Original paper

A retrospective analysis of comorbidities in patients with psoriasis at a single centre

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Abstract

Introduction: Psoriasis is a chronic inflammatory disease occurring worldwide. It is currently considered a multisystem disease, which is associated with several comorbidities.

Aim: To deeply understand the clinical characteristics of psoriasis comorbidities and explore the relationship between psoriasis comorbidities, different subtypes and related influencing factors.

Material and methods: This retrospective study analysed data from the electronic inpatient medical record system of dermatology and non-dermatology departments at a tertiary hospital in China. We collected relevant demographic data and clinical features of all patients diagnosed with psoriasis from January 2013 to September 2023.

Results: This study ultimately included a total of 1097 patients with psoriasis. Psoriasis vulgaris was the most common among the subtypes of psoriasis, with 957 (87.2%) cases. The sample consisted of 65.6% of males and 34.4% of females, with an average age of 53.5 ±15.2 years. Common comorbidities of psoriasis included hypertension (38.2%), hyperlipidaemia (29.4%), type 2 diabetes mellitus (24.6%), fatty liver disease (21.4%), coronary heart disease (21.0%), tumours (15.5%), gastroduodenal disease (14.4%), osteoarthropathy (11.8%), and cerebrovascular disease (10.8%). The incidence of hypertension ($p = 0.015$), hyperuricemia ($p < 0.001$), osteoarthropathy ($p < 0.001$), and autoimmune disease ($p = 0.003$) among different subtypes of psoriasis showed statistically significant differences. In addition, gender, smoking and alcohol consumption all have significant impacts on the distribution of comorbidities.

Conclusions: The distribution of psoriasis comorbidities and complications varies among different subtypes of psoriasis. Lifestyles such as smoking and alcohol abuse, as well as gender, are also associated with the occurrence of psoriasis comorbidities.

Key words: psoriasis, comorbidities, subtypes, smoking, alcohol consumption, gender.

Introduction

Psoriasis is a chronic, recurrent, inflammatory, and systemic disease that is mediated by the immune system. It is caused by a combination of genetic and environmental factors. The typical clinical manifestations of psoriasis include scaly erythema or plaques, which can be localized or widely distributed. Based on the main clinical manifestations, psoriasis can be classified into several subtypes, including psoriasis vulgaris (PV), psoriatic arthritis (PsA), pustular psoriasis (PP), and erythrodermic psoriasis (EP) [1]. Among these, psoriasis vulgaris is the most prevalent form. Psoriasis occurs all over the world at any age, but its prevalence is unevenly distributed in different geographical regions. The overall prevalence rate ranges from 0.1% in East Asia to 1.5% in Western Europe [2]. Psoriasis affects more than 60 million adults and children globally, significantly impacting their quality of life and imposing a substantial burden on individuals and society [3].

In recent years, many studies have shown that psoriasis is a systemic disease that can cause multiple systemic diseases in addition to skin damage. An expanding body of literature now supports the association between psoriasis and a range of comorbidities, including cardiovascular and metabolic diseases, tumours, gastrointestinal diseases, and other diseases in various populations and environments [4, 5]. The pathogenesis of comorbid diseases in patients with psoriasis remains unknown; however, shared inflammatory pathways, cellular mediators, genetic susceptibility, and common risk factors

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are hypothesized to be contributing elements [6]. The continuous accumulation of global evidence has raised concerns about the necessity of identifying psoriasis comorbidity patterns and related influencing factors to optimize management and enhance our understanding of underlying pathophysiology. However, there is currently a lack of research on the clinical patterns of different comorbidities associated with psoriasis in the Chinese population.

Aim

In this study, we conducted a retrospective analysis of psoriasis patients admitted to the dermatology and non-dermatology departments at a single centre in China. Our aim was to explore the relationship between psoriasis and its comorbidities, as well as the clinical characteristics associated with these comorbidities. By enhancing the understanding of psoriasis comorbidities, we hope to provide valuable insights for the multidisciplinary comprehensive management of psoriasis.

