep among citizens of west part of Lithuania were frequent stress events (OR=1.99 for females and OR=2.53 for males) and dissatisfaction with health (OR=2.77 for females and OR=2.32 for males). These results repeated the data obtained from the population of Canada, where stressful life and dissatisfaction with health were the most associated factors with poor sleep (20). Other factors, which demonstrated less association with poor sleep, were being a female, widow, or single, low education, low income, and unemployment.

Frequent visits to a doctor was the most associated factor with poor sleep among the citizens of France (OR=2.7); less associated factors were being divorced (OR=1.6), a widow (OR=2.7), older than 65 years (OR=1.5), being a female person (OR=1.3), and having low education (OR=1.4) (21).

The citizens of Palanga dissatisfied with their sleep quality had poorer health-related quality of life in every SF-36 domain. Researchers from the United States of America investigated persons older than 18 years and reported that poor sleep was related to poorer health-related quality of life, especially in aspects of physical and emotional role limitations, energy-vitality, and general health perception (22). The data have showed that there was a close relationship between insomnia and chronic illness; therefore, it was difficult to determine the key factor reducing health-related quality of life of the patients (8). Evaluation of health-related quality of life appeared to be a good approach to better understanding the difficulties of poor sleepers in daily activities. Several studies have showed the sensitivity of the SF-36 in evaluating the impact of insomnia either alone or in association with other chronic diseases (5, 8). Despite this, we agree with the opinion of other scientists (5) that it is necessary to develop more accurate tools that would help to evaluate health-related quality of life in individuals with insomnia.

Conclusions

Poor perceived health, frequent stress events, regular nighttime awakenings, and sleep latency period longer than 15 min were indicated as significant predictors of poor sleep. Poor sleep worsened health-related quality of life in all domains of SF-36.

Nepasitenkinimą miegu lemiantys veiksniai ir su sveikata susijusi gyvenimo kokybė

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Raktažodžiai: nepasitenkinimas miegu, miego kokybė, su sveikata susijusi gyvenimo kokybė.

Santrauka. *Darbo tikslas.* Ištirti veiksnius, lemiančius nepasitenkinimą miegu, ir nustatyti ryšį tarp miego kokybės vertinimo bei su sveikata susijusios gyvenimo kokybės.
Tyrimo medžiaga ir metodai. Miego kokybė vertinta remiantis Šiaurės šalių miego klausimynu. Su sveikata

susijusiai gyvenimo kokybei nustatyti naudotas SF-36 klausimynas. Į Šiaurės šalių miego klausimyno klausimus atsakė 1602 atsitiktinai atrinkti 35–74 metų Palangos miesto gyventojai, iš jų 600 vyrų ir 1002 moterys. SF-36 klausimyną užpildė 1016 respondentų, iš jų 379 vyrai ir 637 moterys. Savo sveikatą tiriamieji vertino atsakydami į anketos „Savo sveikatos vertinimas" klausimus. Tiriamų veiksnių įtaka subjektyviai miego kokybei apskaičiuota dvinarės logistinės regresijos metodu. Priklausomas kintamasis buvo miego kokybė (bloga/gera), o nepriklausomi kintamieji – savo sveikatos vertinimas ir kiti veiksniai. Buvo sudarytas kelių nepriklausomų kintamųjų logistinės regresijos modelis.

Rezultatai. Vyrams nepasitenkinimo miegu galimybę reikšmingai didino blogas savo sveikatos vertinimas, dažnai patiriamas stresas, reguliarūs prabudimai ir užmigimo trukmė, ilgesnė nei 15 minučių. Moterims nepasitenkinimo miegu galimybę statistiškai reikšmingai didino miego trukmė, trumpesnė nei 7 valandos, dažnai patiriamas stresas, blogas savo sveikatos vertinimas, užmigimo trukmė, ilgesnė nei 15 minučių, ir reguliarūs prabudimai naktį. Nustatyta, kad nepatenkintų miegu vyrų ir moterų su sveikata susijusios gyvenimo kokybės visų sričių balai buvo statistiškai reikšmingai mažesni nei patenkintų miegu vyrų ir moterų.

Išvados. Blogas savo sveikatos vertinimas, dažnai patiriamas stresas, reguliarūs prabudimai ir užmigimo trukmė, ilgesnė nei 15 minučių, buvo statistiškai reikšmingi veiksniai, lemiantys nepasitenkinimą miegu. Be to, nepasitenkinimas miegu buvo susijęs su blogesne sveikata, susijusia su gyvenimo kokybe.

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