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ORIGINAL RESEARCH

Risk of cancer in Korean patients with psoriatic arthritis: a nationwide population-based cohort study

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ABSTRACT

Objective While many studies on the increased risk of cancer in patients with psoriasis are available, data on the risk of cancer in patients with psoriatic arthritis (PsA) are still scarce. We assessed the risk of cancer in patients with PsA in a nationwide population-based cohort in Korea.

Methods From 2010 to June 2021, patients newly diagnosed with PsA and 1:10 age-matched and sex-matched controls were included in this study. The outcome was the incidence of overall and specific cancers.

Results Total 162 cancers occurred in 4688 PsA patients (incidence rate 83.2 (95% CI 70.8 to 97.0) per 10 000 person-years) and 1307 cancers occurred in 46 880 controls (incidence rate 66.9 (95% CI 63.3 to 70.6) per 10 000 person-years). The adjusted HR (aHR) of overall cancer in PsA patients was 1.20 (95% CI 1.02 to 1.41). However, this significance disappeared when non-melanoma skin cancer (NMSC) was excluded (aHR 1.16, 95% CI 0.98 to 1.37). Among specific cancers, the risk of NMSC (aHR 3.64 (95% CI 1.61 to 8.23)), lymphoma (aHR 2.63 (95% CI 1.30 to 5.30)) and thyroid cancer (aHR 1.83 (95% CI 1.18 to 2.85)) was higher in patients with PsA than in controls.

Conclusion The risk of overall cancer was higher in patients with PsA than in the general population. Patients with PsA had increased risks of NMSC, lymphoma and thyroid cancer compared with the general population. Our findings suggest a need to conduct cancer screening by a detailed history and comprehensive clinical examination in patients with PsA.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Psoriasis is known to be associated with an increased risk of cancer, but there is relatively little data on the association between psoriatic arthritis and cancer risk. In addition, most studies have been conducted in Western countries, with scarce evidence in Asian populations.

WHAT THIS STUDY ADDS

⇒ In Korea, compared with the general population, patients with psoriatic arthritis are associated with an increased risk of overall cancer, particularly non-melanoma skin cancer, lymphoma and thyroid cancer.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Our study suggests the need to pay attention to cancer screening by a detailed history and comprehensive clinical examination in patients with psoriatic arthritis.

INTRODUCTION

Psoriatic arthritis (PsA) is a chronic inflammatory arthropathy associated with psoriasis (PsO). The prevalence of PsA has been reported to be approximately 0.1%–1% worldwide and varies according to geographic regions.[1] Moreover, the prevalence of PsA has been increasing in recent years. A Taiwanese study reported that the prevalence of PsA increased from 0.01% in 2000 to 0.04% in 2013.[2] Similarly, a Canadian study also reported that the age-standardised and sex-standardised cumulative prevalence of PsA increased from 0.09% in 2008 to 0.15% in 2015.[3]

Several studies have been conducted on the association between cancer and inflammatory diseases, of which many have reported that PsO, an immune-mediated inflammatory skin disease, is associated with an increased risk of cancer.[4–6] Among specific cancers, the risk of several cancers, including lung cancer, lymphomas and non-melanoma skin cancer (NMSC), has reported to be increased in patients with PsO. The mechanism of the increased cancer risk in patients with PsO is not yet fully understood. However, chronic inflammation in PsO, immunomodulatory agents used for the treatment of PsO and lifestyle factors that are common risk factors for PsO and cancer may be associated with an increased risk of cancer.

A recent meta-analysis also reported an increased risk of cancer in patients with PsO (risk ratio 1.21, 95% CI 1.11 to 1.33), but not in patients with PsA (risk ratio 1.02, 95% CI 0.97 to 1.08).[4] Indeed, patients with PsO