Material and methods

This retrospective study collected medical records of psoriasis patients admitted to the dermatology and non-dermatology departments of the Beijing Friendship Hospital affiliated with the Capital Medical University from January 2013 to September 2023. Inclusion criteria: patients diagnosed with psoriasis during hospitalization at the Beijing Friendship Hospital affiliated with the Capital Medical University, and their basic information and diagnosis and treatment process information were complete. Exclusion criteria: incomplete medical record data; familial hyperlipidaemia and type 1 diabetes; suffering from diseases such as hypothyroidism and Cushing syndrome that affect metabolism; for patients who had been hospitalized multiple times, only the medical record data from the first hospitalization were counted.

The demographic and clinical characteristics of psoriasis inpatients were collected by reviewing the electronic medical records of patients. The extracted data included gender, age, inpatient departments, psoriasis subtypes, smoking history, drinking history, and comorbidities. Psoriasis was divided into four subtypes, including PV, PsA, PP, and EP. PP included generalized PP (GPP) and localized PP like palmoplantar pustulosis. Patients with two or three types of mixed psoriasis were classified as the last type. Smoking was defined as having smoked at least 100 cigarettes in one's lifetime, and alcohol consumption was defined as drinking at least 30 g per week for at least 1 year. Common comorbidities included cardiovascular diseases (coronary heart disease, hypertension, cerebrovascular diseases), endocrine and metabolic diseases (hyperlipidaemia, type 2 diabetes mellitus, fatty liver disease, hyperuricemia, thyroid dysfunction), digestive system diseases, respiratory system diseases, urinary system diseases, tumours, osteoarthritis, tonsillitis, atopic diseases, autoimmune diseases, skin diseases, psychosocial diseases, and others.

Statistical analysis

We collected all data using Microsoft Excel 2021. Then we entered and analysed the data in IBM Statistical Package for the Social Sciences (SPSS) version 27.0. Qualitative variables were presented using descriptive statistics in the form of categories and summarized as frequencies and percentages. The intergroup comparison of psoriasis comorbidities and related risk factors was conducted using chi square test/Fisher's exact test, with a defined test level of 0.05. $P < 0.05$ indicated a statistically significant difference.

Results

Demographic and clinical characteristics

This study ultimately included a total of 1097 patients with psoriasis, with PV being the most common subtype (87.2%), followed by PsA (8.7%), PP (2.4%), and EP (1.7%). There were 720 (65.6%) males and 377 (34.4%) females, with a gender ratio of 2.06 : 1. Patients with PV, PsA, and EP were more common in males, while patients with PP were more common in females, with a statistically significant difference ($p = 0.006$). Patient ages ranged from 10 to 90 years, with an average of 53.5 ±15.2 years and a median age of 56.0 years. Most patients were non-smokers (58.3%) and non-drinkers (78.2%), and there was no statistically significant difference in the distribution of age, smoking, and alcohol consumption among different subtypes of psoriasis ($p > 0.05$). The majority of patients had at least one comorbidity (87.3%), and there was a statistically significant correlation between different subtypes of psoriasis and the presence or absence of comorbidities, with a p-value of 0.010. The relationship between sociodemographic data and psoriasis subtypes is shown in Table 1.

The study included psoriasis inpatients from a total of 27 departments. The top five departments based on the proportion of psoriasis inpatients were Cardiology (10.5%), Dermatology (8.7%), Rheumatology (8.5%), Otolaryngology (7.2%), and Gastroenterology (6.6%). Among these departments, Cardiology had the highest proportion of hospitalized patients with PV, and Rheumatology had the highest proportion of patients with PsA. Dermatology had the highest proportion of patients with PP and EP, indicating that patients with these subtypes were predominantly treated in the Dermatology department. The distribution of inpatients across different subtypes of psoriasis in various departments is summarized in Table 2.

