Association of sleep duration with rheumatoid arthritis in Korean adults: analysis of seven years of aggregated data from the Korea National Health and Nutrition Examination Survey (KNHANES)

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ABSTRACT

Objectives: To investigate the association between rheumatoid arthritis (RA) and self-reported sleep duration.

Setting: The present study analysed 7 years of aggregated cross-sectional data (2007–2013) from the Korea National Health and Nutrition Examination Surveys (KNHANES).

Participants: A total of 37 979 individuals were selected for the analyses.

Interventions: RA.

Primary and secondary outcome measures: Sleep duration.

Results: After adjusting for confounding factors, the odds of short-duration sleepers (≤6 hours/day) and long-duration sleepers (≥9 hours/day) for RA were 1.23-fold (95% CI 1.101 to 1.51) and 1.27-fold (95% CI 0.85 to 1.88) higher, respectively, than those for persons with sleep duration of 7–8 hours/day. A subgroup analysis according to the extent of pain in RA revealed that the strong relationship between RA and sleep disturbances was observed in those with high pain from RA (OR: 1.28 CI 1.04 to 1.58).

Conclusions: Individuals with RA may be at a higher risk for sleep disturbances compared with individuals without RA. Therefore, the provision of comprehensive care for patients with RA by healthcare professionals should include assessments of sleep duration and patients with RA should be encouraged to report sleep problems.

INTRODUCTION

Arthritis is the most common cause of disability worldwide. Rheumatoid arthritis (RA) is characterised by persistent inflammatory symmetrical synovitis with pain, swelling and a broad range of systemic manifestations in the peripheral joints.1 This disease is also associated with sleep disturbances2 which play an important role in the maintenance of an individual’s health.3 4 Importantly, poor sleep in patients with RA could originate from pain or may contribute to increased level of pain and fatigue.5 6 Additionally, sleep disorders such as sleep apnoea or primary insomnia typically result in poor sleep quality in patients with RA as well as exacerbating the patient’s primary symptoms.7

Sleep disturbances affect more than half of patients with RA8 9 and are thought to be more common among those with active inflammation10 or physical health conditions such as associated pain, fatigue and/or functional disabilities.11 Although physicians often assume that inflammation is the stimulus for RA-related pain, many of these
patients continue to experience pain following adequate suppression of inflammation.\footnote{12} Furthermore, sleep disturbances and inadequate sleep are related to serious outcomes such as reduced health-related quality of life,\footnote{13} a higher risk of morbidities\footnote{14} and, ultimately, increase in all-cause mortality.\footnote{15} Additionally, sleep disturbances are almost threefold more frequent in females than males.\footnote{16} Thus, the quality and amount of sleep in patients with RA are important issues for rheumatologists, particularly after the finding that etanercept and infliximab’s ability to reduce daytime sleepiness.\footnote{17}

Therefore, the primary aim of the present study was to investigate the association between RA and self-reported sleep duration using 7 years of aggregated cross-sectional data (2007–2013) obtained from the Korea National Health and Nutrition Examination Survey (KNHANES).

\section*{METHODS}

\subsection*{Study sample}

To evaluate the relationship between sleep duration and RA, the present study analysed data from the fourth (2007–2009), fifth (2010–2012) and sixth (2013) KNHANES assessments performed by the Korean Ministry of Health and Welfare. The KNHANES is a cross-sectional survey based on stratified multistage probability sampling units of Korean households that targets members of the civilian non-institutionalised South Korean population who are 1-year of age or older. The samples were determined by the household registries of the 2005 National Census Registry.