Table 1 Summary of studies on cancer risk in patients with psoriatic arthritis

Study	Study design, country	Participants	No of participants	No of cancer	Assessment of PsA	Main findings (95% CI)
Rohekar *et al* (2008)[48]	Prospective cohort, Canada	PsA patients, compared with data of Ontario GP	665	68	Based on modified Moll and Wright criteria	SIR 0.98 (0.77 to 1.24) (excluding NMSC)
Gross *et al* (2014)[49]	Prospective cohort, USA	PsA patients vs RA patients	PsA: 2970 RA: 19 260	PsA: 40 RA: 307	Diagnosed by a rheumatologist and enrolled in the CORRONA registry	aIRR 1.17 (0.82 to 1.69)
Hagiwara *et al* (2016)[50]	Descriptive, Japan	PsA patients	115	4	Met the CASPAR criteria	N/A
Hagberg *et al* (2016)[21]	Retrospective cohort, UK	PsA patients vs age and sex-matched non-PsA cohorts	Solid and haematological cancer cohorts PsA: 8493 Non-PsA: 82 601 NMSC cohorts PsA: 8677 Non-PsA: 86 413	Solid cancer PsA: 344 Non-PsA: 3139 Haematological cancer PsA: 43 Non-PsA: 261 NMSC PsA: 160 Non-PsA: 1561	New diagnoses of PsA with diagnostic code in the CPRD	Solid cancer IRR 1.01 (0.90 to 1.13) Haematological cancer IRR 1.52 (1.10 to 2.10) NMSC IRR 0.97 (0.82 to 1.14)
Wilton *et al* (2016)[51]	Retrospective cohort, USA	PsA patients vs age-matched and sex-matched comparators	PsA: 217 Comparator: 434	PsA: 43 Comparator: 70	Met the CASPAR criteria	HR 1.41 (0.96 to 2.07) Excluding NMSC HR 1.64 (1.03 to 2.61)
Hellgren *et al* (2017)[46]	Retrospective cohort, Sweden and Denmark	PsA patients (TNFi-treated and TNFi-naïve patients) vs age, sex and county of residence-matched GP	TNFi-treated: 3833 TNFi-naïve: 15 908 Comparator: 74 010	TNFi-treated: 71 TNFi-naïve: 722 Comparator: 3227	ICD-10 (M07.0–3 and L40.5) recorded by the rheumatologist	TNFi-treated vs comparator SIR 0.9 (0.7 to 1.1) TNFi-naïve vs comparator SIR 1.0 (0.9 to 1.1)
Fagerli *et al* (2019)[52]	Prospective cohort, UK	PsA patients starting TNFi, compared with published data of GP	709	34 NMSC: 15	Physician diagnosis of PsA	SIR 0.94 (0.65 to 1.34) NMSC SIR 2.12 (1.19 to 3.50)
Polachek *et al* (2021)[53]	Prospective cohort, Canada	PsA patients, compared with data of Ontario GP	1413	149	Based on modified Moll and Wright criteria	SIR 0.85 (0.69 to 1.04) (excluding NMSC)

aIRR, adjusted incidence rate ratio; CASPAR, ClASsification criteria for Psoriatic ARthritis; CORRONA, Consortium of Rheumatology Researchers of North America; CPRD, Clinical Practice Research Datalink; GP, general population; ICD-10, International Classification of Diseases 10th edition; N/A, not available; NMSC, non-melanoma skin cancer; No, number; PsA, psoriatic arthritis; RA, rheumatoid arthritis; SIR, standardised incidence ratio; TNFi, tumour necrosis factor α inhibitors.

have been mainly targeted in previous studies related to cancer risk, and data on cancer risk in patients with PsA are relatively scarce (table 1). In addition, most studies have been conducted in Western countries, and no studies have compared the risk of cancer between the patients with PsA and general population in Asia. Therefore, we attempted to compare the incidence of cancer between the patients with PsA and general population in a nationwide population-based cohort in South Korea.

METHODS

Data resource

The National Health Insurance Service (NHIS) is a single government insurer that provides health insurance to all citizens living in South Korea. The Health Insurance Review and Assessment Service (HIRA) evaluates medical service fees, quality of healthcare and adequacy of medical service.[7] The HIRA database contains demographic information such as sex and age of the insured

and information on healthcare utilisation such as diagnosis, surgery, procedure and prescription of medicine. The HIRA database has been widely used in epidemiological studies.[8 9]

Study population

Patients newly diagnosed with PsA between 1 January 2010 and 30 June 2021 were included in the study. PsA was defined as ≥1 claims with the diagnostic code for PsA (International Classification of Disease 10th revision M07) and enrolment in the Rare and Intractable Disease (RID) registration programme for PsA (RID code V237). The RID programme is run by the NHIS and provides financial support to patients with certain RID. A document from a physician proving that the patient meets the ClASsification of Psoratic ARthritis criteria or has a history of PsO and meets the Assessment of SpondyloArthritis international Society axial spondyloarthropathy criteria is required to get enrolled in the RID programme for PsA. Previous studies have reported that using the RID code to define diseases included in the RID programme in the Korean administrative claims database has high sensitivity and specificity.[10 11] Patients aged 18 years or younger, or 90 years or older; patients with a history of cancer; and patients with other coexisting autoimmune diseases (online supplemental table S1) were excluded from the study.