Table 1. Relationship between sociodemographic data and psoriasis subtypes

Parameter		PV	PsA	PP	EP	Total	*P*-value
		***n* = 957**	***n* = 95**	***n* = 26**	***n* = 19**	***n* = 1097**	
Gender, *n* (%)	Male	644 (67.3)	52 (54.7)	11 (42.3)	13 (68.4)	720 (65.6)	**0.006***
	Female	313 (32.7)	43 (45.3)	15 (57.7)	6 (31.6)	377 (34.4)	
Age, *n* (%)	≤ 30	88 (9.2)	4 (4.2)	3 (11.5)	2 (10.5)	97 (8.8)	0.178*
	31–60	504 (52.7)	64 (67.4)	15 (57.7)	11 (57.9)	594 (54.1)	
	60	365 (38.1)	27 (28.4)	8 (30.8)	6 (30.8)	406 (37.0)	
Smoking, *n* (%)	No	553 (57.8)	61 (64.2)	16 (61.5)	10 (52.6)	640 (58.3)	0.608*
	Yes	404 (42.2)	34 (35.8)	10 (38.5)	9 (47.4)	457 (41.6%)	
Alcohol consumption, *n* (%)	No	745 (77.8)	73 (76.8)	23 (88.5)	17 (89.5)	858 (78.2)	0.362*
	Yes	212 (22.2)	22 (23.2)	3 (11.5)	2 (10.5)	239 (21.7)	
Comorbidities, *n* (%)	No	128 (13.4)	5 (5.3)	6 (23.1)	0	139 (12.7)	**0.010****
	Yes	829 (86.6)	90 (94.7)	20 (76.9)	19 (100)	958 (87.3)	

**χ^2 test, **Fisher's exact test. Bold values indicate statistical significance ($p < 0.05$).*

Table 2. Distribution of inpatients with different subtypes of psoriasis in different departments

Department groups	PV (*n* = 957)	PsA (*n* = 95)	PP (*n* = 26)	EP (*n* = 19)	Total
Cardiology	112*	4	0	0	116
Dermatology	68	5	9*	14*	96
Rheumatology	26	60*	6	2	94
Otolaryngology	75	2	3	0	80
Gastroenterology	70	3	0	0	73
General surgery	64	3	0	0	67
Urology	54	1	4	0	59
Hepatic	54	2	1	0	57
Respiratory	50	2	0	0	52
Neurology	41	2	1	0	44
Orthopaedics	42	2	0	0	44
Obstetrical	34	2	0	0	36
Endocrinology	34	1	0	0	35
Vascular surgery	29	0	0	0	29
Thoracic surgery	26	0	0	0	26
Infectious diseases	20	3	1	1	25
Gynaecology	23	1	0	0	24
Nephrology	21	0	0	1	22
Stomatology	21	0	0	0	21
Others	93	2	1	1	97

**The one with the highest quantity.*

Comorbidities and complications

The common psoriasis comorbidities included hypertension (38.2%), hyperlipidaemia (29.4%), type 2 diabetes mellitus (24.6%), fatty liver disease (21.4%), coronary heart disease (21.0%), tumours (15.5%), gastroduodenal diseases (14.4%), osteoarthropathy (11.8%), and cerebrovascular diseases (10.8%). The study further identified additional comorbidities believed to be associated with psoriasis. These included hyperuricemia (7.2%), chronic obstructive pulmonary disease (6.4%), chronic kidney disease (5.9%), autoimmune disease (5.2%), tonsillitis (5.0%), atopic disease (3.6%), thyroid disease (3.5%),

Table 3. Comorbidities and complications of patients with different subtypes of psoriasis