The total target population initially consisted of 24,871, 25,534 and 8018 participants who completed the 2007–2009, 2010–2012 and 2013 KNHANES assessments, which had average response rates of 78.4%, 80.8% and 79.5%, respectively. The information from 14,305 individuals aged 1–18 years old were excluded from the present analyses while the information of 44,118 individuals aged 19 years and older were included. Additionally, the present study excluded 6036 individuals with missing data regarding age, occupation, income and/or marriage status and 103 individuals with missing data regarding smoking, drinking, perceived stress, exercise, sleep duration, RA, hypertension, and/or dyslipidaemia. Thus, a total of 37,979 individuals were selected for the final analyses in the present study. Since all KNHANES data are available publicly, this study did not require approval from an institutional review board.

\subsection*{Variables}

\subsection*{Dependent variables}

In the present study, sleep duration was based on self-reported data acquired in response to the question ‘How many hours do you usually sleep?’. The responses were classified into three categories (\(\leq 6\) hours, 7–8 hours and\(\geq 9\) hours) based on the sleep definitions of the International Classification of Sleep Disorders, 2nd edition, in which \(\leq 6\) hours is defined as a short sleeper and \(\geq 9\) hours as a long sleeper.\footnote{18}

\subsection*{Independent variables}

In the present study, diabetes mellitus type 2 cases were considered to be the participants who answered ‘Yes’ to the question ‘Are you currently suffering from RA?’ in the self-reported data. RA was categorised as either ‘Yes’ or ‘No’.

\subsection*{Sociodemographic factors}

The present analyses included age, gender, household income, marital status, occupation and region of residency as sociodemographic factors; all of the covariates were categorical. Individual income was calculated by dividing a participant’s household monthly income by the square root of the household size, and the participants were ranked from lowest to highest income and then grouped into four household income quartiles. Predefined categories were used to categorise household incomes, similar to how the raw KNHANES data are processed. The residency regions were categorised into urban (administrative divisions of a city: Seoul, Daegu, Busan, Incheon, Kwangju or Ulsan) and rural (not classified as administrative of a city), and occupational status was classified into the following three categories: white collar (administrative, engineering, scientific, teaching and related occupations, sales and related occupations, and service occupation), blue collar (farming, forestry, fishing and hunting, craft and repair, operators, fabricators, and labourers) and unpaid employment (including housewives and students).

\subsection*{Health behaviour factors}

Questions regarding alcohol use, smoking status and the number of days of moderate exercise per week were assessed by a health interview survey and included as covariates in the present analyses. Alcohol use was further assessed by questioning the participants about their average frequency (days per week or month) of alcohol use during the past year.

\subsection*{Health status factors}

Perceived stress, the extent of RA pain and body mass index (BMI) were also included in the present model. The following were categorised into four groups for the present analyses: perceived stress (very high, high, low and very low), and BMI (thin: \(<18.5\) kg/m\(^2\), moderate: 18.5–23.9 kg/m\(^2\), overweight: 24.0–26.9 kg/m\(^2\) and obese: \(\geq 27.0\) kg/m\(^2\)).\footnote{19} Extent of RA pain was measured by asking the respondents to assess the extent suffering from RA using a pictorial representation of 0–10 scores. Extent of RA pain was categorised into two groups: Low (0–5) or High (6–10).

