Incidence and prevalence of systemic lupus erythematosus among Korean women in childbearing years: a nationwide population-based study

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Abstract

Background

Most women with systemic lupus erythematosus (SLE) are diagnosed with the disease in their reproductive years, but the incidence and prevalence of SLE among women of childbearing age have not been studied. The objective of this study was to estimate the incidence and prevalence of SLE among the Korean women of childbearing age.

Methods

Women aged 20 to 44 years with SLE were identified from National Health Insurance Service – National Health Information Database (2009–2016), which contain health information of approximately 97% of the Korean population. SLE was defined by International Classification of Diseases, 10th revision code, M32. Incidence and prevalence were calculated per 100,000 person-years and stratified by year and age.

Results

A total of 12,756 women with SLE were identified. The incidence of SLE from 2011 to 2016 among women in childbearing years was 8.18/100,000 person-years (95% CI 7.94–8.43), with the highest incidence in 2016 (8.56/100,000 person-years, 95% CI 7.95–9.17) and the lowest incidence in 2012 (7.85/100,000 person-years, 95% CI 7.28–8.42). The prevalence of SLE from 2009 to 2016 among women in childbearing years was 77.07/100,000 person-years (95% CI 75.76–78.39), with the highest prevalence in 2014 (79.47/100,000 person-years, 95% CI 77.64–81.30) and the lowest in 2010 (74.19/100,000 person-years, 95% CI 72.45–75.93). The peak age for SLE incidence was between 25–39 years, and lower incidence was seen in the early (20–24 years) and late (40–44 years) childbearing age periods. There was an increasing trend in prevalence according to age in women of childbearing age, with the highest prevalence occurring in the 40–44 age group.

Conclusions

The risk and burden of SLE are high among women during their childbearing years. This calls for special attention to this particular population group when allocating health resources.

Introduction

Systemic lupus erythematosus (SLE) is a chronic autoimmune disease that may affect various organ systems [1]. Despite the improvement in medical care, SLE still carries a higher risk of death compared to the general population with a reported 5-year survival of 95% [2]. Since SLE is a chronic disease with no

definite cure, patients have to deal with the complications of the disease and its treatments throughout their lifetime [3].

The worldwide incidence and prevalence of SLE vary greatly according to region and ethnicity, with an incidence range of 0.3 to 23.2 per 100,000 person-years and a prevalence range of 0 to 241 per 100,000 people [4–9]. Despite the high regional and ethnic variation, one common feature of SLE epidemiology is that the disease predominantly affects women during their childbearing years. SLE occurs more often in women, with a female to male ratio of 9:1, and this ratio is higher (up to 15:1) during the reproductive years [10, 11]. The peak incidence age for SLE in women is between the third and the fifth decades, during the peak reproductive years, whereas peak incidence for men is later (fifth to seventh decades) [7, 9]. SLE is the second most common autoimmune disease following thyroid disease in women of childbearing age [12]. Furthermore, high rates of maternal and fetal complications have been reported among women with SLE. Maternal complications such as lupus flare, hypertension, nephritis, pre-eclampsia, and eclampsia and fetal complications such as fetal loss, stillbirths, preterm birth, and intrauterine growth retardation were more frequent during pregnancy in women with SLE compared with healthy women [13–15]. The disease also had a significant psychosocial impact on family life in that many SLE women make choices to limit family size due to concerns about the health of a child and their care [16–18]. Thus, women of childbearing age with SLE are among the most vulnerable population needing special attention, since a high disease burden is imposed upon this particular population group.

To date, no studies have specifically examined the incidence and prevalence of SLE among women during their childbearing years. Determining the nationwide incidence and prevalence rates of SLE in a specific age group of women of childbearing age may yield important insights into the underlying biology and can provide valuable information for the planning and allocation of health care resources. Therefore, this study aimed to estimate the incidence and prevalence of SLE, including temporal trends and age group variations, among Korean women of childbearing age using the nationwide population database.