Parameter	PV (*n* = 957)	PsA (*n* = 95)	PP (*n* = 26)	EP (*n* = 19)	Total (*n* = 1097)	*P*-value
Cardiovascular diseases, *n* (%):						
Hypertension	351 (36.7)	50 (52.6)	12 (46.2)	6 (31.6)	419 (38.2)	**0.016***
Coronary heart disease	203 (21.2)	21 (22.1)	3 (11.5)	3 (15.8)	230 (21.0)	0.612*
Cerebrovascular disease	105 (11.0)	11 (11.6)	2 (7.7)	1 (5.3)	119 (10.8)	0.927**
Endocrine and metabolic diseases, *n* (%):						
Hyperlipidaemia	279 (29.2)	31 (32.6)	7 (26.9)	6 (31.6)	323 (29.4)	0.891*
T2DM	232 (24.2)	28 (29.5)	6 (23.1)	4 (21.1)	270 (24.6)	0.695*
Fatty liver disease	201 (21.0)	25 (26.3)	5 (19.2)	4 (21.1)	235 (21.4)	0.676*
Hyperuricemia	61 (6.4)	10 (10.5)	0	8 (42.1)	79 (7.2)	**< 0.001****
Thyroid dysfunction	32 (3.3)	5 (5.3)	1 (3.8)	0	38 (3.5)	0.557**
Others, *n* (%):						
Tumours	158 (16.5)	10 (10.5)	2 (7.7)	0	170 (15.5)	0.063**
Gastroduodenal diseases	140 (14.6)	14 (14.7)	3 (11.5)	1 (5.3)	158 (14.4)	0.798**
Osteoarthropathy	56 (5.9)	63 (66.3)	6 (23.1)	4 (21.1)	129 (11.8)	**< 0.001****
COPD	57 (6.0)	9 (9.5)	2 (7.7)	2 (10.5)	70 (6.4)	0.300**
CKD	56 (5.9)	5 (5.3)	2 (7.7)	2 (10.5)	65 (5.9)	0.604**
Autoimmune diseases	42 (4.4)	11 (11.6)	4 (15.4)	0	57 (5.2)	**0.003****
Tonsillitis	52 (5.4)	1 (1.1)	2 (7.7)	0	55 (5.0)	0.158**
Atopic diseases	38 (4.0)	2 (2.1)	0	0	40 (3.6)	0.808**
Eczema	28 (2.9)	4 (4.2)	0	2 (10.5)	34 (3.1)	0.176**
Psychiatric diseases	15 (1.6)	3 (3.2)	0	0	18 (1.6)	0.562**

Bold values indicate statistical significance (p < 0.05). T2DM – type 2 diabetes mellitus, COPD – chronic obstructive pulmonary disease, CKD – chronic kidney disease.

Table 4. Psoriasis comorbidities and complications according to gender

Parameter	Gender		Total	*P*-value
	Male (*n* = 720)	Female (*n* = 377)		
Cardiovascular diseases, *n* (%):				
Hypertension	306 (42.5)	113 (30.0)	419	**< 0.001***
Coronary heart disease	179 (24.9)	51 (13.5)	230	**< 0.001***
Cerebrovascular disease	88 (12.2)	31 (8.2)	119	**0.043***
Endocrine and metabolic diseases, *n* (%):				
Hyperlipidaemia	234 (32.5)	89 (23.6)	323	**0.002***
T2DM	197 (27.4)	73 (19.4)	270	**0.003***
Fatty liver disease	168 (23.3)	67 (17.8)	235	**0.033***
Hyperuricemia	66 (9.2)	13 (3.4)	79	**< 0.001***
Others, *n* (%):				
Tumours	121 (16.8))	49 (13.0)	170	0.098*
Gastroduodenal diseases	107 (14.9)	51 (13.5)	158	0.550*
Osteoarthropathy	72 (10.0)	57 (15.1)	129	**0.012***
COPD	62 (8.6)	8 (2.1)	70	**< 0.001***
CKD	46 (6.4)	19 (5.0)	65	0.369*

Bold values indicate statistical significance (p < 0.05). T2DM – type 2 diabetes mellitus, COPD – chronic obstructive pulmonary disease, CKD – chronic kidney disease.

