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ORIGINAL RESEARCH

Relationship between quality of life and restless legs syndrome among a community-dwelling population in Japan

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Objectives: Restless legs syndrome (RLS) is a sensorimotor disturbance that causes the production of impulses and dysesthesia and makes the patients feel as though they must move their lower extremities. Because the symptoms of RLS in the lower limbs tend to develop at night, RLS could cause sleep disorders. We investigated an association between the symptoms of RLS and the health-related quality of life among community-dwelling individuals in Japan.

Methods: In this cross-sectional survey, we enrolled 985 volunteers who participated in the Iwaki Health Promotion Project in 2013. The symptoms of RLS were evaluated by the criteria of the International Restless Legs Syndrome Study Group. The assessments included an interview to obtain sociodemographic data, the second version of the Short Form Health Survey, the Center for Epidemiological Studies Depression scale, and the Pittsburgh Sleep Quality Index. A multiple regression analysis was used to assess the relationship between the symptoms of RLS and subscores of the Short Form Health Survey, Version 2.

Results: The overall prevalence of RLS in our participants was 1.0%. We found a significant and negative association between symptoms of RLS and physical functioning, role – physical functioning, bodily pain, social functioning, and the physical composite summary score.

Conclusion: After adjusting for confounders such as age, sex, and comorbidity, the burden of RLS appears to be mainly a physical problem. Impaired health-related quality of life among community individuals with RLS emphasizes the importance of screening for these symptoms and evaluating the need for treatment.

Keywords: cross-sectional study, restless legs syndrome, quality of life, Japanese

Background

Restless legs syndrome (RLS) is a sensorimotor disturbance characterized by an irresistible urge to move the legs during periods of rest or inactivity. The urge to move is typically accompanied or prompted by unpleasant sensations in the affected legs, which have been described by terms such as burning, crawling, painful, pulling, and tingling. The symptoms worsen at night and are temporarily relieved with movement. Because the diagnostic criteria of RLS were proposed by the International Restless Legs Syndrome Study Group (IRLSSG) of the National Institutes of Health, several studies on the prevalence of RLS have been carried out.[1] The prevalence of RLS, as reported from population-based studies, ranges from 5.5% to 9.6% in Western countries and from ~0.9% to 4.0% in Japan.[2–9] Although cultural and ethnic differences might affect the differences between Japan and Western countries, the causes for this lower rate of susceptibility among Japanese individuals have not been established.

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Exacerbation of RLS symptoms at night often results in marked sleep disturbances,[1] and chronic sleep deprivation would be expected to have a negative impact on economic costs and on individual daily life role functioning.[10] Although the sleep and sensorimotor disturbances associated with RLS are well documented, there is limited information on the effect of RLS across a range of health-related quality of life (HRQoL) domains in Japan.

In this study, we assessed (1) the prevalence of RLS and (2) the relationship between symptoms of RLS and the self-reported HRQoL among a community-dwelling population in Japan. We hypothesized that RLS symptoms would be associated with a decreased HRQoL.

Methods

Participants

The subjects included 985 volunteers (375 males and 610 females) who participated in the Iwaki Health Promotion Project in 2013. The data collection method for this study was approved by the Ethics Committee of Hirosaki University School of Medicine, and all subjects provided written informed consent before participating in the project. The demographic data (age, sex, amount of education) and medical information (positive history of hypertension, diabetes, dyslipidemia) were obtained from self-questionnaires and interviews.

The participants were assessed by trained testers in face-to-face interviews according to the RLS diagnostic criteria developed by the IRLSSG.[1] The RLS diagnostic criteria consist of the following four items: (1) an urge to move the legs, usually accompanied or caused by an uncomfortable sensation in the legs; (2) the beginning or worsening of symptoms during periods of rest or inactivity; (3) the partial or total relief of symptoms by movement; and (4) worse symptoms in the evening or night than during the day, or occurring only in the evening or night.