\subsection*{Statistical analysis}

The distributions of the general characteristics of the participants were assessed using \(\chi^2\) tests, and
| Demographic characteristics of the study population | Sleep duration |  |
|---|---|---|
|  | Total | Short sleeper (≤6 hours) | Appropriate sleeper (7–8 hours) | Long sleeper (≥9 hours) |
|  | N   | Per cent | N   | Per cent | N   | Per cent | N   | Per cent | p Value |
| Rheumatoid arthritis (RA) |  |  |  |  |  |  |  |  |  |
| No | 37 309 | 98.2 | 15 508 | 40.8 | 18 883 | 49.7 | 2918 | 7.7 | <0.0001 |
| Yes | 670 | 1.8 | 347 | 51.8 | 58 | 8.7 | 265 | 39.6 |  |
| Age (year) |  |  |  |  |  |  |  |  |  |
| ≤29 | 4751 | 12.5 | 1566 | 33.0 | 2569 | 54.1 | 616 | 13.0 | <0.0001 |
| 30–49 | 14 551 | 38.3 | 5476 | 37.6 | 8259 | 56.8 | 816 | 5.6 |  |
| 50–69 | 13 135 | 34.6 | 6001 | 45.7 | 6253 | 47.6 | 881 | 6.7 |  |
| ≥79 | 5542 | 14.6 | 2812 | 50.7 | 2067 | 37.3 | 663 | 12.0 |  |
| Gender |  |  |  |  |  |  |  |  |  |
| Male | 16 254 | 42.8 | 6732 | 41.4 | 8357 | 51.4 | 1165 | 7.2 | <0.0001 |
| Female | 21 725 | 57.2 | 9123 | 42.0 | 10 791 | 49.7 | 1811 | 8.3 |  |
| Household income level |  |  |  |  |  |  |  |  |  |
| Low | 7633 | 20.1 | 3592 | 47.1 | 3226 | 42.3 | 815 | 10.7 | <0.0001 |
| Lower middle | 9685 | 25.5 | 4102 | 42.4 | 4790 | 49.5 | 793 | 8.2 |  |
| Upper middle | 10 216 | 26.9 | 3980 | 39.0 | 5462 | 53.5 | 774 | 7.6 |  |
| High | 10 445 | 27.5 | 4181 | 40.0 | 5670 | 54.3 | 594 | 5.7 |  |
| Marital status |  |  |  |  |  |  |  |  |  |
| Married | 27 602 | 72.7 | 11 246 | 40.7 | 14 338 | 52.0 | 2018 | 7.3 | <0.0001 |
| Single | 5312 | 14.0 | 1889 | 35.6 | 2876 | 54.1 | 547 | 10.3 |  |
| Separated, divorced | 5065 | 13.3 | 2720 | 53.7 | 1934 | 38.2 | 411 | 8.1 |  |
| Occupation |  |  |  |  |  |  |  |  |  |
| White collar | 12 635 | 33.3 | 5171 | 40.9 | 6846 | 54.2 | 618 | 4.9 | <0.0001 |
| Blue collar | 10 340 | 27.2 | 4488 | 43.4 | 5073 | 49.1 | 779 | 7.5 |  |
| Unpaid employment | 15 004 | 39.5 | 6196 | 41.3 | 7229 | 48.2 | 1579 | 10.5 |  |
| Residential region |  |  |  |  |  |  |  |  |  |
| Urban | 17 032 | 44.9 | 7363 | 43.2 | 8517 | 50.0 | 1152 | 6.8 | <0.0001 |
| Rural | 20 947 | 55.2 | 8492 | 40.5 | 10 631 | 50.8 | 1824 | 8.7 |  |
| Smoking status |  |  |  |  |  |  |  |  | 0.402 |
| Current smoker | 11 101 | 29.2 | 4564 | 41.1 | 5633 | 50.7 | 904 | 8.1 |  |
| Former smoker | 4552 | 12.0 | 1927 | 42.3 | 2280 | 50.1 | 345 | 7.6 |  |
| Never smoked | 22 326 | 58.8 | 9364 | 41.9 | 11 235 | 50.3 | 1727 | 7.7 |  |
| Frequency of alcohol use |  |  |  |  |  |  |  |  |  |
| Never drink | 10 950 | 28.8 | 4947 | 45.2 | 5018 | 45.8 | 985 | 9.0 | <0.0001 |
| 1 times or less per month | 10 786 | 28.4 | 4238 | 39.3 | 5734 | 53.2 | 814 | 7.6 |  |
| 2–4 times per week | 13 510 | 35.6 | 5462 | 40.4 | 7122 | 52.7 | 926 | 6.9 |  |
| 4 times or more per week | 2733 | 7.2 | 1208 | 44.2 | 1274 | 46.6 | 251 | 9.2 |  |
| Number of days of moderate exercise per week |  |  |  |  |  |  |  |  |  |
| Never | 23 187 | 61.1 | 9718 | 41.9 | 11 457 | 49.4 | 2012 | 8.7 | <0.0001 |
| 1–3 | 9145 | 24.1 | 3741 | 40.9 | 4829 | 52.8 | 575 | 6.3 |  |
| 4–6 | 3318 | 8.7 | 1361 | 41.0 | 1761 | 53.1 | 196 | 5.9 |  |
| Everyday | 2329 | 6.1 | 1035 | 44.4 | 1101 | 47.3 | 193 | 8.3 |  |
| Perceived stress |  |  |  |  |  |  |  |  | 0.0001 |
| Very high | 1749 | 4.6 | 920 | 52.6 | 685 | 39.2 | 144 | 8.2 |  |
| High | 8442 | 22.2 | 3960 | 46.9 | 3887 | 46.0 | 595 | 7.1 |  |
| Low | 21 556 | 56.8 | 8495 | 39.4 | 11 480 | 53.3 | 1581 | 7.3 |  |
| Very low | 6232 | 16.4 | 2480 | 39.8 | 3096 | 49.7 | 656 | 10.5 |  |
| Extent of pain from RA |  |  |  |  |  |  |  |  |  |
| Low | 36 660 | 96.5 | 15 099 | 41.2 | 18 708 | 51.0 | 2853 | 7.8 | <0.0001 |
| High | 1319 | 3.5 | 756 | 57.3 | 440 | 33.4 | 123 | 9.3 |  |