Table 5. Psoriasis comorbidities and complications classified by smoking and alcohol consumption

Parameter	Smoking		Total	*P*-value	Alcohol consumption		Total	*P*-value
	Yes (*n* = 457)	No (*n* = 640)			Yes (*n* = 239)	No (*n* = 858)		
Cardiovascular diseases, *n* (%):								
Hypertension	210 (46.0)	209 (32.7)	419	**< 0.001***	122 (51.0)	297 (34.6)	419	**< 0.001***
Coronary heart disease	130 (28.4)	100 (15.6)	230	**< 0.001***	65 (27.2)	165 (19.2)	230	**0.007***
Cerebrovascular disease	66 (14.4)	53 (8.3)	119	**0.001***	29 (12.1)	90 (10.5)	119	0.470*
Endocrine and metabolic diseases, *n* (%):								
Hyperuricemia	172 (37.6)	151 (23.6)	323	**< 0.001***	92 (38.5)	231 (26.9)	323	**< 0.001***
T2DM	131 (28.7)	139 (21.7)	270	**0.008***	71 (29.7)	199 (23.2)	270	**0.039***
Fatty liver disease	117 (25.6)	118 (18.4)	235	**0.004***	70 (29.3)	165 (19.2)	235	**< 0.001***
Hyperuricemia	40 (8.8)	39 (6.1)	79	0.093*	23 (9.6)	56 (6.5)	79	0.101*
Others, *n* (%):								
Tumours	70 (15.3)	100 (15.6)	170	0.890*	36 (15.1)	134 (15.6)	170	0.834*
Gastroduodenal diseases	76 (16.6)	82 (12.8)	158	0.076*	37 (15.5)	121 (14.1)	158	0.591*
Osteoarthropathy	45 (9.8)	84 (13.1)	129	0.097*	26 (10.9)	103 (12.0)	129	0.633*
COPD	46 (10.1)	24 (3.8)	70	**< 0.001***	21 (8.8)	49 (5.7)	70	0.085*
CKD	33 (7.2)	32 (5.0)	65	0.125*	12 (5.0)	53 (6.2)	65	0.503*

Bold values indicate statistical significance (p < 0.05). T2DM – type 2 diabetes mellitus, COPD – chronic obstructive pulmonary disease, CKD – chronic kidney disease.

eczema (3.1%), and psychiatric disorders (1.6%). The distribution of comorbidities and complications among different subtypes of psoriasis patients is shown in Table 3.

Among cardiovascular diseases, patients with PsA had the highest incidence of hypertension (52.6%), while patients with EP had the lowest incidence of hypertension (31.6%), with a statistically significant difference ($p = 0.015$). Among endocrine and metabolic diseases, hyperuricemia accounted for a higher prevalence (42.1%) in patients with EP, followed by PsA (10.5%). The prevalence of hyperuricemia significantly varied among different subtypes of psoriasis ($p < 0.001$). Regarding other diseases, arthropathy had a higher prevalence in patients with PsA (66.3%). The difference in arthropathy prevalence among different subtypes of psoriasis was statistically significant ($p < 0.001$). The incidence of autoimmune diseases in patients with PP was the highest (15.4%), followed by PsA (11.6%). There was a statistically significant difference in the distribution of autoimmune diseases among the four subtypes of psoriasis patients ($p = 0.003$) (Table 3).

In the distribution of psoriasis comorbidities and complications by gender (Table 4), male psoriasis patients had a higher prevalence of hypertension (42.5% vs. 30.0%, $p < 0.001$), coronary heart disease (24.9% vs. 13.5%, $p < 0.001$), cerebrovascular disease (12.2% vs. 8.2%, $p = 0.043$), hyperlipidaemia (32.5% vs. 23.6%, $p = 0.002$), type 2 diabetes mellitus (27.4% vs. 19.4%, $p = 0.003$), fatty liver disease (23.3% vs. 17.8%, $p = 0.033$), hyperuricemia (9.2% vs. 3.4%, $p < 0.001$), chronic obstructive pulmonary disease (8.6% vs. 2.1%, $p < 0.001$) compared with female patients. However, in terms of osteoarthropathy, the prevalence rate was higher among female patients compared to male patients (15.1% vs. 10.0%, $p = 0.012$). There was no significant difference in the incidence of tumours, gastroduodenal diseases, and chronic kidney diseases between male and female psoriasis patients.