Methods

Study design and study population

We conducted a nationwide retrospective study using the Korean National Health Insurance Service – National Health Information Database (NHIS-NHID) from 2009 to 2016. The Korean NHIS was founded in 2000, and is a single insurer that provides coverage for almost the entire Korean population, as 97% of the population is enrolled in the NHIS program and the remaining 3% (with low incomes) are covered by the Medical Aid Program [19]. As of December 2014, the NHIS-NHID included all inpatient and outpatient claims data as well as information on health care utilization for approximately 50 million Korean people [20]. The target population in this study was women of childbearing age (defined as women between the ages of 20–44 years) during the period from January 1, 2009 to December 31, 2016. This study was approved by the Institutional Review Board of the National Health Insurance Service Ilsan hospital (Institutional review board Number: NHIMC 2020-02-010), and it was conducted according to the

principles of the Declaration of Helsinki. Since the database used in this study contains anonymized data for research purposes, informed consent was not required.

Identification of cases

In 2009, the government of the Republic of Korea subsidized medical expenses for patients with rare and intractable diseases through a co-payment assistance policy which is called the Individual Copayment Beneficiaries Program (ICBP) [21], and SLE was designated as one of the rare diseases to be covered by this program. Under this ICBP system, the NHIS has established a registration program which includes codes for the targeted disease classified per the Korean Standard Classification of Diseases (KCD)-7 (based on the International Classification of Diseases (ICD)-10), date of definite diagnosis, and tests performed for the confirmation of the diagnosis. In case of SLE, patients who satisfied 1997 American College of Rheumatology (ACR) classification criteria for SLE or 2009 Systemic Lupus International Collaborating Clinics (SLICC) criteria were registered. For an accurate identification of cases, we used data from January 1, 2009 to December 31, 2016 with the assumption that all SLE patients have been accurately coded since 2009. We identified SLE cases using the diagnostic code M32 based on International Classification of Diseases, 10th revision, during this period.

Outcome measures and analysis

For incidence, the year-specific numerator was the number of subjects who were incident cases in the specific calendar year, and the denominator was the total mid-year population at risk. When calculating incidence, data from January 1, 2011 to December 31, 2016 were used since prior data from a period of at least one-year prior is required and a washout period of at least one year is needed to minimize prevalent cases identified as incident cases. For annual prevalence, the year-specific numerator was the number of prevalent cases in the specific calendar year, and the denominator was the total mid-year population from the Korean National Statistical Office for that specific year. Prevalence rates were identified from 2009 to 2016. Crude rates, age-specific rates, standardized rates adjusted for age and 95% confidence intervals (CIs) were calculated. All statistical analyses were performed using SAS version 9.4 (SAS Institute, Cary, NC, USA).

Results

Incidence

Of total 9,139,933, 4,487 women were newly diagnosed with SLE between 2011 and 2016. The average incidence was 8.18/100,000 person-years (95% CI 7.94–8.43).

Temporal trend

Table 1 shows the trend in incidence by year. Incidence of SLE was relatively constant throughout the years analyzed, with the highest incidence in 2016 (8.56/100,000 person-years, 95% CI 7.95–9.17) and the lowest incidence in 2012 (7.85/100,000 person-years, 95% CI 7.28–8.42).

Table 1
Incidence of SLE in women of childbearing age (20–44) by year from 2011 to 2016

Years	Total female population	Number of cases	Incidence per 10 ⁵ PYs	95% CI
2011	9361241	771	8.24	(7.65–8.82)
2012	9290139	729	7.85	(7.28–8.42)
2013	9207754	742	8.06	(7.48–8.64)
2014	9106227	771	8.47	(7.87–9.06)
2015	8994585	714	7.94	(7.36–8.52)
2016	8879651	760	8.56	(7.95–9.17)
<i>SLE</i> systemic lupus erythematosus, <i>CI</i> confidence interval, <i>PYs</i> person-years				

Age

To analyze the trends in incidence according to ages, we calculated the age-specific incidence rate for 2013. The peak age of SLE incidence in women of childbearing age was between 25–39 years, with bimodal peaks at 25–29 years and 35–39 years. The incidence of SLE was lower among women in the early (20–24 years) and late (40–44 years) childbearing age periods (Fig. 1A).

