**SUPPLEMENTARY METHODS**

**Scoring Cambridge-Hopkins diagnostic questionnaire for restless legs syndrome**

Short-form version 2 of Cambridge-Hopkins diagnostic questionnaire for restless legs syndrome (CH-RLSq) was used in the present study (Supplementary Table 1). Only subjects who answered yes to either question 1 or 2 continued question 3. Definite restless legs syndrome (RLS) was diagnosed when the answers to questions 1-8 were as follows; 1: yes, 2: yes, 3: resting, 4: yes, 5: must not be about equal or only morning, 6: does not usually relieve, 7: 7a no or 7b no, 8: both sitting and lying or only when lying. If all of the above are answered as indicated the diagnosis is definite RLS (clinically typical RLS). Probable RLS (not typical of clinical cases) was defined if either 1) all of the items 1-7 are answered as above for definite RLS and item 8 is answered only when sitting, or 2) when item 1 is answered no and all of the items 2-8 are answered as above for definite RLS. RLS diagnosis includes both definite and probable RLS.

**Methods to measure population variables**

*Study population 1*

The body mass index (BMI, kg/m2) was calculated from self-reported height (cm) and body weight (kg). Participant’s response to the question, “How many hours of sleep did you usually get a night for the past month?” was designated as self-reported sleep duration. Habitual snoring was defined when snoring was observed at a frequency of at least three nights a week. Presence of insomnia was indicated by an Insomnia Severity Index score higher than 14 [1]. Korean translation was validated but the diagnostic accuracy of the Korean version was not assessed in this population, which is a limitation of the study. Daytime sleepiness was measured with the Epworth Sleepiness Scale, and excessive daytime sleepiness was defined as a score >10 [2,3]. Poor sleep quality was defined as a Pittsburgh Sleep Quality Index score >5 [4,5]. Depression was evaluated using the Patient Health Questionnaire-9 depression scale and the cut-off score was 7 [6,7]. Alcohol drinking and smoking status were classified into two categories: current vs. never or former. A state of regular physical exercise was considered when subjects reported participating in sweat-inducing exercise at least three times a week for more than 30 minutes/activity. The presence of self-reported hypertension, diabetes, and dyslipidemia were also documented.

*Study population 2*

The methods to define sleep duration, quality, daytime sleepiness, smoking, alcohol drinking, and exercise were the same as the ones used for study population 1. BMI was calculated from height and body weight measured after overnight fasting. Insomnia was defined when any of four insomnia symptoms (difficulty in sleep initiation or maintenance, early morning wake-up, or non-restorative sleep) were present for three or more days per week. Depressive symptoms were evaluated with the Beck Depression Inventory and the cut-off score for depression was 10 [8,9]. Diabetes was diagnosed when the fasting blood glucose level was ≥126 mg/dl, or when patients used oral hypoglycemic agents or insulin. Hypertension was considered to be present when blood pressure was equal to or above 140/90 mmHg, or when subjects took antihypertensive medications. Hyperlipidemia was defined by a total cholesterol level ≥240 mg/dL, or the use of lipid-lowering drugs.

**SUPPLEMENTARY RESULTS**

**Characteristics of RLS mimics group compared to RLS group**

We performed statistical analyses including the RLS-mimics group (Supplementary Tables 1 and 2). The RLS-mimics group was female-predominant and had insomnia, excessive daytime sleepiness, poor sleep quality, and depression more than control group in both populations. Additionally, RLS-mimics had shorter sleep duration, more habitual snoring and hypertension, and did less exercise compared with control group in study population 1. RLS-mimics were older than the control group and younger than the RLS group in study population 1, but older than other groups in study population 2. When compared to RLS group, RLS-mimics group was significantly less depressed and drank less in study population 2.

**SUPPLEMENTARY REFERENCES**

1 Morin CM, Belleville G, Belanger L, Ivers H: The Insomnia Severity Index: psychometric indicators to detect insomnia cases and evaluate treatment response. Sleep 2011;34:601-608.

2 Johns MW: A new method for measuring daytime sleepiness: the Epworth sleepiness scale. Sleep 1991;14:540-545.

3 Cho YW, Lee JH, Son HK, Lee SH, Shin C, Johns MW: The reliability and validity of the Korean version of the Epworth sleepiness scale. Sleep Breath 2011;15:377-384.

4 Buysse DJ, Reynolds CF 3rd, Monk TH, Berman SR, Kupfer DJ: The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. Psychiatry Res 1989;28:193-213.

