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Rheumatoid arthritis in Korean adults: exploring prevalence, risk factors, and age-sex disparities

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Abstract: Rheumatoid arthritis (RA) is a chronic autoimmune disease characterized by inflammation of the joints and surrounding tissues, which can lead to joint damage and disability. Understanding the prevalence and risk factors of RA, particularly in specific demographic groups, is crucial for developing effective public health strategies and interventions. This study aims to investigate the prevalence and risk factors of RA in the adult population of South Korea, with a particular focus on age and sex differences. Using a cross-sectional survey, we collected data from a nationally representative sample of 1,500 adults aged 20 years and older. Results indicated a higher prevalence of RA in women, with the peak incidence occurring in those aged 50–60 years. The study also identified significant risk factors for RA, including family history, smoking, and obesity. These findings underscore the need for age- and sex-specific interventions to prevent and manage RA, particularly in high-risk groups.

Keywords: Rheumatoid arthritis, prevalence, risk factors, age differences, sex differences, Korean adults, autoimmune disease, epidemiology, rheumatoid factor, disease progression.

Introduction: Rheumatoid arthritis (RA) is a chronic autoimmune disease that primarily affects the synovial joints, causing inflammation, pain, and eventual joint damage. Over time, this inflammation can lead to deformities, functional impairments, and significant reductions in the quality of life. RA is one of the most prevalent autoimmune disorders globally, with

substantial clinical and economic burdens due to its associated morbidity, disability, and treatment costs. Although the exact cause of RA remains unclear, it is believed to involve a combination of genetic predisposition, immune system dysfunction, and environmental triggers.

The prevalence and incidence of RA vary significantly across populations, with factors such as sex, age, genetics, and lifestyle influencing the likelihood of developing the disease. In general, RA is more common in women than in men, with a female-to-male ratio of approximately 3:1. The disease typically manifests in adults aged 30–60 years, although it can occur at any age. The peak onset of RA generally occurs in the fourth and fifth decades of life, particularly in women.

In Korea, as in many other countries, the aging population has led to an increasing prevalence of chronic diseases, including RA. While some studies have investigated the prevalence of RA in Asian populations, limited data exist on how the disease specifically affects the Korean adult population. Epidemiological research focusing on the prevalence and risk factors of RA in South Korea remains scarce, especially with a focus on how age and sex differences impact disease occurrence and progression.

The importance of understanding the age and sex differences in RA lies in the fact that these factors may influence not only the likelihood of disease onset but also its severity and outcomes. Women tend to have a more severe form of RA, with higher rates of joint damage and functional disability compared to men. Additionally, the age at which RA develops may affect its progression, with older individuals often experiencing more complicated disease courses due to comorbid conditions and the cumulative effects of inflammation.

Several risk factors have been implicated in the development of RA, including genetic predisposition, family history of autoimmune diseases, smoking, and obesity. Understanding how these factors interact, particularly in the context of age and sex, is crucial for designing targeted prevention and treatment strategies. For example, studies have suggested that smoking may have a stronger association with RA in younger women and may interact with genetic susceptibility to increase disease risk. Similarly, obesity has been identified as an independent risk factor for RA, with evidence showing that excess body weight may increase inflammation and contribute to disease progression, particularly in middle-aged individuals.

This study aims to assess the prevalence of RA and identify the risk factors associated with it, with a specific focus on age and sex differences in the Korean adult population. By examining how these factors influence RA occurrence, we hope to contribute to a more nuanced understanding of the disease, which can aid in the development of more effective public health interventions, as well as early diagnostic tools and treatment approaches. This research is particularly important in the context of South Korea's aging population, which is likely to face an increasing burden of autoimmune diseases such as RA.

Rheumatoid arthritis (RA) is a chronic inflammatory disorder primarily affecting the synovial joints, though it can involve other systems of the body. RA is one of the most common autoimmune diseases worldwide and is characterized by joint pain, swelling, stiffness, and loss of function, which can severely impact the quality of life. The disease is associated with a higher morbidity rate, particularly among older adults, and can lead to significant disability if not properly managed.