We selected the general population without a history of cancer and other coexisting autoimmune diseases for comparison, and 1:10 age-matched and sex-matched controls were obtained. In patients with PsA, the date of diagnosis of PsA was defined as the index date, and in the control group, the date corresponding to the date of diagnosis of the matched patients with PsA was defined as the index date.

Study outcomes and follow-up

The primary outcome of the study was the incidence of cancer, defined as hospitalisation with a diagnostic code for cancer as the principal diagnosis. The positive predictive value of cancer diagnosis using diagnostic codes in the Korean nationwide claim database was reported to be 81.8%–94.1% in a previous validation study.[12] The secondary outcome was the incidence of specific cancer types. Participants were followed up from the index date until the occurrence of the outcome, death or the end of the study (30 June 2021), whichever occurred first.

Table 2 Baseline characteristics of study population

Variables	PsA patients (n=4688)	Controls (n=46 880)
Age, years	49.2±14.8	49.2±14.8
19–64	3944 (84.1)	39 440 (84.1)
65–89	744 (15.9)	7440 (15.9)
Sex, men	2678 (57.1)	26 780 (57.1)
Comorbidities		
Diabetes	1210 (25.8)	6760 (14.4)
Hypertension	1484 (42.9)	10 715 (23.1)

Data are expressed as mean±standard deviation, or n (%).
PsA, psoriatic arthritis.

Statistical analyses

Continuous variables were expressed as mean±SD, and categorical variables were expressed as numbers and percentages. The t-test and Fisher's exact test were used to compare baseline characteristics. The incidence rate was estimated as the number of cancers observed divided by the time at risk of events during the observation period. Cox proportional hazard regression models were used to compare the risks of overall and specific cancers. Age, sex, diabetes mellitus and hypertension were used as adjustment variables in the multivariable model. The log minus log plot was used for the validation of the proportional hazard assumption (online supplemental figure S1). Sensitivity analysis was performed with age as the time scale. The one minus Kaplan-Meier curve was used to compare the cumulative incidence of cancer between patients with PsA and controls. Subgroup analyses were performed based on age and sex. A $p<0.05$ was considered statistically significant. All analyses were performed using R software (V.4.1.1).

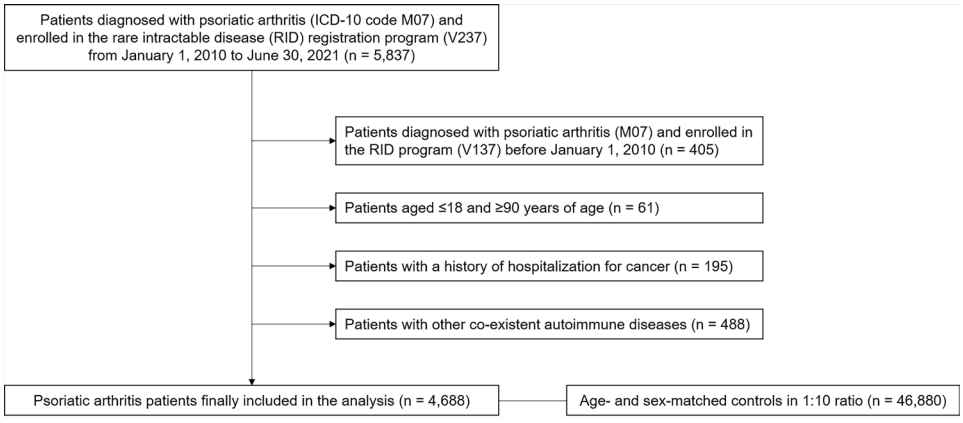

Figure 1 Flow chart of study population. ICD-10, International Classification of Disease 10th revision.

RESULTS

Baseline characteristics

Figure 1 depicts the flow chart of the study population. Of the 5837 patients diagnosed with PsA between January 2010 and June 2021, 4688 PsA patients and 46 880 age-matched and sex-matched controls were included in this analysis. The mean age of the participants was 49.2±14.8 years, and 57.1% were men (table 2). Comorbidities such as diabetes mellitus and hypertension were more common in patients with PsA.

