Correlation Between Sleep Quality And Quality Of Life Among Hypertensive Adults In A Mountainous Area Of Hubei Province, China

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Research

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Abstract

Background: Hypertension is one of the most common and easy paroxysm diseases. Inadequately controlled hypertension has been related to poor sleep quality, which would be associated with worsening quality of life.

Methods: A descriptive analyses was conducted to describe social demographic factors, while ANOVA and *t*-test were carried out to compare scores between different groups. The total score of life quality (MCS and PCS) was used as the dependent variable (Y), and the dimensions of sleep quality were used as the independent variable (X) for multiple line regression analysis (Stepwise) to evaluate the correlation between sleep quality and life quality.

Results: The results of group comparison showed that the total PSQI score was significant at people's residence ($P < 0.01$). Correlation analysis indicated that subjective sleep quality, sleep disturbance, daytime dysfunction, age, concomitant diseases, and years of diagnosed hypertension had a significant association with the PCS scores ($P < 0.05$ for all). Subjective sleep quality, sleep disturbance, daytime dysfunction, and monthly income had a significant association with the MCS scores ($P < 0.05$ for all).

Conclusion: The correlation analysis shows that sleep quality of hypertensive patients is related to quality of life. Considering the close relation among hypertension, sleep quality, and life quality, possible interventions like sleep hygiene was appealed to relieve hypertensive symptoms, promote sleep quality, and increase life quality.

Trial registration: 2018-1602000-03-02

1 Background

Along with the continued increase of longevity and life expectancy, more attention has been attached to the improvements in health-related quality of life (HRQoL). As the World Health Organization (WHO) summarized – “adding years to life is an empty victory without adding life to years” (Khalifeh et al., 2015)(ChenTaichman & Doyle, 2008; Halaweh, Willen, Grimby-Ekman, & Svantesson, 2015), there is a consensus that HRQoL is one of the important aspects of health status. The quality of life consequently has a close relationship to everyone, considering the association with a person's perception of the position in life as well as the impact on an individual's physical, psychological health status, and social relationships. For patients with chronic diseases, especially hypertensive patients, HRQoL would be influenced by the changes in lifestyle attributed to disease labels and treatment (Trevisol, Moreira, Fuchs, & Fuchs, 2012).

Hypertension or high blood pressure is one of the most common and easy paroxysm diseases, which accounts for a risk factor of coronary heart disease and stroke. It accounts for about 13% of all global deaths and affects approximately 25% of the world population (Hanus, Amboni, Rosa, Ceretta, & Tuon, 2015). Numerous studies have found the widespread phenomenon that hypertension exerts a negative effect on HRQoL. For example, hypertensive patients suffered low HRQoL scores, which was evaluated by The Short-Form Health Survey (SF) (Bardage & Isacson, 2001; Mena-Martin et al., 2003). A systematic review and meta-analysis conducted by Trevisol DJ et, al confirmed the results. It identified a lower HRQoL in both physical and mental components among hypertensive patients compared with those normotensive ones (Trevisol, Moreira, Kerkhoff, Fuchs, & Fuchs, 2011). Similarly, Chinese hypertensive patients were found experiencing lower HRQoL compared with normotensive individuals (Wang et al., 2009; Zhang et al., 2017).

Although the control of hypertension through a pharmacological treatment reduces mortality, it is difficult for more than 50% of hypertensive individuals worldwide to have their blood pressure under control (Hering, Esler, Krum, Mahfoud, & Schlaich, 2011; LiuByrd & Rodriguez, 2018). Some researches indicated that inadequately controlled hypertension has been related to poor sleep quality, which would be associated with worsening quality of life. Sleep is essential to renew our strength from the rigor of the day, but hypertensive individuals are more likely to have poor sleep quality influenced by lifestyle. Prior questionnaire-based surveys have found that the most common sleep disorders are an insufficient amount of hours slept and insomnia, the two also being common in hypertensive individuals (TurekRicardo & Lash, 2012). Meanwhile, some researchers used the PSQI to evaluate sleep quality and HRQoL and indicated an obvious association between poor sleep quality (particularly insomnia, short duration, and poor sleep) and low HRQoL (Lo & Lee, 2012; Reimer & Flemons, 2003). Due to the sleep-related breathing disorders

and nocturnal oxygen desaturation that have been reported adversely to the quality of life, the impact of poor sleep quality or sleep disturbances on HRQoL cannot be ignored (Matura, McDonough, Hanlon, Carroll, & Riegel, 2015).