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multinomial logistic regression analyses were used to
determine whether the general characteristics, health
statuses and/or health risk behaviours of the partici-
pants had relationships with RA. All data were analysed
using SAS software, V.9.4 (SAS Institute; Cary, North
Carolina, USA).

RESULTS
Prevalence of short sleep and long sleep durations
Of the 37 979 KNHANES participants included in the
present study, 16 254 were men (42.8%), 21 735 were
women (57.2%) and 670 were patients with RA (1.8%).
Of the 15 855 participants who reported a short sleeper
(≤6 hours), 347 had RA (51.8%), while of the 2976 par-
ticipants who reported a long sleeper (≥9 hours), 265
had RA (39.6%; table 1).

Association between sleep duration and RA
Table 2 portrays the results of the logistic regression ana-
lyses after adjusting for age, gender, household income,
marital status, occupation, region of residence, smoking
status, frequency of alcohol use, number of days of mod-
erate exercise per week, perceived stress, extent of RA
pain, BMI and year of the survey. After adjusting for all
of these confounding variables, in terms of RA, the odds
of short sleep (≤6 hours/day) were 1.23-fold higher
(95% CI 1.01 to 1.51) and the odds of long sleep
(≥9 hours/day) were 1.27-fold higher (95% CI 0.85 to
1.88) than for those with sleep durations of 7–8 hours/
day (table 2).

Table 3 depicts the results of a subgroup analysis
according to the extent of RA pain after adjusting for
age, household income, marital status, occupation, region
of residence, smoking status, frequency of alcohol use,
number of days of moderate exercise per week, perceived
stress, BMI and year of the survey. Those who reported
RA were 28% more likely to have short sleep (OR: 1.28,
95% CI 1.04 to 1.58), while those who did not report RA
were not more likely to have short sleep (OR: 0.84, 95%
CI 0.49 to 1.46), compared with those with reported sleep
durations of 7–8 hours (table 3).