According to the classification of psoriasis comorbidities based on smoking and alcohol consumption (Table 5), psoriasis patients who smoked had a higher incidence of several comorbidities compared with non-smoking patients. These comorbidities included hypertension (46.0% vs. 32.7%, $p < 0.001$), coronary heart disease (28.4% vs. 15.6%, $p < 0.001$), cerebrovascular disease (14.4% vs. 8.3%, $p = 0.001$), hyperlipidaemia (37.6% vs. 23.6%, $p < 0.001$), type 2 diabetes mellitus (28.7% vs. 21.7%, $p = 0.008$), fatty liver disease (25.6% vs. 18.4%, $p = 0.004$), and chronic obstructive pulmonary disease (10.1% vs. 3.8%, $p < 0.001$). Compared with patients who did not drink alcohol, psoriasis patients who drank alcohol had a higher incidence of hypertension (51.0% vs. 34.6%, $p < 0.001$), coronary heart disease (27.2% vs. 19.2%, $p = 0.007$), hyperlipidaemia (38.5% vs. 26.9%, $p < 0.001$), type 2 diabetes mellitus (29.7% vs. 23.2%, $p = 0.039$), and fatty liver disease (29.3% vs. 19.2%, $p < 0.001$).

Discussion

Psoriasis is a chronic immune-mediated disease, with genetic susceptibility, environmental factors, and immune dysfunction contributing to its pathogenesis. Psoriasis affects up to 3-5% of the general population and occurs worldwide [7]. This is a disease with a strong psychological and social influence, which impacts on the incidence rate and mortality not only through skin changes, but also through related complications. Comorbidities are very common in patients with psoriasis and their presence has important practical implications for the clinical management of patients.

This study aimed to assess psoriasis subtypes and identify comorbidity patterns in psoriasis patients treated at a single centre in China. In this study, psoriasis vulgaris was found to be the most prevalent subtype (87.2%), followed by arthritis psoriasis (8.7%), pustular psoriasis (2.4%), and erythrodermic psoriasis (1.7%). There were significantly more males than females, with a male to female ratio of 2.06 : 1. Although there is no consensus on gender differences in the incidence of psoriasis, a systematic review has demonstrated that most studies reported a slight male predominance in overall psoriasis [8]. Patients with PV, PsA, and EP were more common in males, while PP was more prevalent among females, which was consistent with multiple studies [9, 10]. Psoriasis can affect individuals of all age groups. Studies in Nigeria and India indicated that the majority of their samples belonged to the fourth decade [11]. In this study, the highest age distribution was observed among patients aged between 31 and 60 years old (54.1%). Our study found that 87.3% of psoriasis patients have at least one comorbidity, with previous studies reporting rates ranging around 73% [5]. Hospitalized patients in this study spanned across 27 departments, covering almost all departments of the hospital. Psoriasis comorbidities cover various disease systems, which highlights the need for clinicians across various departments to strengthen their attention to this disease, understand the clinical characteristics and common comorbidities of psoriasis, and provide timely treatment for psoriasis and its comorbidities.

In this study, cardiovascular diseases and endocrine metabolic diseases were the most common comorbidities of psoriasis. The interleukin (IL) 23/Th17 axis plays a crucial role in the occurrence and development of psoriasis. In recent years, it has been found that the occurrence of cardiovascular and metabolic diseases is also related to the IL-23/Th17 axis [12]. Studies have shown elevated levels of IL-23 and IL-23 receptor in the atherosclerotic plaque, which is related to the disease course and mortality of patients. It has been found that the levels of IL-23 and IL-17 are up-regulated in diabetes patients, and the two can play a synergistic role in leading to pancreatic islets β Cell damage. Elevated IL-23 levels were also present in patients with hyperlipidaemia and non-alcoholic liver cirrhosis. Multiple inflammatory mediators involved in the pathogenesis of psoriasis, such as tumour necrosis factor, vascular endothelial growth factor, IL-6, can affect angiogenesis, thrombosis, insulin signal transmission, fat metabolism, epidermal hyperplasia and other processes, thus affecting the occurrence and development of diabetes, atherosclerosis, and other diseases [13]. On the contrary, inflammatory mediators produced in diabetes and atherosclerosis may also contribute to the development of psoriasis.