The Short Form Health Survey, Version 2 (SF-36®v2), was used to assess the participants' HRQoL.[11] The SF-36®v2 is a standardized, 36-item, self-administered questionnaire that has been translated, adapted, and validated for use in Japan.[12] This questionnaire assesses eight quality-of-life (QoL) domains of health status. The domains concerning physical health consist of physical functioning, role – physical functioning, bodily pain, and general health. The domains concerning mental health consist of vitality, social functioning, role – emotional functioning, and mental health. For each QoL domain, a score ranging from 0 to 100 is calculated, and higher scores indicate more positive perceptions of the HRQoL. The scores from all eight domains are combined to create more comprehensive indicators of physical and mental health: the physical composite summary (PCS) and the mental composite summary (MCS). The PCS and MCS are standardized (Japanese mean =50, standard deviation =10) to compare with the general population or with the results of other studies.

The Japanese version of the Center for Epidemiological Studies Depression (CES-D) scale was administered to all participants to measure their depressive status.[13,14] This questionnaire has been widely used to measure depressive symptoms in community populations and is used as a screening tool for depression. The CES-D is a 20-item self-report measure that focuses on depressive symptoms within the week prior to the administration of the questionnaire. The maximum score is 60, with higher scores indicating an increased severity of depression.

As an evaluation of sleep, we used the Pittsburgh Sleep Quality Index (PSQI).[15] The PSQI is a validated self-rated questionnaire that assesses sleep quality and disturbances during the preceding month. Eighteen individual items generate seven component scores: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. The cutoff value is 5.5, and a perfect score is a total of 21 points.

Statistical analyses

Continuous variables were expressed as the mean ± standard deviation. After adjusting for confounding factors (sex, age, CES-D score, PSQI score, and positive history of hypertension, diabetes, and dyslipidemia), a multiple regression analysis was employed to assess the relationship between the symptoms of RLS (numbers meeting the criteria of IRLSSG) and subscores of the SF-36®v2. A value of $P<0.05$ was considered significant. The data were analyzed using the SPSS software for Windows (Version 23.0).

Results

Characteristics of participants

Characteristics of the study subjects are shown in Table 1. Ten subjects (four males, six females) met all four items of the RLS diagnostic criteria, and the prevalence of RLS was 1.0% (male 1.1%, female 1.0%).

Comparing subscores of the SF-36®v2 between the subjects who met more than three items of the RLS diagnostic criteria and who met less than two items, all former subscores were lower than the latter (Table 2).

Table 1 Demographic characteristics of the subjects

	N	%
Sex		
Male	375	38.1
Female	610	61.9
Positive history of hypertension	271	27.5
Positive history of diabetes	57	5.8
Positive history of dyslipidemia	148	15.0
	Mean	**(±)SD**
Age (years)	54.8	15.3
Met RLS diagnostic criteria (N)	0.3	0.8
CES-D score	9.3	7.7
PSQI score	3.4	2.3
SF-36®v2 score		
Physical functioning	49.5	12.2
Role – physical functioning	50.7	10.2
Bodily pain	49.2	9.8
General health	48.8	9.7
Vitality	50.5	9.4
Social functioning	52.2	8.7
Role – emotional functioning	51.6	9.1
Mental health	51.3	9.4
Physical component summary	50.3	11.3
Mental component summary	50.6	9.2

Abbreviations: SD, standard deviation; RLS, restless legs syndrome; CES-D, Center for Epidemiologic Studies Depression Scale; PSQI, Pittsburgh Sleep Quality Index; SF-36®v2, Short Form Health Survey, Version 2.

Factors that influenced the Short Form 36 scores

Table 3 shows the multiple regression results for the Short Form 36 (SF-36) subscores. The physical functioning, role – physical functioning, bodily pain, social functioning, and PCS scores were significantly and negatively associated with the symptoms of RLS (numbers meeting the criteria of the IRLSSG).