DISCUSSION
Since sleep disturbances may be an important clinical
feature for patients with RA, this issue has recently
received an increasing amount of attention.20 21 Thus,
the present study aimed to investigate RA and its rela-
tionship with sleep duration using 7 years of aggregated
data from a large representative population-based survey
conducted in Korea. The present study found an associ-
ation between RA and the reported symptoms of short
sleep duration that was statistically signi
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ificant (OR: 1.23,
95% CI 1.01 to 1.51) even in the presence of perceived
stress, which suggests that stress could be a trigger or
signal for an inappropriate sleep duration in patients
with RA. In general, there is a U-shaped association
between RA and short or long sleep duration, and this
similarly shaped relationship was evident in this study. In
addition, in a subgroup analysis based on the extent of
pain in RA, these associations were statistically signi
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cant only in those with high pain from RA. These associations
were independent of sociodemographic variables, (eg,
age, gender, household income level, marital status,
occupation and region of residence), health behaviour
variables (eg, smoking status, frequency of alcohol use
and number of days of moderate exercise per week),
and health status variables (eg, perceived stress, the
extent of RA pain, BMI), and year of the survey.

Table 1 Continued

| BMI          | Total | Sleep duration | Appropriate sleeper (7–8 hours) | Long sleeper (≥9 hours) |
|--------------|-------|----------------|---------------------------------|-------------------------|
|              | N     | Per cent       | N Per cent                      | N Per cent              |
| Thin (<18.5 kg/m²) | 1908  | 5.0            | 656 34.4                        | 1010 52.9               |
| Moderate (18.5kg/m-23.9kg/m²) | 19 689 | 51.8          | 7970 40.5                       | 10 153 51.6             |
| Overweight (24.0kg/m-26.9kg/m²) | 10 767 | 28.4          | 4649 43.2                       | 5351 49.7               |
| Obese (≥27.0 kg/m²) | 5615  | 14.8           | 2580 46.0                       | 2634 46.9               |
| Year         |       |                | p Value                         |                         |
| 2007         | 1403  | 3.7            | 576 41.1                        | 747 53.2                |
| 2008         | 6513  | 17.2           | 2672 41.0                       | 3258 50.0               |
| 2009         | 7338  | 19.3           | 2922 39.8                       | 3796 51.7               |
| 2010         | 6059  | 16.0           | 2461 40.6                       | 3114 51.4               |
| 2011         | 5927  | 15.6           | 2535 42.8                       | 2947 49.7               |
| 2012         | 5465  | 14.4           | 2303 42.1                       | 2762 50.5               |
| 2013         | 5274  | 13.9           | 2386 45.2                       | 2524 47.9               |
| Total        | 37 979| 100.0          | 15 855 41.8                     | 19 148 50.4             |

BMI, body mass index.
## Table 2  Results of logistic regression between rheumatoid arthritis and sleep duration