To date, there are very limited studies concerning the relationship between the quality of sleep and HRQoL of hypertensive patients, especially in China. Therefore, the present study's overall goal is to investigate the association between sleep quality and life quality among those with hypertension. Besides, self-reported HRQoL and patient characteristics associated with it were examined, while sleep quality was compared with domestic norms.

2 Methods

2.1 Participants and Setting

It is a cross-sectional and quantitative study conducted from July 2018 to August 2018. Data collection was based on a Self-Monitoring Intervention Programme for Hypertension Control in remote mountainous areas in Hubei province. Unified standard training was provided for investigators before the investigation begins. This program cooperated with local government and it was approved by the Research Ethics Committees of Wuhan University (2018-1602000-03-02) and the local institutional review board of Xuanen, Hubei. All participants provided with written informed consent and were interviewed face to face.

The inclusion criteria of eligible participants are as follows: 1) aged over 18 years, 2) living in the Xuanen Area, Hubei, 3) diagnosed with hypertension: systolic BP ≥ 140 mmHg and/or diastolic BP ≥ 90 mmHg or treated with antihypertensive medication, and 4) exhibiting communication proficiency to complete the research. Those who meet the exclusion criteria will be excluded: 1) had cognitive dysfunction, 2) inability to complete investigation due to severe illness or aging. A total of 600 potential participants performed this survey, which eventually retained 572 (95.33%).

2.2 Measures

2.2.1 Sociodemographic information

A self-designed questionnaire was used. Sociodemographic information collected in the survey included: gender, age, educational background, occupation, monthly income, ethnicity, marital status, residence, concomitant diseases, and years of diagnosed hypertension.

2.2.2 The Pittsburgh Sleep Quality Index (PSQI)

The Pittsburgh Sleep Quality Index (PSQI) (Buysse, Reynolds, Monk, Berman, & Kupfer, 1989) was used to measure participant's sleep quality. The scale covers 7 areas, including subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbance, use of sleeping medication, and daytime dysfunction. Each of the 7 dimensions had a possible score of 0 to 3. The total score of PSQI was the sum of the scores of 7 dimensions with a range from 0 to 21 points, higher scores indicate poorer sleep quality. The acceptable reliability coefficient of the PSQI ranged from 0.77 to 0.85 among Chinese population [17].

2.2.3 The 12-item Short-Form Health Survey Questionnaire (SF-12)

Life quality was assessed using the 12-item Short-Form Health Survey Questionnaire (SF-12). SF-12 is a simplified version of the 36 items Short-Form Health Survey Questionnaire (SF-36) (FleishmanSelim & Kazis, 2010), containing 12 items and 8 dimensions— general health, physical functioning, role-physical, bodily pain, mental health, vitality, social functioning, and role-emotional. The 8 dimensions are summarized into 2 comprehensive indicators of physical component summary (PCS) and mental component summary (MCS). The theoretical score ranges from 0 to 100 points, higher scores indicate a higher level of life quality. The Cronbach's alpha was 0.85 in this sample.

2.3 Statistical analysis

EpiData 3.0 was used to complete data entry and conversion. A double machine imputing method was used to enter the collected data into the computer. Statistical analyses were performed using the SPSS software version 21.0. Descriptive

analyses were conducted to describe social demographic factors. Variables with normal distribution were reported as mean values $\pm$ standard deviation ($M \pm SD$), whereas they were described as median and interquartile range with abnormal distribution. ANOVA and t -test are carried out to compare scores between different groups. The total score of life quality (MCS and PCS) was used as the dependent variable (Y), and the dimensions of sleep quality and characteristics were used as the independent variable (X) for multiple line regression analysis (Enter) to evaluate the correlation between sleep quality and life quality. P -values less than 0.05 (two-sides) were considered statistically significant.