Risk of cancer in patients with PSA

The mean follow-up duration was 4.2±3.0 years. Cancer occurred in 162 patients with PsA and in 1307 patients in the controls. The incidence rate of overall cancer was 83.2 (95% CI 70.8 to 97.0) per 10 000 person-years in patients with PsA and 66.9 (95% CI 63.3 to 70.6) per 10 000 person-years in controls (table 3). The mean time to the diagnosis of cancer was 3.1±2.6 years in patients with PsA and 3.2±2.5 years in controls (p=0.530). The mean age at the diagnosis of cancer was 64.3±13.7 years for patients with PsA and 63.3±13.6 years for controls (p=0.409). Compared with controls, the adjusted HR (aHR) of overall cancer incidence in patients with PsA was 1.20 (95% CI 1.02 to 1.41), indicating a higher risk of overall cancer in patients with PsA than in controls. However, this significance disappeared when NMSC was excluded (aHR 1.16, 95% CI 0.98 to 1.37). In the sensitivity analysis, the aHR of overall cancer in patients with PsA was 1.20 (95% CI 1.02 to 1.41), which was in line with the main analysis.

The risk of solid cancer was slightly numerically increased in patients with PsA (aHR 1.10, 95% CI 0.93 to 1.32), and the risk of haematological cancer was significantly increased (aHR 2.24, 95% CI 1.25 to 4.01). With respect to cancer type, the risk of NMSC (aHR 3.64, 95% CI 1.61 to 8.23), lymphoma (aHR 2.63, 95% CI 1.30 to 5.30) and thyroid cancer (aHR 1.83, 95% CI 1.18 to 2.85) was higher in patients with PsA than in controls. Figure 2 shows the cumulative incidence of overall cancer in patients with PsA and in controls during the study period. As the follow-up duration increased, the difference in cancer incidence between patients with PsA and controls became more significant.

Subgroup analysis

Table 4 shows the HRs for cancer in patients with PsA stratified according to age and sex. In patients with PsA, an increased risk of cancer was not observed in those younger than 65 years (aHR 1.07, 95% CI 0.86 to 1.33) but only in those older than 65 years (aHR 1.41, 95% CI 1.09 to 1.81). In men, there was no significant increase in the risk of cancer in PsA patients (aHR 1.08, 95% CI 0.86 to 1.36); however, in women, the risk of cancer increased significantly (aHR 1.34, 95% CI 1.06 to 1.69). An increased risk of NMSC in patients with PsA was observed in those younger than 65 years of age, and was similarly observed in both sexes (online supplemental table S2).

DISCUSSION

In this nationwide population-based cohort study, patients with PsA had an increased risk of cancer compared with age-matched and sex-matched controls. However, the risk of cancer excluding NMSC did not show a significant increase in patients with PsA. The association between PsA and an increased risk of cancer was significant in relation to haematological cancer. Among specific cancers, the risk of NMSC, lymphoma and thyroid cancer was higher in patients with PsA than in controls. Subgroup analysis showed an increased risk of cancer in patients with PsA aged >65 years and in women.

NMSC deserves special attention in patients with PsO or PsA. The results of our study showed that the risk of NMSC was significantly increased in patients with PsA. Previous studies investigating the risk of NMSC in patients with PsA have reported conflicting results. A meta-analysis identified an increased risk of NMSC in patients with PsA undergoing treatment in subgroup analysis (pooled relative risk 2.46, 95% CI 1.84 to 3.28).[13] However, another meta-analysis reported that the risk of NMSC increased in patients with PsO (relative risk 2.28, 95% CI 1.73 to 3.01) but not in patients with PsA (relative risk 1.22, 95% CI 0.89 to 1.66).[4] Although the mechanisms related to the increased NMSC risk in patients with PsO are not well known to date, ultraviolet therapy or systemic agents used for treatment have been suggested as possible explanations.[14–16] Since our study did not include information on skin disease, it is unclear whether the factors affecting the risk of NMSC are PsO, PsO treatment or PsA itself. Further investigations are needed to determine whether PsA itself is associated with NMSC, independently of PsO.