Table 2 Comparison of the SF-36®v2 scores between the subjects who met >3 RLS diagnostic criteria and who met <2 criteria

	Subjects who met RLS diagnostic criteria		*P*-value
	>3 (n=36)	<2 (n=949)	
Physical functioning	42.0±14.3	49.8±12.0	0.003
Role – physical functioning	44.9±11.9	50.9±10.1	0.005
Bodily pain	43.7±10.1	49.4±9.8	0.001
General health	45.2±9.7	49.0±9.7	0.024
Vitality	45.9±9.3	50.7±9.3	0.003
Social functioning	48.3±10.3	52.3±8.6	0.028
Role – emotional functioning	48.2±11.2	51.8±9.0	0.064
Mental health	47.8±9.3	51.4±9.4	0.023
Physical component summary	43.8±14.6	50.6±11.1	0.010
Mental component summary	47.9±9.4	50.7±9.2	0.066

Abbreviations: SF-36®v2, Short Form Health Survey, Version 2; RLS, restless legs syndrome.

Discussion

This study evaluated the association between the symptoms of RLS and HRQoL among a community-dwelling population in Japan. The prevalence rate of RLS in this sample was 1.0% of participants. After adjusting for confounders, the three domains of physical health, social functioning, and the PCS score were significantly and negatively associated with RLS symptoms.

Previous studies have reported a relationship between RLS and the HRQoL. Abetz et al compared differences in the HRQoL between 85 patients with primary RLS and the general population in the UK.[16] In that study, patients with RLS reported significant deficits in all domains of physical health and in three domains of mental health (vitality, social functioning, and role – emotional functioning) compared with the general population. Another study from the US found that subjects with RLS reported poorer HRQoL in all physical domains as well as in the mental health and vitality domains.[17] Kushida et al reported that all SF-36 measures of individuals with RLS were significantly below the adjusted US general population norms, and the burden of RLS was greater on physical than on mental/emotional HRQoL.[18] In 2010, Allen et al reported the largest-scale population study from primary practices in six countries of Western Europe.[9] Although 365 of the 10,564 original participants (3.5%) were diagnosed by physicians, 91% of these subjects had not been previously diagnosed with RLS. The RLS subjects showed significant associations between the severity of RLS and all domains of physical health and two domains of mental health (vitality and social functioning) of the HRQoL. In Japan, most previous studies that investigated an association between RLS and the HRQoL were based on clinical patient populations. Therefore, there was limited evidence in Japan.[19,20] Two studies focusing on an association between RLS and the HRQoL among a community population in Japan showed that the MCS on the Short Form 8 among individuals with RLS was significantly lower than in subjects without RLS.[8,21]

Although our results indicate that the primary health impact of RLS involves more physical than mental aspects of HRQoL, previous studies have shown a two- to fourfold risk of depression in patients with RLS.[22–24] Although the neurobiological pathways involved in RLS have not been established, the effect of dopamine agonists on RLS symptom alleviation suggests that dopaminergic dysfunction might be involved.[25] A dopaminergic deficiency has also been implicated in the pathophysiology of depression.[26,27] A shared neurobiological origin might explain the comorbidity of mood disorders and RLS, and the high prevalence