A cross-sectional study in China concluded that cardiovascular and endocrine metabolic comorbidities affect both men and women, while male patients have a higher risk of developing cardiovascular and endocrine metabolic diseases [14]. In our study, male psoriasis patients had a higher incidence of hypertension ($p < 0.001$), coronary heart disease ($p < 0.001$), cerebrovascular disease ($p = 0.043$), hyperlipidaemia ($p = 0.002$), T2DM ($p = 0.003$), fatty liver disease ($p = 0.033$), hyperuricemia ($p < 0.001$), and COPD ($p < 0.001$). Our study also highlighted the role of modifiable lifestyle factors such as smoking and alcohol consumption in the development and progression of psoriasis and its associated comorbidities. Smoking and alcohol consumption have been identified as risk factors for psoriasis and are also recognized risk factors for cardiovascular and metabolic diseases. In this study, 41.6% of patients with psoriasis had a history of smoking and 21.7% had a history of alcohol consumption. Excessive drinking at once can cause immune suppression, while long-term drinking can lead to cellular inflammatory reactions. A prospective study conducted in the United States suggested that drinking alcohol 2–3 times a week increased the risk of psoriasis by 1.72 times [15]. Furthermore, existing studies have confirmed a stronger correlation between smoking and psoriasis. A study provided genetic evidence to support the causal impact of smoking on the risk of psoriasis [16]. Nicotine can stimulate the production of IL-12 by dendritic cells and increase the expression of CD40 and CD86, thereby stimulating T cell activation, and dioxins produced by tobacco burning can bind to the aromatic hydrocarbon receptors and regulate the transcription of IL-17 and IL-22, which are closely related to the onset and progression of psoriasis [17]. Our study also found that the incidence of comorbidities, particularly cardiovascular and endocrine metabolic diseases, was higher among psoriasis patients who smoked or consumed alcohol. These findings highlight the importance of managing modifiable risk factors like smoking and alcohol consumption in psoriasis patients to potentially prevent or manage associated comorbidities. in addition, it is currently known that obesity is also a risk factor for psoriasis [18]. evidence suggests that obesity, through pro-inflammatory pathways, leads to cardiovascular diseases, metabolic diseases, and autoimmune diseases, exacerbating the development of pso-

riasis comorbidities [19]. therefore, weight reduction may improve the severity of psoriasis in overweight individuals and reduce the occurrence of psoriasis comorbidities.

A Canadian study has reported higher incidence rates of cardiovascular and metabolic diseases in patients with PsA than in other types of psoriasis. Hypertension was found to be the most common comorbidity associated with PsA, with an estimated prevalence rate of 37% [20]. In our study, the incidence of hypertension (52.6%), cerebrovascular disease (11.6%), hyperlipidaemia (32.6%), T2DM (29.5%), and fatty liver disease (26.3%) in patients with PsA was higher than that of the other three types, with statistically significant differences in the distribution of hypertension (p = 0.015). Previous studies have shown a stronger correlation between EP, PsA, and hyperuricemia, which is consistent with the results of our study [21]. One of the recognized mechanisms leading to hyperuricemia in EP and PsA is the increased cellular turnover characterizing this disorder. Excessive proliferation of keratinocytes leads to accelerated nucleic acid catabolism and enhanced uric acid synthesis [22]. Furthermore, the concentration of uric acid in psoriasis patients is also influenced by factors such as ethnicity, region, and age [23]. A systematic review and meta-analysis from China showed a significant higher serum uric acid level in patients with psoriasis in Western Europe (MD = 0.68; 95% CI: 0.2–1.09), but no significant differences were found between the East Asia and India subgroup or the Middle East subgroup. In addition to genetic components, different lifestyles, eating, and social behaviours might contribute to such differences in disease prevalence among different populations [24].