In our study, patients with PsA showed a 2.6-fold increase in the risk of lymphoma compared with controls. PsO has also been reported to be associated with an increased risk of lymphoma in several studies.[17–20] Mixed evidence exists regarding the association between PsA and lymphoma. In a population-based study using the UK Clinical Practice Research Datalink, the incidence of haematological cancer was higher in patients with PsA compared with age- and sex-matched controls (incidence rate ratio 1.52, 95% CI 1.10 to 2.10).[21] Analysis by the subtype of haematological cancer was not presented in that study. In contrast, a recent meta-analysis reported that the relative risk of overall lymphoma in patients with PsA was 0.99 (95% CI 0.70 to 1.39).[4] A cohort study in Sweden also reported that the average risk of lymphoma did not increase (HR 1.2, 95% CI 0.9 to 1.7) in patients with PsA compared with controls matched by age, sex and county of residence.[22] Considering that the risk of lymphoma did not increase in the Western population with PsA, the increased risk of lymphoma in patients with PsA may be a characteristic finding in the Asian population.

Several mechanisms for the association between autoimmune-mediated inflammatory diseases and lymphoma have been proposed, including the role of cytokines, receptor pathways and immune cells associated with persistent immune activation.[23] There are regional

Table 3 Risk of cancer in patients with psoriatic arthritis and age-matched and sex-matched controls

	No of cancers (%)		IR of cancers (/10 000 PYs) (95% CI)		HR (95% CI)	aHR (95% CI)*
	PsA patients	Controls	PsA patients	Controls		
Overall	162 (3.45)	1307 (2.79)	83.2 (70.8 to 97.0)	66.9 (63.3 to 70.6)	1.24 (1.06 to 1.46)	1.20 (1.02 to 1.41)
Overall excluding NMSC	154 (3.28)	1285 (2.74)	79.1 (67.1 to 92.6)	65.8 (62.2 to 69.5)	1.20 (1.02 to 1.42)	1.16 (0.98 to 1.37)
NMSC	8 (0.17)	22 (0.05)	4.1 (1.8 to 8.1)	1.1 (0.7 to 1.7)	3.65 (1.62 to 8.19)	3.64 (1.61 to 8.23)
Solid	140 (2.99)	1223 (2.61)	71.9 (60.5 to 84.8)	62.6 (59.2 to 66.2)	1.15 (0.96 to 1.37)	1.10 (0.93 to 1.32)
Thyroid	24 (0.51)	126 (0.27)	12.3 (7.9 to 18.3)	6.5 (5.4 to 7.7)	1.91 (1.24 to 2.96)	1.83 (1.18 to 2.85)
Stomach	24 (0.51)	162 (0.35)	12.3 (7.9 to 18.3)	8.3 (7.1 to 9.7)	1.49 (0.97 to 2.28)	1.40 (0.91 to 2.15)
Colorectal	16 (0.34)	161 (0.34)	8.2 (4.7 to 13.3)	8.2 (7.0 to 9.6)	1.00 (0.60 to 1.66)	0.96 (0.57 to 1.60)
Liver	12 (0.26)	101 (0.22)	6.2 (3.2 to 10.8)	5.2 (4.2 to 6.3)	1.19 (0.65 to 2.17)	1.09 (0.60 to 1.99)
Biliary	8 (0.17)	45 (0.10)	4.1 (1.8 to 8.1)	2.3 (1.7 to 3.1)	1.78 (0.84 to 3.78)	1.86 (0.87 to 3.95)
Pancreas	4 (0.09)	55 (0.12)	2.1 (0.6 to 5.3)	2.8 (2.1 to 3.7)	0.73 (0.26 to 2.01)	0.64 (0.23 to 1.77)
Lung	13 (0.28)	167 (0.36)	6.7 (3.6 to 11.4)	8.6 (7.3 to 10.0)	0.78 (0.44 to 1.37)	0.78 (0.44 to 1.37)
Breast	11 (0.23)	109 (0.23)	5.7 (2.8 to 10.1)	5.6 (4.6 to 6.7)	1.01 (0.54 to 1.88)	0.96 (0.51 to 1.79)
Prostate	7 (0.15)	56 (0.12)	3.6 (1.5 to 7.4)	2.9 (2.2 to 3.7)	1.25 (0.57 to 2.75)	1.24 (0.56 to 2.72)
Bladder	3 (0.06)	25 (0.05)	1.5 (0.3 to 4.5)	1.3 (0.8 to 1.9)	1.20 (0.36 to 3.98)	1.18 (0.35 to 3.93)
Kidney	2 (0.04)	27 (0.06)	1.0 (0.1 to 3.7)	1.4 (0.9 to 2.0)	0.74 (0.18 to 3.12)	0.69 (0.16 to 2.91)
Haematologic	14 (0.30)	62 (0.13)	7.2 (3.9 to 12.1)	3.2 (2.4 to 4.1)	2.26 (1.27 to 4.04)	2.24 (1.25 to 4.01)
Lymphoma	10 (0.21)	38 (0.08)	5.1 (2.5 to 9.4)	2.0 (1.4 to 2.7)	2.64 (1.31 to 5.29)	2.63 (1.30 to 5.30)
Leukaemia	3 (0.06)	14 (0.03)	1.5 (0.3 to 4.5)	0.7 (0.4 to 1.2)	2.14 (0.62 to 7.46)	2.19 (0.63 to 7.68)