Table 3 Factors that influenced the SF-36 scores

	Multiple regression statistics				
	B	**SE**	β	**t-value**	***P*-value**
Physical functioning					
Sex	1.91	0.69	0.08	2.79	<0.01
Age	−0.35	0.03	−0.44	−13.71	<0.001
Positive history of hypertension	−1.74	0.85	−0.06	−2.04	<0.05
Positive history of diabetes	−2.97	1.46	−0.06	−2.04	<0.05
Positive history of dyslipidemia	1.67	0.96	0.05	1.74	0.08
Number met criteria	−1.51	0.44	−0.09	−3.44	<0.01
CES-D score	−0.33	0.05	−0.21	−7.09	<0.001
PSQI score	−0.25	0.16	−0.05	−1.59	0.11
Role – physical functioning					
Sex	1.14	0.59	0.05	1.95	0.05
Age	−0.19	0.02	−0.29	−8.74	<0.001
Positive history of hypertension	−0.86	0.73	−0.04	−1.18	0.24
Positive history of diabetes	−2.08	1.25	−0.05	−1.66	0.1
Positive history of dyslipidemia	0.81	0.83	0.03	0.98	0.33
Number met criteria	−1.12	0.38	−0.08	−2.97	<0.01
CES-D score	−0.46	0.04	−0.34	−11.35	<0.001
PSQI score	−0.4	0.14	−0.09	−2.91	<0.01
Bodily pain					
Sex	0.65	0.61	0.03	1.08	0.28
Age	−0.1	0.02	−0.15	−4.44	<0.001
Positive history of hypertension	0.12	0.75	0.01	0.16	0.87
Positive history of diabetes	−1.93	1.29	−0.05	−1.5	0.13
Positive history of dyslipidemia	0.5	0.85	0.02	0.59	0.56
Number met criteria	−1.85	0.39	−0.14	−4.76	<0.001
CES-D score	−0.3	0.04	−0.24	−7.3	<0.001
PSQI score	−0.59	0.14	−0.13	−4.14	<0.001
General health					
Sex	−0.14	0.56	−0.01	−0.26	0.8
Age	−0.06	0.02	−0.1	−3.06	<0.01
Positive history of hypertension	−1.61	0.7	−0.07	−2.3	<0.05
Positive history of diabetes	−0.44	1.19	−0.01	−0.37	0.71
Positive history of dyslipidemia	−1.32	0.79	−0.05	−1.67	0.1
Number met criteria	−0.52	0.36	−0.04	−1.44	0.15
CES-D score	−0.56	0.04	−0.44	−14.49	<0.001
PSQI score	−0.35	0.13	−0.08	−2.66	<0.01
Vitality					
Sex	0.7	0.5	0.04	1.39	0.16
Age	0.05	0.02	0.07	2.43	<0.05
Positive history of hypertension	−0.25	0.62	−0.01	−0.4	0.69
Positive history of diabetes	−1.01	1.07	−0.03	−0.95	0.34
Positive history of dyslipidemia	0.34	0.71	0.01	0.48	0.63
Number met criteria	−0.54	0.32	−0.04	−1.67	0.1
CES-D score	−0.64	0.03	−0.53	−18.72	<0.001
PSQI score	−0.5	0.12	−0.12	−4.24	<0.001
Social functioning					
Sex	0.25	0.49	0.01	0.51	0.61
Age	−0.04	0.02	−0.07	−2.28	<0.05
Positive history of hypertension	0.16	0.62	0.01	0.26	0.79
Positive history of diabetes	−0.64	1.05	−0.02	−0.61	0.54
Positive history of dyslipidemia	0.55	0.7	0.02	0.79	0.43
Number met criteria	−0.71	0.32	−0.06	−2.24	<0.05
CES-D score	−0.54	0.03	−0.47	−15.82	<0.001
PSQI score	−0.37	0.12	−0.1	−3.24	<0.01

(*Continued*)

Table 3 (*Continued*)