3 Results

3.1 Sample characteristics

The descriptive analysis of the 572 participants allowed us to obtain the results presented below (Table 1). Over half of the respondents (55.77%) are female. Among all people, 80.60% were aged more than 60 years, with a mean age of 70.07 years (standard deviation: 10.43, range: 18–99). Educational background of them was generally low with only 27 (4.72%) having attended high school. 515 (90.03%) were peasantry and 539 (94.23%) lived in rural areas. 261 earned less than 1001 Yuan per month. The majority (52.09%) were Tujia, followed by Han. 416 (72.73%) were currently married. Most people (87.24%) had concomitant diseases besides hypertension. More than a third of people had been diagnosed with high blood pressure for more than a decade.

Table 1
Sociodemographic characteristics and comparison on scores of PSQI and SF-12 of the participants

Group		Number (%)	Sleep quality		PCS		MCS	
			Mean $\pm$ SD ^a	<i>t/F(P)</i>	Mean $\pm$ SD ^a	<i>t/F (P)</i>	Mean $\pm$ SD ^a	<i>t/F (P)</i>
Gender ^b	male	253 (44.23)	7.11 $\pm$ 3.66	-1.778 (0.076)	34.60 $\pm$ 11.83	0.023 (0.981)	50.28 $\pm$ 11.93	2.614 (0.009**)
	female	319 (55.77)	7.67 $\pm$ 3.81		34.58 $\pm$ 11.09		47.66 $\pm$ 11.89	
Age (years) ^c	≤41	7 (1.22)	4.29 $\pm$ 3.45	1.749 (0.156)	47.42 $\pm$ 11.87	6.893 (0.000**)	50.75 $\pm$ 9.17	0.165 (0.920)
	41 ~ 60	104 (18.18)	7.53 $\pm$ 3.75		37.48 $\pm$ 11.76		48.44 $\pm$ 11.45	
	61 ~ 80	390 (68.18)	7.48 $\pm$ 3.71		34.06 $\pm$ 11.18		48.77 $\pm$ 12.10	
	≥80	71 (12.42)	7.25 $\pm$ 3.95		31.98 $\pm$ 11.75		49.47 $\pm$ 12.39	
Educational background ^c	illiteracy	188 (32.87)	7.94 $\pm$ 3.83	1.843 (0.138)	32.38 $\pm$ 10.47	4.503 (0.004**)	48.10 $\pm$ 12.46	2.802 (0.039*)
	primary school	273 (47.73)	7.23 $\pm$ 3.76		35.12 $\pm$ 11.66		48.14 $\pm$ 11.94	
	middle school	84 (14.68)	7.08 $\pm$ 3.47		37.48 $\pm$ 11.58		51.33 $\pm$ 11.22	
	high school and above	27 (4.72)	6.89 $\pm$ 3.67		35.63 $\pm$ 12.48		52.86 $\pm$ 9.50	
Occupation ^b	peasantry	515 (90.03)	7.41 $\pm$ 3.71	-0.182 (0.856)	34.13 $\pm$ 11.12	-2.919 (0.004**)	48.44 $\pm$ 11.96	-2.274 (0.023*)
	non-peasants	57 (9.97)	7.51 $\pm$ 4.15		38.75 $\pm$ 13.21		52.23 $\pm$ 11.58	
Monthly income (Yuan) ^c	< 1000	261 (45.63)	7.59 $\pm$ 3.79	0.674 (0.610)	33.14 $\pm$ 11.36	2.581 (0.036*)	47.61 $\pm$ 13.05	4.374 (0.002**)
	1001 ~ 2000	144 (25.17)	7.49 $\pm$ 3.78		35.92 $\pm$ 11.21		47.82 $\pm$ 10.91	
	2001 ~ 3000	87 (15.21)	7.08 $\pm$ 3.56		34.76 $\pm$ 9.92		50.19 $\pm$ 10.81	

Note: ^a SD, standard deviation. ^b *t* test was used for comparison between two groups. ^c the analysis of variance was used for comparison between three groups and above. ***P* < 0.01. **P* < 0.05.