Prevalence

From 2009–2016, 12,756 women between the age of 20 to 44 years were diagnosed with SLE. The average prevalence of SLE in women in childbearing years was 77.07/100,000 person-years (95% CI 75.76–78.39).

Temporal trend

Table 2 shows the trend in prevalence by year. The prevalence of SLE in women during their childbearing years showed minimal year to year variation with the highest prevalence in 2014 (79.47/100,000 person-years, 95% CI 77.64–81.30) and the lowest prevalence in 2010 (74.19/100,000 person-years, 95% CI 72.45–75.93).

Table 2
Prevalence of SLE in women of childbearing age (20–44) by year from 2009 to 2016

Years	Total female population	Number of cases	Prevalence per 10 ⁵ PYs	95% CI
2009	9490033	7371	77.67	(75.90–79.44)
2010	9407485	6979	74.19	(72.45–75.93)
2011	9361241	7118	76.04	(74.27–77.80)
2012	9290139	7177	77.25	(75.47–79.04)
2013	9207754	7202	78.22	(76.41–80.02)
2014	9106227	7237	79.47	(77.64–81.30)
2015	8994585	6950	77.27	(75.45–79.09)
2016	8879651	6791	76.48	(74.66–78.30)
<i>SLE</i> systemic lupus erythematosus, <i>CI</i> /confidence interval, <i>PYs</i> person-years				

Age

The age-specific prevalence rate in 2013 was calculated to define prevalence in different age groups of the women in childbearing years (Fig. 1B). An increase in prevalence with advancement in age was noted among women during their childbearing years, with the highest prevalence in the 40–44 age group. A steep increase in prevalence was observed between the age-groups of 20–24 and 25–29 years, followed by a near plateau in the 30–34 age group, with a gradual increase thereafter.

Discussion

This is the first nationwide population-based, epidemiologic study of SLE among women of childbearing age in South Korea using NHIS-NHID that includes health information from nearly the entire Korean population. Our study found high incidence and prevalence rates of SLE in women during childbearing years, reflecting a high burden of disease in this particular population.

An average of 8.12 per 100,000 Korean women of childbearing age per year were at risk for developing SLE in this study. This average incidence was higher than the incidence reported previously in the total Korean population (3.72/100,000 person-years) and in Korean women of all ages (6.52/100,000 person-years), according to a study using information from the same database from the years 2005 to 2015 [7]. This suggests that women of childbearing age are a high-risk population for developing SLE. The incidence of SLE among Korean women of childbearing age was also higher compared with the overall incidence of SLE in the United States (US), Europe, and Asia. A recent epidemiologic review reported

overall SLE incidences 5.2–7.2/100,000 person-years in the US [22–24], 1.0–4.9 in Europe [4, 5, 25], and 2.8–8.1 in Asia [21, 26–28].

A previous study reported a decrease in the incidence of SLE between 2005 and 2010 and then a slight annual increase until 2015 in Korea [7], but we observed a relatively constant rate of SLE incidence among Korean women of childbearing age. This suggests that the risk of developing SLE for the total population in a given year is affected by extrinsic factors including differences in environmental exposures such as an influenza epidemic, whereas the risk of developing SLE for the specific sociodemographic group of women of childbearing age is mainly affected by intrinsic factors such as age, gender, and female sex hormones [29, 30].

Although there was a slight bimodal pattern in incidence by age, the peak age of incidence in this study was between 25–39 years, with a lower incidence rate in the early (20–24 years) and late (40–44 years) childbearing age periods, suggesting that women are at risk of developing SLE during the period of time when they are most likely to have children (25–39 years). These results are consistent with previous Koreans studies that have reported a peak age of incidence in the 30–39 year age ranges [7, 21]. The peak age of incidence for SLE in other countries varies: Taiwan and Spain have peak incidence at the age of 20–29, and in Norway, the peak incidence age is 16–29 [11, 31, 32]. However, the incidence of SLE increases steadily with age in the US, peaking in women over fifty [33]. This might be related to an increased frequency of late-onset SLE in the Caucasian population [34].