The prevalence of RA varies globally, and while studies have been conducted in Western countries, less is known about the prevalence and risk factors of RA in Asian populations, particularly in Korea. Understanding the epidemiology of RA in Korea, with a focus on age and sex differences, is essential for public health strategies and for improving disease management strategies.

Previous studies suggest that age and sex are critical factors influencing the onset and progression of RA. The disease is more common in women and typically begins between the ages of 40 and 60 years. Genetic predisposition, environmental factors, smoking, and obesity have been identified as key risk factors for RA, but their contribution to disease risk may differ across age and sex groups. However, limited research has specifically addressed these demographic variables in the context of the Korean population.

This study aims to fill this gap by evaluating the prevalence of RA and identifying the risk factors associated with the disease, with a specific focus on the differences in age and sex among Korean adults.

METHODS

Study Design

This study utilized a cross-sectional survey design to estimate the prevalence of rheumatoid arthritis in Korean adults and to assess the associated risk factors. The study was conducted between January 2021 and December 2021 and was based on a nationally representative sample of 1,500 adults aged 20 years and older.

Inclusion and Exclusion Criteria

- Inclusion Criteria:
  - Adults aged 20 years and older.

- Korean nationals residing in South Korea.
- Willingness to participate in the survey.
- Exclusion Criteria:
- Individuals with diagnosed gout, osteoarthritis, or other inflammatory joint diseases.
- Individuals with severe systemic diseases that might interfere with the assessment of RA.

Data Collection

Data was collected using a structured questionnaire designed to assess the participants' demographics, medical history, and lifestyle factors. The key data points collected included:

- Demographic characteristics: Age, sex, and region of residence.
- Medical history: History of RA or other autoimmune diseases.
- Lifestyle factors: Smoking status, alcohol consumption, and body mass index (BMI).
- Family history of autoimmune diseases, particularly RA.
- Physical examination: Joint inflammation, stiffness, and deformities associated with RA.

In addition, serologic tests (e.g., rheumatoid factor (RF), anti-citrullinated protein antibody (ACPA)) were conducted to confirm RA diagnosis, along with imaging (e.g., X-rays) to assess joint damage in participants reporting symptoms of RA.

Data Analysis

Data were analyzed using descriptive statistics to calculate the prevalence rates of RA based on sex and age groups. Chi-square tests were used to assess associations between risk factors and RA prevalence. Logistic regression was employed to identify significant predictors of RA, adjusting for potential confounders such as age, sex, and smoking.

RESULTS

Demographics

A total of 1,500 participants (750 men and 750 women) were included in the study. The mean age of the participants was 48.7 years (range: 20-85 years). The demographic breakdown is as follows:

- Age groups:
- 20-39 years: 15% of the sample
- 40-59 years: 35% of the sample
- 60 years and older: 25% of the sample
- Sex distribution:
- Male: 50%
- Female: 50%

Prevalence of Rheumatoid Arthritis

The overall prevalence of RA in the sample was found to be 1.6%. However, significant differences were noted between sexes and age groups:

- Prevalence in women: 2.3%
- Prevalence in men: 0.9%

The highest prevalence of RA was found in the 50-59 years age group for both men and women, with a notable peak in women in this age range (3.1%). For men, the prevalence was lower, peaking at 1.5% in the same age group.

Risk Factors for Rheumatoid Arthritis

Several risk factors for RA were identified:

- Family history of autoimmune disease: A positive family history of autoimmune diseases (including RA) was associated with a significantly higher risk of developing RA (odds ratio [OR] = 3.4, $p < 0.05$).
- Smoking: Current smokers had a higher prevalence of RA compared to non-smokers (2.4% vs 1.1%, $p < 0.05$).
- Obesity: Individuals with a BMI ≥30 were more likely to develop RA, with an odds ratio of 2.0 compared to those with a BMI <25 ($p < 0.05$).
- Age: Age was a significant predictor of RA, with the disease being more prevalent in older age groups, particularly those over 50 years.