Group		Number (%)	Sleep quality		PCS		MCS	
			Mean $\pm$ SD ^a	<i>t/F(P)</i>	Mean $\pm$ SD ^a	<i>t/F(P)</i>	Mean $\pm$ SD ^a	<i>t/F(P)</i>
	3001 ~ 4000	34 (5.95)	7.59 $\pm$ 4.24		35.08 $\pm$ 11.31		50.77 $\pm$ 9.65	
	> 4000	46 (8.04)	6.78 $\pm$ 3.46		37.93 $\pm$ 14.03		48.82 $\pm$ 11.97	
Ethnic ^c	Han	175 (30.59)	7.05 $\pm$ 3.63	1.033 (0.389)	34.45 $\pm$ 11.28	0.954 (0.433)	48.19 $\pm$ 11.45	2.034 (0.088)
	Tujia	297 (51.92)	7.56 $\pm$ 3.85		34.34 $\pm$ 11.25		49.76 $\pm$ 11.93	
	Miao	10 (1.75)	7.30 $\pm$ 3.59		31.81 $\pm$ 10.11		54.16 $\pm$ 11.93	
	Dong	79 (13.81)	7.89 $\pm$ 3.74		35.40 $\pm$ 12.34		46.35 $\pm$ 12.87	
	others	11 (1.93)	6.45 $\pm$ 3.11		40.20 $\pm$ 12.07		48.82 $\pm$ 11.97	
Marital status ^c	unmarried	6 (1.05)	6.67 $\pm$ 5.13	2.060 (0.128)	36.86 $\pm$ 18.05	0.136 (0.873)	53.83 $\pm$ 14.19	1.982 (0.139)
	married	416 (72.73)	7.25 $\pm$ 3.66		34.62 $\pm$ 11.08		49.28 $\pm$ 11.78	
	divorce/widowed	150 (26.22)	7.95 $\pm$ 3.92		34.42 $\pm$ 12.09		47.34 $\pm$ 12.31	
Residence ^b	county town	33 (5.77)	5.76 $\pm$ 2.48	-2.642 (0.008**)	42.17 $\pm$ 11.23	3.982 (0.000**)	50.42 $\pm$ 11.09	0.789 (0.431)
	Rural area	539 (94.23)	7.53 $\pm$ 3.79		34.12 $\pm$ 11.27		48.72 $\pm$ 12.02	
Concomitant diseases ^b	yes	499 (87.24)	6.93 $\pm$ 3.16	-1.200 (0.231)	31.77 $\pm$ 10.17	-2.268 (0.024*)	47.60 $\pm$ 12.51	-0.934 (0.351)
	no	73 (12.76)	7.49 $\pm$ 3.83		35.00 $\pm$ 11.54		49.00 $\pm$ 11.89	
Years of diagnosed hypertension ^c	< 1	74 (12.94)	6.97 $\pm$ 4.01	0.761 (0.551)	38.96 $\pm$ 11.98	4.724 (0.001**)	50.59 $\pm$ 11.36	1.830 (0.122)
Note: ^a SD, standard deviation. ^b <i>t</i> test was used for comparison between two groups. ^c the analysis of variance was used for comparison between three groups and above. ** <i>P</i> < 0.01. * <i>P</i> < 0.05.								