*Adjusted for age, sex, diabetes and hypertension.
aHR, adjusted HR ; IR, incidence rate; NMSC, non-melanoma skin cancer; No, number; PsA, psoriatic arthritis; PYs, person-years.

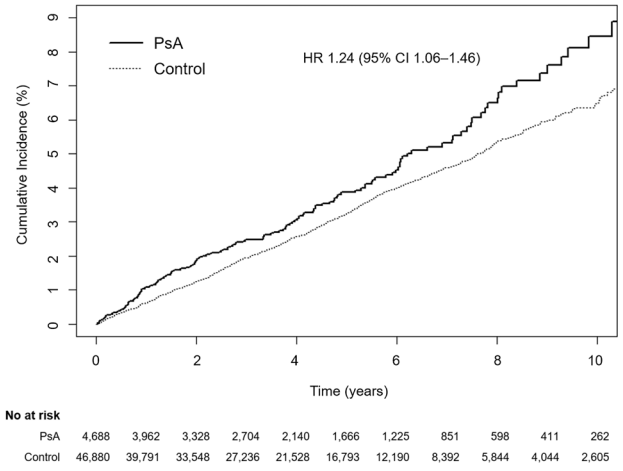

Figure 2 Cumulative incidence curve of cancer in patients with psoriatic arthritis (PsA) and age-matched and sex-matched controls.

and racial differences in the incidence of lymphoma,[24 25] which may be attributed to differences in environmental, occupational exposures and lifestyle factors or racial differences in specific genetic variants. In addition, immune dysregulation also appears differently according to race, and such differences may affect the association between PsA and lymphoma.[26] Further studies are warranted to determine the association between PsA and haematological malignancies, including lymphomas.

To the best of our knowledge, this is the first study to reveal an association between PsA and thyroid cancer. In our study, thyroid cancer was the only solid cancer that was associated with an increased risk in patients with PsA. A previous nationwide population-based cohort study including 8 92 089 patients with PsO in Korea showed that patients with PsO had an increased risk of thyroid cancer compared with age-matched and sex-matched controls (aHR 1.11, 95% CI 1.07 to 1.16).[20] Korea has the highest incidence of thyroid cancer in the world, which is associated with a high detection rate due to screening.[27 28] Such an incidence rate may have contributed to the distinct difference between patients with PsA and controls without PsA. In patients with PsO and PsA, few studies exist on the association with thyroid cancer compared with the evidence for association with autoimmune thyroid disorders.[29–33] Future research will be necessary on the association between PsO, PsA and thyroid cancer and whether autoimmune thyroid disorders are involved in this association.

Subgroup analysis revealed a significant association between PsA and cancer in women. Clinical and genetic differences exist in men and women with PsA.[34] Gender differences may have affected the difference in cancer risk. The mechanism by which cancer risk increases in patients with PsA remains unknown. Our data showed an association between PsA and cancer in patients over 65 years of age. Age is an important risk factor for cancer, and ageing-related genomic instability, epigenetic alterations, immunosenescence and inflammaging may be associated with cancer development.[35–37]