| RA | Appropriate sleeper (7–8 hours) Ref | Short sleeper (≤6 hours) OR 95% CI | Long sleeper (≥9 hours) OR 95% CI |
|----|-------------------------------------|-------------------------------------|-----------------------------------|
| RA | 1.00                                | 1.23 (1.01 to 1.51)                | 1.27 (0.85 to 1.88)               |
| Age (year) |                                      |                                    |                                   |
| ≤29 | 1.00                                | 1.16 (1.04 to 1.31)                | 0.45 (0.37 to 0.55)               |
| 30–49 |                                    | 1.49 (1.32 to 1.69)                | 0.51 (0.42 to 0.63)               |
| ≥79 | 2.15 (1.85 to 2.50)                | 0.84 (0.65 to 1.08)               |                                   |
| Gender |                                      |                                    |                                   |
| Male | 1.00                                | 1.02 (0.95 to 1.10)                | 0.64 (0.55 to 0.74)               |
| Female |                                   |                                    |                                   |
| Household income level |                                    |                                    |                                   |
| Low | 1.04 (0.95 to 1.14)                | 1.50 (1.27 to 1.77)               |                                   |
| Lower middle | 1.01 (0.93 to 1.09) | 1.25 (1.09 to 1.44)               |                                   |
| Upper middle | 0.95 (0.89 to 1.02) | 1.25 (1.08 to 1.44)               |                                   |
| High | 1.00                                |                                    |                                   |
| Marital status |                                    |                                    |                                   |
| Married | 1.00                                |                                    |                                   |
| Single | 1.11 (1.00 to 1.23)                | 0.99 (0.82 to 1.21)               |                                   |
| Separated, divorced | 1.49 (1.37 to 1.62) | 0.90 (0.77 to 1.06)               |                                   |
| Occupation |                                    |                                    |                                   |
| White collar | 1.00                                |                                    |                                   |
| Blue collar | 1.05 (0.97 to 1.12) | 1.32 (1.14 to 1.54)               |                                   |
| Unpaid employment | 0.87 (0.81 to 0.93) | 1.78 (1.55 2.04) |                                   |
| Residential region |                                    |                                    |                                   |
| Urban | 1.00                                |                                    |                                   |
| Rural | 0.88 (0.83 to 0.94)                | 1.24 (1.12 to 1.38)               |                                   |
| Smoking status |                                    |                                    |                                   |
| Current smoker | 0.99 (0.92 to 1.08) | 1.51 (1.31 to 1.75)               |                                   |
| Former smoker | 0.95 (0.85 to 1.05) | 1.51 (1.26 to 1.81)               |                                   |
| Never smoked | 1.00                                |                                    |                                   |
| Frequency of alcohol use |                                    |                                    |                                   |
| Never drink | 0.96 (0.85 to 1.09) | 0.88 (0.71 to 1.09)               |                                   |
| 1 times or less per month | 0.89 (0.79 to 1.01) | 0.81 (0.65 to 1.00)               |                                   |
| 2–4 times per week | 0.93 (0.83 to 1.04) | 0.79 (0.65 to 0.96)               |                                   |
| 4 times or more per week | 1.00                                |                                    |                                   |
| Number of days of moderate exercise per week |                                    |                                    |                                   |
| Never | 1.00                                |                                    |                                   |
| 1–3 | 0.98 (0.92 to 1.05)                | 0.75 (0.66 to 0.86)               |                                   |
| 4–6 | 0.99 (0.90 to 1.09)                | 0.70 (0.57 to 0.85)               |                                   |
| Everyday | 1.09 (0.98 to 1.22) | 1.04 (0.84 to 1.28)               |                                   |
| Perceived stress |                                    |                                    |                                   |
| Very high | 1.88 (1.64 to 2.16) | 1.19 (0.93 to 1.51)               |                                   |
| High | 1.57 (1.44 to 1.71)                | 0.86 (0.74 to 1.01)               |                                   |
| Low | 1.12 (1.04 to 1.21)                | 0.85 (0.75 to 0.97)               |                                   |
| Very low | 1.00                                |                                    |                                   |
| Extent of pain from RA |                                    |                                    |                                   |
| Low | 1.00                                |                                    |                                   |
| High | 1.39 (1.19 to 1.63)                | 1.22 (0.93 to 1.58)               |                                   |
| BMI | Thin (<18.5 kg/m²) | 0.79 (0.70 to 0.90) | 1.26 (1.04 to 1.53) |                                   |
| Moderate (18.5kg/m²-23.9kg/m²) | 1.00                                |                                    |                                   |
| Overweight (24.0kg/m-26.9kg/m²) | 1.05 (0.99 to 1.11) | 0.95 (0.84 to 1.07)               |                                   |
| Obese (≥27.0 kg/m²) | 1.20 (1.11 to 1.29) | 1.00 (0.86 to 1.17)               |                                   |