Group		Number (%)	Sleep quality		PCS		MCS	
			Mean $\pm$ SD ^a	<i>t</i> /F(<i>P</i>)	Mean $\pm$ SD ^a	<i>t</i> /F (<i>P</i>)	Mean $\pm$ SD ^a	<i>t</i> /F (<i>P</i>)
	1 ~ 3	117 (20.45)	7.37 $\pm$ 3.61		34.83 $\pm$ 11.64		49.77 $\pm$ 11.56	
	4 ~ 6	130 (22.73)	7.18 $\pm$ 3.62		34.59 $\pm$ 11.86		49.45 $\pm$ 11.42	
	7 ~ 10	53 (9.27)	7.75 $\pm$ 3.36		35.87 $\pm$ 11.44		45.66 $\pm$ 13.40	
	> 10	198 (34.61)	7.69 $\pm$ 3.92		32.47 $\pm$ 10.29		48.03 $\pm$ 12.27	
Total	---	572 (100)	7.62 $\pm$ 3.75	---	34.59 $\pm$ 11.41	---	48.84 $\pm$ 11.97	---

Note: ^a SD, standard deviation. ^b *t* test was used for comparison between two groups. ^c the analysis of variance was used for comparison between three groups and above. ***P* < 0.01. **P* < 0.05.

3.2 Comparison on scores of PSQI and SF-12

The results of group comparison also appeared in Table 1. For sleep quality, the total PSQI score was significant at people's residence ($P < 0.01$), the sleep quality of people in rural areas is lower than that in the county. For PCS of life quality, significant differences can be found for age, educational background, occupation, monthly income, residence, concomitant diseases, years of diagnosed hypertension ($P < 0.05$ for all). Gender, educational background, occupation, monthly income had significant influence on MCS ($P < 0.05$ for all). As shown in Table 2, score of 7 subscales and total score of the PSQI in our research were lower than Chinese norm, and the comparison results of *t*-test are statistically significant ($P < 0.05$ for all). In addition, 294 participants had a poor sleep quality (PSQI ≥ 7).

Table 2
Comparison of sleep quality between hypertension patients and domestic norms (M $\pm$ SD)

	n	Subjective sleep quality	Sleep Latency	Sleep duration	Sleep efficiency	Sleep disturbance	Hypnotic drugs	Daytime dysfunction	Total PSQI score
Chinese norm group ^a	112	0.63 $\pm$ 0.68	0.70 $\pm$ 0.86	0.70 $\pm$ 0.58	0.15 $\pm$ 0.47	0.90 $\pm$ 0.44	0.06 $\pm$ 0.24	0.73 $\pm$ 0.83	3.88 $\pm$ 2.52
Hypertension group	572	1.31 $\pm$ 0.84	1.64 $\pm$ 1.14	0.94 $\pm$ 1.02	0.50 $\pm$ 0.94	1.58 $\pm$ 0.67	0.17 $\pm$ 0.23	1.62 $\pm$ 1.09	7.62 $\pm$ 3.75
<i>t</i>		8.06	8.28	2.41	3.85	10.31	4.50	8.19	10.11
<i>P</i>		< 0.01**	< 0.01**	< 0.05*	< 0.01**	< 0.01**	< 0.01**	< 0.01**	< 0.01**

Note: ^a norm group, score of Chinese normal adults. ***P* < 0.01. **P* < 0.05.

3.3 Correlation analysis of sleep quality and life quality

PCS and MCS were taken as dependent variables, respectively. Table 3 presents the regression results for PCS. The overall model of PCS was significant ($R^2 = 0.21$, $F = 25.38$, $P < 0.01$). Subjective sleep quality ($\beta = -2.41$, $P < 0.01$), sleep disturbance ($\beta = -1.71$, $P < 0.05$), daytime dysfunction ($\beta = -2.50$, $P < 0.01$), age ($\beta = -3.09$, $P < 0.01$), concomitant diseases ($\beta = -3.03$, $P < 0.05$), and

year of diagnosed hypertension ($\beta=-0.71$, $P<0.05$) had a significant association with the PCS scores. The regression results for MCS were demonstrated in Table 4. The overall model of MCS was significant ($R^2 = 0.21$, $F = 37.68$, $P<0.01$). Subjective sleep quality ($\beta=-1.54$, $P<0.05$), sleep disturbance ($\beta=-2.49$, $P<0.01$), daytime dysfunction ($\beta=-3.31$, $P<0.01$), and monthly income ($\beta = 1.24$, $P<0.01$) had a significant association with the MCS scores.