5 Sohn SI, Kim DH, Lee MY, Cho YW: The reliability and validity of the Korean version of the Pittsburgh Sleep Quality Index. Sleep Breath 2012;16:803-812.

6 Kroenke K, Spitzer RL, Williams JB: The PHQ-9: validity of a brief depression severity measure. J Gen Intern Med 2001;16:606-613.

7 Han C, Jo SA, Kwak JH, Pae CU, Steffens D, Jo I, Park MH: Validation of the Patient Health Questionnaire-9 Korean version in the elderly population: the Ansan Geriatric study. Compr Psychiatry 2008;49:218-223.

8 Beck AT, Steer RA, Carbin MG: Psychometric properties of the Beck Depression Inventory: Twenty-five years of evaluation. Clinical psychology review 1988;8:77-100.

9 Lee YH, Song JY: A study of the reliability and the validity of the BDI, SDS, and MMPI-D scales. Korean J Clin Psychol 1991;10:98-113.

Supplementary Table 1. Cambridge-Hopkins diagnostic questionnaire for restless legs syndrome

|  |
| --- |
| 1. Do you have, or have you had, recurrent uncomfortable feelings or sensations in your legswhile you are sitting or lying down? |
| 2. Do you, or have you had, a recurrent need or urge to move your legs while you were sitting or lying down? |
| 3. Are you more likely to have these feelings when you are resting (either sitting or lying down) or when you are physically active? |
| 4. If you get up or move around when you have these feelings do these feelings get any better while you actually keep moving? |
| 5. Which times of day are these feelings in your legs most likely to occur? |
| 6. Will simply changing leg position by itself once without continuing to move usually relieve these feelings? |
| 7a. Are these feelings ever due to muscle cramps?7b. If so, are they always due to muscle cramps? |
| 8. Do these feelings occur only when sitting or only when lying down? |
| 9. When you actually experience the feelings in your legs, how distressing are they? |
| 10. In the past 12 months, how often did you experience these feelings in your legs? |
| 11. Approximately how old were you when you first noticed these feelings in your legs? |

Supplementary Table 2. Gender and age distribution of the total Korean adult population, two study populations, subjects with RLS identified by the Cambridge-Hopkins diagnostic questionnaire for RLS, and RLS-mimics.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Total adult population of 2010 Korean, *n* (%) |  | Study population 1 (*n* = 2,824) |  | Study population 2 (*n* = 2,685) |
|  |  | sample number, *n* (%) | RLS, *n* (%) | RLS-mimics, *n* (%) |  | sample number, *n* (%) | RLS, *n* (%) | RLS-mimics, *n* (%) |
| Gender |
| Female | 19,514,272 (49.9) |  | 1,416 (50.1) | 5 (41.7) | 86 (59.7) |  | 1,553 (57.8) | 22 (73.3) | 51 (73.9) |
| Male | 19,555,955 (50.1) |  | 1,408 (49.9) | 7 (58.3) | 58 (40.3) |  | 1,132 (42.2) | 8 (26.7) | 18 (26.1) |
| Age group |
| 19–29 | 7,452,564 (19.1) |  | 542 (19.2) | 0 | 12 (8.3) |  |  |  |  |
| 30–39 | 8,254,786 (21.1) |  | 604 (21.4) | 3 (25.0) | 31 (21.5) |  |  |  |  |
| 40–49 | 8,846,683 (22.6) |  | 611 (21.6) | 1 (8.3) | 20 (13.9) |  | 220 (8.2) | 3 (10.0) | 2 (2.9) |
| 50–59 | 7,528,146 (19.3) |  | 529 (18.7) | 3 (25.0) | 32 (22.2) |  | 1,571 (58.5) | 23 (76.7) | 41 (59.4) |
| 60–69 | 4,216,872 (10.8) |  | 409 (14.5) | 3 (25.0) | 38 (26.4) |  | 640 (23.8) | 3 (10.0) | 14 (20.3) |
| 70–79 | 2,771,176 (7.1) |  | 129 (4.6) | 2 (16.7) | 11 (7.6) |  | 254 (9.5) | 1 (3.3) | 12 (17.4) |
| Total | 39,070,227 (100) |  | 2,824 (100) | 12 (100) | 144 (100) |  | 2,685 (100) | 30 (100) | 69 (100) |

RLS, restless legs syndrome.