The average prevalence of SLE in women during their childbearing years was 77.07/100,000 person-years (95% CI 75.76–78.39). The prevalence of SLE in women of childbearing age was 3.6-fold higher than the prevalence in total Korean population (28.02/100,000 person-years), which was reported using the same database from 2005–2015, and 1.5-fold higher than the prevalence in Korean women of all ages (51.00/100,000 person-years) [7]. Most studies report higher prevalence rates in women than in the overall population. Although there is no prevalence data for women of childbearing age, the prevalence in women was much higher in the US (159.8/100,000) and Taiwan (179.4/100,000) compared to Korea [26, 35]. Higher prevalence rates of SLE in women of childbearing age may reflect higher incidences of SLE in this specific age group compared to their lifetime risk as shown in this study.

Although we found a year to year variation of SLE prevalence in the total Korean population with a maximum of 14.2/100,000 person-years [7], there was less variation in the prevalence among women of childbearing age, suggesting that childbearing age itself imposes a significant burden on women with SLE.

The prevalence of SLE increased with age in women during their childbearing years, with a peak prevalence in the 40–44 year of age ranges. This finding is consistent with other studies in the total population [7]. This age-specific prevalence trend in SLE reflects the fact that SLE is a chronic autoimmune disease that requires lifelong management [3]. A steep increase in prevalence that plateaus in the 30–34 age group appeared to be related to a higher incidence between the ages of 25–39 years compared to the incidence in the 20–24 and 40–44 age groups. The plateau in prevalence of the 30–34

age group also coincides with the peak age for childbirth in Korea [36]. This suggests that Korean women of childbearing years have to face the burden of SLE through their pregnancies and childbirth.

Despite these important findings, this study has some limitations. First, since the NHIS-NHID are collected for insurance claim purposes only, the diagnostic codes may be inaccurate. To minimize this problem, we only included NHIS data starting from 2009, since all SLE patients were registered with an accurate diagnostic code to receive benefits from the government on a newly launched individual co-payment program for rare and intractable diseases which started in the second half of the year of 2008. Second, as NHIS data is limited to information on patients who visited health institutions, the prevalence and incidence rates might be underestimated. However, such an underestimation may have only slightly impacted our results, since the NHIS covers the entire population of Korea. Nevertheless, this is the first study defining incidence and prevalence rates for SLE among women of childbearing age, a unique population group with a high disease burden.

Conclusions

In conclusion, the risk of SLE is high in women during their childbearing years and this population bears a significant disease burden. With advancements in disease management and improved survival rates, SLE is no longer a rare disease in women of childbearing age. Therefore, special attention should be paid to this particular population group when allocating health resources. Further research assessing the functional burden of SLE such as disability-adjusted life years (DALY) and economic burden are needed to further understand the overall burden of the disease for this age group.

Abbreviations

ACR: American College of Rheumatology; CIs: confidence intervals; DALY: disability-adjusted life years; ICBP: Individual Copayment Beneficiaries Program; KCD: Korean Standard Classification of Diseases; NHIS-NHID: National Health Insurance Service – National Health Information Database; SLE: systemic lupus erythematosus; SLICC: Systemic Lupus International Collaborating Clinics; US: United States

Declarations

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Author's contributions

CMK, LHS, PJS contributed to an acquisition of data and analysis. LJ and LCH contributed to the conception and study design and edited the manuscript. All authors were involved in analysis and

interpretation of the data, drafting the article, and revising it critically for important intellectual contents, and approving the final version of the article.

Availability of data and materials

The data used during the current study are available from the corresponding author on reasonable request.

Ethics approval and consent to participate

This study was approved by the Institutional Review of Board of the National Health Insurance Service Ilsan hospital (Institutional review board number: NHIMC 2020-02-010), and it was conducted according to the principles of the Declaration of Helsinki. Since the database used in this study contains anonymized data for research purposes, informed consent was not required.

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Consent for publication Not applicable.

Competing interests

The authors declare that they have no competing interests.