	Multiple regression statistics				
	B	**SE**	***β***	***t*-value**	***P*-value**
Role – emotional functioning					
Sex	0.28	0.5	0.02	0.56	0.57
Age	−0.1	0.02	−0.17	−5.51	<0.001
Positive history of hypertension	−0.66	0.63	−0.03	−1.05	0.29
Positive history of diabetes	−1.34	1.07	−0.03	−1.25	0.21
Positive history of dyslipidemia	0.7	0.71	0.03	0.99	0.32
Number met criteria	−0.44	0.32	−0.04	−1.35	0.18
CES-D score	−0.61	0.03	−0.51	−17.56	<0.001
PSQI score	−0.21	0.12	−0.05	−1.78	0.07
Mental health					
Sex	−0.28	0.45	−0.01	−0.62	0.54
Age	0.05	0.02	0.08	2.76	<0.01
Positive history of hypertension	0.5	0.56	0.02	0.88	0.38
Positive history of diabetes	−1.55	0.96	−0.04	−1.62	0.11
Positive history of dyslipidemia	0.34	0.63	0.01	0.53	0.59
Number met criteria	−0.28	0.29	−0.02	−0.99	0.32
CES-D score	−0.8	0.03	−0.66	−26.06	<0.001
PSQI score	−0.26	0.11	−0.06	−2.43	<0.05
Physical component summary					
Sex	1.53	0.64	0.07	2.39	<0.05
Age	−0.31	0.02	−0.42	−13.27	<0.001
Positive history of hypertension	−1.43	0.8	−0.06	−1.79	0.07
Positive history of diabetes	−2.48	1.36	−0.05	−1.83	0.07
Positive history of dyslipidemia	1.32	0.9	0.04	1.47	0.14
Number met criteria	−1.47	0.41	−0.1	−3.61	<0.001
CES-D score	−0.32	0.04	−0.22	−7.37	<0.001
PSQI score	−0.32	0.15	−0.06	−2.16	<0.05
Mental component summary					
Sex	−0.37	0.46	−0.02	−0.81	0.42
Age	0.12	0.02	0.2	7.01	<0.001
Positive history of hypertension	0.33	0.57	0.02	0.58	0.56
Positive history of diabetes	−0.47	0.98	−0.01	−0.48	0.63
Positive history of dyslipidemia	−0.4	0.65	−0.02	−0.62	0.54
Number met criteria	−0.25	0.3	−0.02	−0.84	0.4
CES-D score	−0.7	0.03	−0.58	−22.02	<0.001
PSQI score	−0.39	0.11	−0.1	−3.61	<0.001

Notes: *B*, the coefficient that is not standardized; *β*, the coefficient that was standardized.
Abbreviations: SF-36, Short Form-36; SE, standard error; CES-D, Center for Epidemiological Studies Depression; PSQI, Pittsburgh Sleep Quality Index.

of depressive disorders in patients with RLS indicates an association between these disorders. There is a strong relationship between insomnia and depression, and studies have shown that patients with chronic insomnia are at a high risk of developing depression.[28,29] Sustained sleep disturbances in RLS likely have particular relevance in the development of depression. In line with this consideration is the modulating effect of RLS-related sleep disturbances on the association of RLS severity with emotional distress.[30]

RLS is still underdiagnosed and poorly understood by clinicians.[9] Cho et al reported that the SF-36 QoL in patients with RLS was lower than that of the normal controls, and even lower than patients with hypertension or diabetes.[31] However, there is sufficient evidence to conclude that dopamine agonists are effective in the treatment of RLS.[32] Promotion of the best practices of pharmacotherapy and screening is needed for physicians treating patients with RLS. Furthermore, there are many risk factors for RLS, including female sex, pregnancy, low iron levels, lower socioeconomic status, poor health, elderly age, comorbidity with Parkinson's disease, positive family history of RLS, and comorbidity with psychiatric disorders. However, most of these risk factors are speculative at this time, and further investigations are required to establish their validity.[33]

The current findings should be cautiously interpreted for several reasons. First, the cross-sectional nature of the study does not allow for causal assumptions about the HRQoL and RLS. Future longitudinal studies are needed to

investigate these associations.[34] Second, several potential confounding factors, such as physical activity levels, socioeconomic status, lifestyle, iron deficiency, and antidepressant medications, were not assessed in our study. Future studies adjusting for these confounders are needed. Third, because all participants were volunteers with interest in their health, the subjects might be healthier than the general population. Therefore, those not in the study might have more severe RLS symptoms. Finally, because our sample size was relatively small, we could not completely rule out beta error as the reason that we did not detect associations between symptoms of RLS and the HRQoL.

Conclusion

RLS symptoms have a significant and negative impact on the HRQoL among community-dwelling populations. Previous studies suggest that pharmacological treatment including dopamine agonists could alleviate RLS symptoms. Promotion of the best practices of pharmacotherapy and screening is needed for physicians treating patients with RLS.

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Disclosure

The authors report no conflicts of interest in this work.

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