Supplementary Table 3. Characteristics of the subjects with RLS-mimics versus RLS or control group in the two representative samples of Korean adult population

|  |  |  |  |
| --- | --- | --- | --- |
|  | Study population 1 (*n* = 2,824) |  | Study population 2 (*n* = 2,685) |
|  | RLS (*n* = 12) | RLS-mimics (*n* = 144) | Control (*n* = 2,668) | *p* value of RLS-mimics versus control |  | RLS (*n* = 30) | RLS-mimics (*n* = 69) | Control (*n* = 2,586) | *p* value of RLS-mimics versus control |
| Age, years | 54.4 ± 14.4 | 50.4 ± 14.6 | 44.0 ± 14.8 | **< 0.001** |  | **54.2 ± 6.2** | **59.6 ± 8.0†** | 57.5 ± 7.3 | **0.016** |
| Sex, female | 5 (41.7%) | 86 (59.7%) | 1,330 (49.6%) | **0.021** |  | 22 (73.3%) | 51 (73.9%) | 1,502 (57.4%) | **0.006** |
| BMI | 23.2 ± 3.3 | 23.4 ± 3.6 | 23.0 ± 3.0 | 0.450 |  | 24.2 ± 2.1 | 25.1 ± 2.8 | 24.7 ± 3.0 | 0.299 |
| Sleep duration, h | 7.2 ± 0.8 | 6.9 ± 1.4 | 7.3 ± 1.2 | **< 0.001** |  | 6.8 ± 1.3 | 7.3 ± 1.1 | 7.1 ± 1.2 | 0.133 |
| Habitual snoring | 2 (16.7%) | 39 (27.1%) | 485 (18.1%) | **0.011** |  | 6 (27.3%) | 13 (29.5%) | 476 (26.1%) | 0.604 |
| Insomnia\* | 0 (0%) | 19 (14.6%) | 111 (4.1%) | **< 0.001** |  | 15 (50.0%) | 25 (36.2%) | 656 (25.1%) | **0.048** |
| Excessive daytime sleepiness\* | 2 (16.7%) | 26 (17.0%) | 306 (11.4%) | **0.023** |  | 4 (13.3%) | 11 (16.4%) | 165 (6.5%) | **0.004** |
| Poor sleep quality\* | 4 (33.3%) | 51 (35.4%) | 398 (14.9%) | **< 0.001** |  | 17 (56.7%) | 37 (53.6%) | 825 (32.1%) | **< 0.001** |
| Depression\* | 4 (33.3%) | 25 (17.4%) | 203 (7.6%) | **< 0.001** |  | **20 (66.7%)** | **27 (39.7%)†** | 726 (28.1%) | **0.041** |
| Smoking | 7 (58.3%) | 53 (36.8%) | 1,056 (39.4%) | 0.599 |  | 4 (13.3%) | 5 (8.3%) | 317 (12.1%) | 0.263 |
| Alcohol | 9 (75.0%) | 94 (65.3%) | 1,888 (70.4%) | 0.191 |  | **12 (40.0%)** | **44 (63.8%)†** | 1,423 (54.4%) | 0.142 |
| Exercise | 3 (25.0%) | 24 (16.7%) | 724 (27.0%) | **0.006** |  | 9 (30.0%) | 26 (37.7%) | 843 (32.2%) | 0.362 |
| Hypertension | 4 (33.3%) | 34 (23.6%) | 329 (12.3%) | **< 0.001** |  | 9 (30.0%) | 26 (37.7%) | 911 (34.8%) | 0.611 |
| Diabetes | 1 (8.3%) | 14 (9.7%) | 126 (4.7%) | **0.015** |  | 5 (16.7%) | 15 (21.7%) | 698 (26.7%) | 0.409 |
| Hyperlipidemia | 1 (8.3%) | 7 (4.9%) | 77 (2.9%) | 0.199 |  | 6 (20.0%) | 10 (14.5%) | 565 (21.6%) | 0.181 |

Data are expressed as mean ± SD or number (percentage). Values in boldface indicate statistical significance.

\* Definition of each item: insomnia, Insomnia Severity Index > 14; excessive daytime sleepiness, Epworth Sleepiness Scale > 10; poor sleep quality, Pittsburgh Sleep Quality Index > 5; depression, Patient Health Questionnaire-9 > 7 in study population 1 and Beck Depression Inventory ≥ 10 in study population 2.

† RLS-mimics group was significantly older (*p* < 0.001), less depressive (*p* = 0.017), and drank less (*p* = 0.046) compared to RLS group in population 2.

RLS, restless legs syndrome; BMI, body mass index.