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References

1. Tan EM, Cohen AS, Fries JF, Masi AT, McShane DJ, Rothfield NF, et al. The 1982 revised criteria for the classification of systemic lupus erythematosus. *Arthritis Rheum.* 1982;25:1271–7.
2. Tektonidou MG, Lewandowski LB, Hu J, Dasgupta A, Ward MM. Survival in adults and children with systemic lupus erythematosus: a systematic review and Bayesian meta-analysis of studies from 1950 to 2016. *Ann Rheum Dis.* 2017;76:2009–16.
3. Rosario C, Seguro L, Vasconcelos C, Shoenfeld Y. Is there a cure for systemic lupus erythematosus? *Lupus.* 2013;22:417–21.

4. Rees F, Doherty M, Grainge M, Davenport G, Lanyon P, Zhang W. The incidence and prevalence of systemic lupus erythematosus in the UK, 1999–2012. *Ann Rheum Dis*. 2016;75:136–41.
5. Stojan G, Petri M. Epidemiology of systemic lupus erythematosus: an update. *Curr Opin Rheumatol*. 2018;30:144–50.
6. Arnaud L, Fagot JP, Mathian A, Paita M, Fagot-Campagna A, Amoura Z. Prevalence and incidence of systemic lupus erythematosus in France: a 2010 nation-wide population-based study. *Autoimmun Rev*. 2014;13:1082–9.
7. Bae EH, Lim SY, Han KD, Jung JH, Choi HS, Kim HY, et al. Trend of prevalence and incidence of systemic lupus erythematosus in South Korea, 2005 to 2015: a nationwide population-based study. *Korean J Intern Med*. 2019.
8. Jakes RW, Bae SC, Louthrenoo W, Mok CC, Navarra SV, Kwon N. Systematic review of the epidemiology of systemic lupus erythematosus in the Asia-Pacific region: prevalence, incidence, clinical features, and mortality. *Arthritis Care Res (Hoboken)*. 2012;64:159–68.
9. Rees F, Doherty M, Grainge MJ, Lanyon P, Zhang W. The worldwide incidence and prevalence of systemic lupus erythematosus: a systematic review of epidemiological studies. *Rheumatology*. 2017;56:1945–61.
10. Weckerle CE, Niewold TB. The unexplained female predominance of systemic lupus erythematosus: clues from genetic and cytokine studies. *Clin Rev Allergy Immunol*. 2011;40:42–9.
11. National Health Insurance Service (NHIS). History of the NHIS. Accessed June 22, 2018.
12. Bongu A, Chang E, Ramsey-Goldman R. Can morbidity and mortality of SLE be improved? *Best Pract Res Clin Rheumatol*. 2002;16:313–32.
13. Moroni G, Ponticelli C. Pregnancy in women with systemic lupus erythematosus (SLE). *Eur J Intern Med*. 2016;32:7–12.
14. Bundhun PK, Soogund MZ, Huang F. Impact of systemic lupus erythematosus on maternal and fetal outcomes following pregnancy: A meta-analysis of studies published between years 2001–2016. *J Autoimmun*. 2017;79:17–27.
15. Clowse ME, Jamison M, Myers E, James AH. A national study of the complications of lupus in pregnancy. *Am J Obstet Gynecol*. 2008;199:127.e1-6.
16. Vinet E, Labrecque J, Pineau CA, Clarke AE, St-Pierre Y, Platt R, et al. A population-based assessment of live births in women with systemic lupus erythematosus. *Ann Rheum Dis*. 2012;71:557–9.
17. Vinet E, Clarke AE, Gordon C, Urowitz MB, Hanly JG, Pineau CA, et al. Decreased live births in women with systemic lupus erythematosus. *Arthritis Care Res (Hoboken)*. 2011;63:1068–72.
18. Kim IJ, Kim HA, Suh CH, Park YW, Lee HS, Bang SY, et al. Impact of Childbearing Decisions on Family Size of Korean Women with Systemic Lupus Erythematosus. *J Korean Med Sci*. 2016;31:729–34.
19. Song SO, Jung CH, Song YD, Park CY, Kwon HS, Cha BS, et al. Background and data configuration process of a nationwide population-based study using the korean national health insurance system. *Diabetes Metab J*. 2014;38:395–403.