Chronic inflammation seen in patients with PsA may contribute to an increase in cancer risk. Inflammation can cause the accumulation of mutations and various epigenetic changes in the process of carcinogenesis.[38] Reactive oxygen and nitrogen species produced during inflammation can induce mutations and initiate tumour development.[39] In addition, inflammation can contribute to carcinogenesis through epigenetic alterations such as DNA methylation and modulation of histone modifications.[40] Furthermore, lifestyle factors that act as shared risk factors for PsA and cancer, such as smoking and obesity, may have contributed to the increase in cancer risk in patients with PsA.[41–44] There is a possibility that immunosuppressive medications or biological agents used for the treatment of PsA may affect the risk of cancer. Among the patients with PsA in this study, 857 were prescribed tumour necrosis factor inhibitors (TNFi), among which 28 patients developed cancer. The very low incidence of cancer in these patients makes it impossible

Table 4 Subgroup analysis according to age and sex

		n	No of cancers	HR (95% CI)	aHR (95% CI)*
Age					
≤65 years	PsA	3944	92	1.13 (0.91 to 1.40)	1.07 (0.86 to 1.33)
	Control	39 440	813		
>65 years	PsA	744	70	1.46 (1.13 to 1.87)	1.41 (1.09 to 1.81)
	Control	7440	494		
Sex					
Men	PsA	2678	81	1.13 (0.90 to 1.42)	1.08 (0.86 to 1.36)
	Control	26 780	715		
Women	PsA	2010	81	1.38 (1.10 to 1.74)	1.34 (1.06 to 1.69)
	Control	20 100	592		

*Adjusted for age, sex, diabetes and hypertension.
aHR, adjusted HR; n, number of patients; No, number; PsA, psoriatic arthritis.

to analyse the effects of biological agents on cancer incidence, which could be a weakness of our study. However, the proportion of cancer in patients who used TNFi did not differ significantly from that in patients who did not use TNFi. This is consistent with the results of previous studies that reported that the use of biologics, including TNFi, in patients with PsA did not increase the risk of cancer.[45–47] Further studies are needed to determine the mechanisms underlying the potential link between PsA and increased cancer risk, as well as how specific lifestyle factors and medications may play a role.

Our study had several limitations that should be addressed. First, because our study had a retrospective design, a causal relationship between PsA and cancer could not be established. Second, since the mean follow-up duration of our study was approximately 4 years, there is a possibility that patients diagnosed with cancer after the end of the study could not be captured. Further studies with longer follow-up periods are required. Third, it was not possible to compare some specific cancers with low incidence. The mean age of patients included in the study was relatively young at 49 years, which may have contributed to the low incidence of cancer. In addition, the number of deaths was small, so it was not feasible to conduct a meaningful analysis by considering death as a competing risk. Fourth, information on the activity or severity of PsA and cancer mortality could not be included in the analysis because the study was conducted using a claims database. In addition, comorbidities such as chronic obstructive lung disease, lifestyle factors such as smoking or alcohol consumption and anthropometric variables such as body mass index that could be associated with cancer risk were not included in the analysis. Fifth, although immunosuppressive agents or biological agents used in the treatment of PsA may affect the risk of cancer, our study did not include the analysis of any drugs. Finally, since our study was conducted only in Koreans, there is a limit to generalising the results of our study to other populations. Nevertheless, to the best of our knowledge, this is the first study to compare the incidence of cancer between the patients with PsA and general population in Asia. The results of our study, which showed an increased risk of cancer in patients with PsA compared with the general population, suggest that an increased attention to cancer screening by a detailed history and comprehensive clinical examination in patients with PsA is needed. However, this study does not provide a strong evidence to guide clinical decision making on cancer screening in PsA. Further work is needed to define the optimal approach to cancer screening in PsA.

In conclusion, the overall incidence of cancer was slightly higher in patients with PsA than in the general population. The increased risk of cancer in PsA patients was largely driven by the increased risk of NMSC, lymphoma and thyroid cancer. A significant association between PsA and cancer was observed in patients over 65 years of age and in women.

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Competing interests None declared.

Patient consent for publication Not applicable.

Ethics approval This study adhered to the Declaration of Helsinki, and the study protocol was reviewed and approved by the institutional review board (IRB) of Kangbuk Samsung Hospital (IRB no. 2022-06-050). Informed consent from participants was waived because of the retrospective nature of the study and the analysis used anonymous and public data.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available on reasonable request and with permission of HIRA. The data that support the findings of this study are available from HIRA. Restrictions apply to the availability ofthese data, which were used under licence for this study.

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