Table 3
Multiple linear regression analysis of influencing factors of life quality on physical component summary (PCS) in patients with hypertension

	B	SE	t	95% CI	P
Constant	56.26	2.48	22.69	51.39 ~ 61.13	< 0.001*
Subjective sleep quality	-2.41	0.58	-4.17	-3.55~-1.28	< 0.001*
Sleep disturbance	-1.71	0.71	-2.43	-3.10~-0.33	0.015*
Daytime dysfunction	-2.50	0.43	-5.79	-3.35~-1.65	< 0.001*
Age	-3.09	0.72	-4.25	-4.51~-1.66	< 0.001*
Concomitant diseases	-3.03	1.28	-2.36	-5.54~-0.51	0.019*
Years of diagnosed hypertension	-0.71	0.30	-2.36	-1.29~-0.12	0.018*
R ²	0.21				
F	25.38**				
Note: *p < 0.05. **p < 0.01.					

Table 4
Multiple linear regression analysis of influencing factors of life quality on mental component summary (MCS) in patients with hypertension

	B	SE	t	95% CI	P
Constant	57.60	1.47	39.19	54.71 ~ 60.49	< 0.001*
Subjective sleep quality	-1.54	0.60	-2.54	-2.72~-0.35	0.01*
Sleep disturbance	-2.49	0.74	-3.36	-3.94~-1.04	0.001**
Daytime dysfunction	-3.31	0.45	-7.31	-4.20~-2.42	< 0.001*
Monthly income	1.24	0.36	3.45	0.53 ~ 1.94	0.001**
R ²	0.21				
F	37.68**				
Note: *p < 0.05. **p < 0.01.					

4 Discussion

Sleep plays an important role in human life. Sleep quality is directly related to persons' physical and mental health. The results showed that the sleep quality of hypertensive patients was worse than that of healthy population in China. And 51.40% of respondents had poor sleep quality. Many studies have demonstrated the notion that sleep quality is worse than health people due to abnormal body functions (JinhuanJifang & Xiaoli, 2011; Lan & Yue, 2009; Liu et al., 2016; Osonoi et al., 2015). Continuously rising blood pressure can lead to dysfunction of cerebral cortex and autonomic nerve, which indirectly causes insomnia symptoms such as difficulty in falling asleep, easy to wake up, and restless sleep.

A Chinese population-based study verified that sleep quality was significantly correlated with life quality (JinhuanJifang & Xiaoli, 2011; Lan & Yue, 2009; Liu et al., 2016; Osonoi et al., 2015). Our findings extended the literature suggesting that higher sleep quality score (poor sleep quality) indicates lower life quality in patients with hypertension. Specifically, it was found that subjective sleep quality, sleep disorder, and daytime dysfunction were influencing factors of PCS and MCS. The mechanism of the relationship between sleep quality and life quality has not been clarified due to a lack of confirming evidence, but two aspects must be mainly mentioned here. One reason is that most of the hypertensive patients were elderly people in this study, who might suffer from dizziness, palpitation, and other symptoms due to the pathological changes of the body. The symptoms mentioned above may interfere with sleep quality causing a poor life quality. On the other hand, long-term poor sleep quality can cause or aggravate anxiety and depression, thus affecting the quality of life.

Subjective sleep quality is defined as the retrospective evaluation of the individual's recalled sleep experience, which can be summarized as the overall sleep status (Andrew et al., 2008). Studies conducted in Asia (Hering et al., 2011) and Europe (Hering et al., 2011) have suggested that poor subjective sleep quality is associated with significantly higher odds ratios of hypertension. Our study also found hypertensive patients manifest with a poor subjective sleep quality, which had a negative association with HRQoL including PCS and MCS. We speculated the reason probably related to a series of mental and physical weakness caused by a poor sense of subjective sleep, such as daytime fatigue, bloating, and dizziness, which seriously affects

the quality of life. Being a primary indicator of sleep parameters, subjective perception might be helpful to predict sleep quality as well as life quality. Therefore, elderly people with hypertension should attach attention to their subjective estimates of the ease of sleep onset, sleep maintenance, total sleep time, early awakening, restlessness during the night, and anxiety, tension, or calmness when trying to sleep (Harvey, Kathleen, Whitaker, Damian, & Harvinder, 2008).