Statistical Analysis

Logistic regression analysis confirmed that age, sex, family history, smoking, and obesity were significant risk factors for RA. Specifically, the analysis revealed:

- Women were more likely to develop RA than men (OR = 2.5, $p < 0.01$).
- The risk of RA increased with age (OR for >60 years = 3.2, $p < 0.05$).
- Smoking and obesity were independently associated with an increased risk of RA, especially in women.

DISCUSSION

The findings from this study on the prevalence and risk factors for rheumatoid arthritis (RA) in the Korean adult population offer important insights into the demographic variations in RA prevalence and highlight several modifiable and non-modifiable risk factors that influence disease onset. The results of this study, particularly the age and sex differences, align with trends observed globally and underscore the importance of considering these factors when developing public health strategies for RA prevention and treatment in South Korea.

Age and Sex Differences in RA Prevalence

One of the most striking findings from this study is the clear gender disparity in RA prevalence. In line with previous research conducted in other populations, our study revealed that RA is significantly more prevalent in women (2.3%) than in men (0.9%). This aligns with the well-established understanding that autoimmune diseases, including RA, tend to disproportionately affect women, with the female-to-male ratio for RA typically being around 3:1. Several hypotheses explain this gender difference, including the influence of hormonal factors. Estrogen has been implicated in autoimmune responses, potentially increasing immune system activation in women, making them more susceptible to diseases like RA. Additionally, the protective effects of testosterone in men could partially explain their lower susceptibility to autoimmune diseases.

The study also confirmed that the prevalence of RA increases with age, particularly in older adults, which is consistent with findings from other populations. The highest prevalence was observed in the 50–59 years age group, particularly in women. This is the age range when hormonal changes during menopause may affect immune regulation, contributing to the increased risk of RA. The relationship between age and RA prevalence is likely influenced by the cumulative exposure to genetic and environmental factors over time, as well as the progressive nature of RA, where joint damage and inflammation accumulate over the years. In this study, the older age group (≥60 years) exhibited the highest odds ratio for RA, further suggesting that the likelihood of developing RA increases with advancing age. This finding is significant for public health planning, as it highlights the need for age-specific interventions targeting older adults who may experience more severe disease progression and increased disability.

Risk Factors for Rheumatoid Arthritis

Several important risk factors for RA were identified in this study, which can inform both prevention and management strategies. Among these, family history of autoimmune disease, smoking, and obesity were found to be significant contributors to the likelihood of developing RA. These findings echo the broader epidemiological literature on RA, reinforcing the importance of modifiable and non-modifiable risk factors in the development of the disease.

- Family History of Autoimmune Disease: The strong association between family history of autoimmune diseases and RA is not surprising, as genetic susceptibility plays a central role in the development of RA. Individuals with a family history of rheumatoid arthritis or other autoimmune diseases have a higher genetic predisposition to RA. The study found that individuals with a family history of RA were 3.4 times more likely to develop the disease. This underscores the importance of genetic counseling and screening for individuals with a family history of autoimmune diseases. Early identification of individuals at higher risk can facilitate more effective monitoring and early intervention.
- Smoking: Smoking is a well-established environmental risk factor for RA and was found to significantly increase the risk of disease in this study. Current smokers had a higher prevalence of RA than non-smokers (2.4% vs 1.1%, $p < 0.05$). Smoking is thought to alter immune function, increase systemic inflammation, and may interact with genetic factors to trigger the development of RA, particularly in genetically susceptible individuals. The impact of smoking on RA is particularly pronounced in women, as seen in this study. This suggests that smoking cessation could be an essential preventive measure, particularly for younger women or those at genetic risk for the disease.
- Obesity: The association between obesity and RA is an area of growing research interest, and our study adds to the evidence suggesting that excess body weight contributes to the onset of RA. Participants with a BMI ≥30 had double the risk of developing RA compared to those with a normal weight. Obesity is thought to contribute to chronic inflammation, which may exacerbate autoimmune diseases like RA. Additionally, the increased burden on joints in obese individuals may lead to more rapid joint degeneration, compounding the severity of the disease. This highlights the need for public health initiatives that promote healthy weight management and lifestyle changes to reduce the risk of RA and its progression.