Continued
A nationwide study conducted in the USA found that RA is associated with sleep disturbances in ~10 million adults.22 The presence of sleep disturbances in patients diagnosed with a range of rheumatological-related diseases including systemic lupus erythematosus, fibromyalgia, chronic fatigue syndrome, multiple sclerosis and RA have also been assessed.23 Additionally, recent studies have indicated that sleep disturbances from other causes such as difficulties with the onset of sleep and waking up early in the morning are also major symptoms in patients with RA, and that fatigue in patients with RA is likely due to poor quality of sleep, a functional disability, joint pain and/or depressive symptoms.23–27 Poor quality of sleep and sleep disturbances can worsen physical and mental health conditions, including RA symptoms and pain, in the general population.26 Similarly, the pain and discomfort caused by RA with inflammation may result in a greater frequency of sleep disturbances, contributing to functional impairments such as poor sleep quality which have a significantly negative impact on the health and well-being of individuals.29

Along with a significantly higher prevalence of fatigue, there is also a greater risk of sleep disturbances from causes such as obstructive sleep apnoea (OSA) in patients with RA, because they are more likely to have chronic health issues, including high blood pressure and high BMI. This consequently leads to increased risks of cardiovascular disease and nocturnal sudden cardiac death.30 Accordingly, the autonomic response is more severe in patients with chronic OSA than in individuals with a low risk of OSA.30–33

In the present study, a multinomial logistic regression analysis revealed that the important factors influencing the relationship between RA and sleep duration include perceived stress and the extent of RA pain. Although the causes of sleep disturbances in patients with RA are likely multifactorial, only 30% of older Americans with sleep disturbances seek treatment at hospitals or treatment centres using multidisciplinary approaches, relying on various self-care strategies instead.34 35 Therefore, the provision of comprehensive care for patients with RA requires encouraging the patient to report sleep disturbances as well as conducting timely diagnoses to reduce their symptoms. In this manner, the present data regarding the prevalence of sleep disturbances in patients with RA will contribute to the awareness of physicians and healthcare professionals regarding this issue and may aid in the development of appropriate interventions.
to properly manage, minimise or eliminate these symptoms.

There are several potential limitations that should be taken into consideration when interpreting the present results. First, because this study used a cross-sectional design, the results may reflect reverse causality and a bidirectional relationship in the association between RA and sleep duration. Therefore, longitudinal studies using validated measures of RA and sleep duration are required to see if these findings can be replicated and to clarify the causality and mechanisms that underlie the association between RA and sleep duration. Second, although the use of self-reports is a valuable source of information in large-scale epidemiological studies, the lack of validated questionnaires assessing RA and sleep duration was a major limitation of the present study, as more objective methods tend to yield more accurate results. Controlling for socioeconomic status, health status and behaviour variables, as in the present study, may partially ameliorate these issues, but future in-depth studies are necessary to determine more accurately the relationship between RA and sleep disturbances, including difficulty falling asleep, difficulty maintaining sleep, time spent in bed, waking after sleep onset, sleep onset latency, sleep quality, time of going to bed in the evening, time of turning out the lights with the intention to sleep, wake time in the morning, time of getting out of bed in the morning and insomnia.

CONCLUSIONS

The present study found that patients with RA may be at a higher risk for sleep disturbances than are individuals without RA. This apparent difference may be attributed to pain reported by patients with RA, which may also be associated with RA itself. The present findings suggest that healthcare professionals who treat patients with RA in routine clinical practice should be aware of the relationship between RA and sleep disturbances. Future research that includes objective measures of sleep disturbances is necessary to fully characterise the extent to which sleep disturbances affect patients with RA.

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Acknowledgements The English language in this document has been checked by at least two professional editors, both native speakers of English. For a certificate, please see: http://www.textcheck.com/certificate/UiU20s

Contributors J-HK, E-CP, carried out the acquisition of data, performed the experiments and participated in drafting the manuscript. J-HK, E-CP, YHL participated in the design of the study and performed the statistical analysis. J-HK, S-GL, SKS, J-HK conceived of the study, and participated in its design and coordination and helped to draft the manuscript. All authors read and approved the final manuscript.

Competing interests None declared.

Provenance and peer review Not commissioned; externally peer reviewed.

Data sharing statement No additional data are available.

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