Under normal circumstances, the sleep habits of the elderly would undergo physiological changes, but some of the excessive changes in sleep habits were considered to be part of sleep disorders (Hoffman, 2003; Kryger, Monjan, Bliwise, & Ancoli-Israel, 2004; Rajput & Bromley, 1999). Previous studies have found that most people suffer from sleep disturbance as a fact of the aging process (Fermina & Revathi, 2017), which was mainly manifested by awakening at night, cough, a feeling of breathlessness/cold/hot/pain. It was because aging would weaken people's homeostatic sleep drive by age 50, and the amplitude of the circadian rhythm would decline with aging (Smith et al., 2018). Related studies found that 73% of pulmonary hypertensive patients experienced poor sleep quality associated with sleep disturbance (Batal, Khatib, Bair, Aboussouan, & Minai, 2011; Minai, Malik, Foldvary, Bair, & Golish, 2008). Sleep disturbance can be caused by insomnia and restless leg syndrome, and the symptoms interfere with people's lives and negatively affect HRQoL (MaturaMcdonough & Carroll, 2012). Thus, the nondipping pattern through a disruption of the circadian rhythm as well as the increase in the frequency of awakening would lead to a decrease in the deep sleep period, and sleep deficiencies made people inactive (Erden et al., 2010).

Optimal sleep depends on individuals' sleep requirement and circadian rhythm, once one or both of the critical elements are disrupted, daytime dysfunction and non-restorative sleep may occur (Gamaldo, Chung, Yu, & Salas, 2014). It's not difficult to find that daytime dysfunction is a negative result of poor sleep quality at night, and it would lead to a reduced sense of life quality in this study. In general, feeling tired when waking up in the morning is one of the main manifestations of daytime dysfunction. Separate studies have proved that daytime dysfunction caused by poor sleep, would pose a negative impact on life quality, thus worsening symptoms of the underlying disease like hypertension (NasirShahid & Shabbir, 2015; Parish & M., 2009).

What could be underlined was that we assessed the association between PSQI and HRQoL by calculating PSQI components as well as the global score. Although this study cannot explain the causal relationship between sleep quality and life quality in hypertensive patients, the correlation analysis shows that the sleep quality of hypertensive patients is related to the quality of life.

5 Conclusion

Sleep quality is related to the quality of life among hypertensive patients in a mountainous area of Hubei, China. Considering the close relation among hypertension, sleep quality, and life quality, possible interventions like sleep hygiene was appealed to relieve hypertensive symptoms, promote sleep quality, and increase life quality.

List Of Abbreviations

HRQoL: health-related quality of life, SF: Short-Form Health Survey, PSQI: Pittsburgh Sleep Quality Index, PCS: physical component summary, MCS: mental component summary.

Declarations

Ethics approval and consent to participate

All participants provided written informed consent. All procedures performed in the study involving human participants were in accordance with the ethical standards of the institutional research committee and the guidelines of the Declaration of Helsinki. This study was approved by research ethics committees of Wuhan University (2018-1602000-03-02) and the local institutional review board of Xuanen, Hubei.

Consent for publication

Informed consent for publication was obtained.

Availability of data and materials

The datasets generated for this research are available on request to the corresponding author.

Competing interests

The authors report no conflicts of interest.

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Authors' contributions

LR, designed the survey, collected and analyzed data, and wrote the manuscript; XyC, designed the survey, analyzed data and wrote the manuscript; YpZ, collected data, and wrote the manuscript; MyL, collected data, and wrote the manuscript; QC, collected and analyzed data, and wrote the manuscript; XdT, edited the manuscript. All authors have read and approved the manuscript in its final form.

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