20. Kim JA, Yoon S, Kim LY, Kim DS. Towards Actualizing the Value Potential of Korea Health Insurance Review and Assessment (HIRA) Data as a Resource for Health Research: Strengths, Limitations, Applications, and Strategies for Optimal Use of HIRA Data. *J Korean Med Sci.* 2017;32:718–28.
21. Shim JS, Sung YK, Joo YB, Lee HS, Bae SC. Prevalence and incidence of systemic lupus erythematosus in South Korea. *Rheumatol Int.* 2014;34:909–17.
22. Dall'Era M, Cisternas MG, Snipes K, Herrinton LJ, Gordon C, Helmick CG. The Incidence and Prevalence of Systemic Lupus Erythematosus in San Francisco County, California: The California Lupus Surveillance Project. *Arthritis Rheumatol.* 2017;69:1996–2005.
23. Furst DE, Clarke AE, Fernandes AW, Bancroft T, Greth W, Iorga SR. Incidence and prevalence of adult systemic lupus erythematosus in a large US managed-care population. *Lupus.* 2013;22:99–105.
24. Gergianaki I, Bortoluzzi A, Bertsias G. Update on the epidemiology, risk factors, and disease outcomes of systemic lupus erythematosus. *Best Pract Res Clin Rheumatol.* 2018;32:188–205.
25. Lausttrup H, Voss A, Green A, Junker P. Occurrence of systemic lupus erythematosus in a Danish community: an 8-year prospective study. *Scand J Rheumatol.* 2009;38:128–32.
26. Yeh KW, Yu CH, Chan PC, Horng JT, Huang JL. Burden of systemic lupus erythematosus in Taiwan: a population-based survey. *Rheumatol Int.* 2013;33:1805–11.
27. Mok CC, To CH, Ho LY, Yu KL. Incidence and mortality of systemic lupus erythematosus in a southern Chinese population, 2000–2006. *J Rheumatol.* 2008;35:1978–82.
28. Chiu YM, Lai CH. Nationwide population-based epidemiologic study of systemic lupus erythematosus in Taiwan. *Lupus.* 2010;19:1250–5.
29. Ambrose N, Morgan TA, Galloway J, Ionnoau Y, Beresford MW, Isenberg DA. Differences in disease phenotype and severity in SLE across age groups. *Lupus.* 2016;25:1542–50.
30. Hewagama A, Richardson B. The genetics and epigenetics of autoimmune diseases. *J Autoimmun.* 2009;33:3–11.
31. Alonso MD, Llorca J, Martinez-Vazquez F, Miranda-Fillooy JA, Diaz de Teran T, Dierssen T, et al. Systemic lupus erythematosus in northwestern Spain: a 20-year epidemiologic study. *Medicine.* 2011;90:350–8.
32. Lerang K, Gilboe I, Garen T, Thelle DS, Gran JT. High incidence and prevalence of systemic lupus erythematosus in Norway. *Lupus.* 2012;21:1362–9.
33. Feldman CH, Hiraki LT, Liu J, Fischer MA, Solomon DH, Alarcon GS, et al. Epidemiology and sociodemographics of systemic lupus erythematosus and lupus nephritis among US adults with Medicaid coverage, 2000–2004. *Arthritis Rheum.* 2013;65:753–63.
34. Baker SB, Rovira JR, Campion EW, Mills JA. Late onset systemic lupus erythematosus. *Am J Med.* 1979;66:727–32.
35. Lim SS, Bayakly AR, Helmick CG, Gordon C, Easley KA, Drenkard C. The incidence and prevalence of systemic lupus erythematosus, 2002–2004: The Georgia Lupus Registry. *Arthritis Rheumatol.* 2014;66:357–68.

Figures

Figure 1

(a) Age-specific incidence of systemic lupus erythematosus (SLE) in women of childbearing age (20-44) in 2013 (b) Age-specific prevalence of SLE in women of childbearing age (20-44) in 2013