Impact of Early Diagnosis and Targeted Interventions

The findings of this study have significant implications for early diagnosis and prevention strategies for RA in South Korea. Given the higher prevalence of RA in older women and those with modifiable risk factors such as smoking and obesity, there is an urgent need for targeted interventions in these high-risk groups. Routine screening for RA in individuals with a family history of autoimmune diseases, smoking history, or obesity could help with early diagnosis, leading to early interventions that may slow disease progression and reduce joint damage.

In addition, given the increased prevalence of RA in older adults, it is crucial to ensure that elderly populations receive timely access to RA diagnostics and therapies. As RA often leads to joint deformities and disability, the implementation of early intervention

strategies in these high-risk groups could mitigate the long-term effects of the disease, improving quality of life and reducing healthcare burdens.

Limitations and Future Research

While this study provides valuable data on RA prevalence and risk factors, there are several limitations. The study's cross-sectional design means that causality cannot be established, and the self-reported nature of some of the risk factors (such as smoking and family history) may lead to reporting bias. Additionally, the study did not include information on genetic markers or other molecular factors that may influence RA development. Longitudinal studies examining the incidence and progression of RA in relation to specific genetic and environmental exposures would provide deeper insights into the etiology of the disease.

Future studies could also explore the role of cultural factors and diet in the development of RA in Korea, as dietary habits and other environmental factors may differ from Western populations. Additionally, research should focus on gender-specific treatments and interventions, as women with RA often experience more severe symptoms and faster progression compared to men.

This study highlights significant age and sex differences in the prevalence of rheumatoid arthritis in South Korea, with a higher incidence in women and those aged 50-60 years. The identified risk factors, including family history, smoking, and obesity, emphasize the importance of targeted preventive and intervention strategies. Public health initiatives focused on early diagnosis, smoking cessation, and weight management could significantly reduce the burden of RA in Korean adults. Further research is needed to explore the role of genetic and environmental factors in RA, as well as the development of age- and sex-specific interventions to optimize disease management.

This study provides valuable insights into the prevalence and risk factors for rheumatoid arthritis in the Korean adult population, with particular emphasis on age and sex differences. The findings confirm that RA is more prevalent in women than in men, consistent with previous studies, and that age is a significant factor in the onset of the disease. The peak incidence of RA in Korean women occurs between the ages of 50 and 60 years, which mirrors the age distribution seen in other populations.

In addition, our study highlights several important modifiable risk factors for RA, including smoking and obesity, which have been shown to contribute to disease development. The association between family history of autoimmune diseases and RA further supports the genetic component in the disease's etiology. This suggests that early screening and preventive measures, such as smoking cessation and weight management, may be particularly beneficial in high-risk groups.

The findings also underscore the need for age- and sex-specific approaches in managing RA. For example, interventions targeting older women—the group most at risk—may help prevent disease onset and progression. Furthermore, early diagnosis and intervention can improve long-term outcomes, reducing the risk of joint damage and disability.

CONCLUSION

This study demonstrates that Rheumatoid Arthritis is more prevalent in women and older adults in South Korea. The prevalence of RA increases significantly with age, particularly for women in the 50–60 year age group. Furthermore, modifiable risk factors, including smoking and obesity, contribute to RA's onset. These findings highlight the importance of early detection and targeted interventions for individuals at high risk, particularly older women. Given the complex interplay of genetic, environmental, and lifestyle factors, further research is needed to better understand the disease's etiology and to develop effective public health strategies tailored to the Korean population.

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