In this study, we found that in addition to cardiovascular and metabolic diseases, the incidence rate of tumours, gastroduodenal diseases, osteoarthropathy, COPD, and chronic kidney disease was higher. Multiple studies have shown that psoriasis patients have an increased relative risk of developing certain malignant tumours [25]. A meta-analysis conducted in the United Kingdom included a total of 58 cohort studies and case-control studies to evaluate the incidence rate or mortality of malignant tumours in psoriasis patients and controls. They found that the incidence rate (RR = 1.18; 95% CI: 1.06–1.31) and mortality (RR = 1.22; 95% CI: 1.08–1.38) of malignant tumours in psoriasis patients increased [26]. A study in Taiwan found that men have a higher risk of cancer than women with psoriasis, which is consistent with our study [27].

Among digestive system diseases, gastroduodenal diseases were the most common (14.4%). The importance of the gut-skin axis in the pathogenesis of psoriasis suggests that the gut microbiota may have an impact on psoriasis. Helicobacter pylori plays an important role in psoriasis. Halasz *et al.* studied the serum anti Helicobacter pylori immunoglobulin G (IgG) titres of 33 patients and determined the pathogenic relationship between this pathogen and psoriasis [28]. Data from a systematic review were extracted from nine observational studies involving 1546 individuals. The pooled result demonstrated an increased H. pylori infection in psoriasis compared with controls (OR = 1.58; 95% CI: 1.02–2.46, p = 0.04, I^2 = 64%) [29]. Among respiratory diseases, COPD was the most common (6.3%). In 2016, a systematic review and meta-analysis provided evidence to support the increased risk of COPD in psoriasis patients. The pooled odds ratio of COPD in patients with psoriasis versus controls was 1.45 (95% CI: 1.21–1.73). The statistical heterogeneity was high with an I^2 of 91% [30]. In our study, smoking patients had a higher probability of developing COPD. Therefore, preventive and therapeutic actions, in control of risk factors such as smoking cessation or in treatment of the inflammatory process, must be observed in an attempt to prevent the emergence of COPD in patients with psoriasis. Among urinary system diseases, chronic kidney disease was the most prevalent (5.9%). Moderate to severe psoriasis may independently increase the risk of chronic kidney disease and end-stage kidney disease. The severity of psoriasis has been found to have a positive correlation with the probability of developing chronic kidney disease [31].

Some epidemiological investigations have shown that psoriasis is associated with some emerging comorbidities, such as tonsillitis, autoimmune diseases, atopic diseases, sleep apnoea, and psychosocial disorders [32]. This study also examined some emerging comorbidities. There were 55 (5.0%) patients with tonsillitis. The correlation between streptococcal infection and psoriasis has been extensively confirmed, suggesting a connection between psoriasis and bacterial infection. Streptococcus monoclonal antibodies also react with skin lesions, indicating that psoriasis skin lesions and Streptococcus have similar components. This further implies that molecular mimicry exists between streptococcal and epidermal components, thereby allowing T cell clones directed against streptococcal components to initiate the psoriatic process in genetically predisposed individuals [33].

In recent years, studies have reported several autoimmune diseases associated with psoriasis, including rheumatoid arthritis, lupus erythematosus, multiple sclerosis, and Crohn's disease [34]. In this study, there were 57 (5.2%) cases of autoimmune diseases, and 10 (0.9%) cases of IBD. In addition, autoimmune diseases were significantly increased in patients with PP and PsA, which is consistent with previous studies [35, 36]. Research has shown that the adaptive immune system dominates in PV, but innate and autoimmune responses dominate in PP [37]. The IL-1 family includes IL-38 and IL-36 subfamilies, which are central mediators of inflammatory diseases, including pustular psoriasis, atopic dermatitis, rheumatoid arthritis, and intestinal inflammation. Mutations in the functional deficiency of IL-36 receptor

antagonists (IL36RN) are associated with PP [38]. Inflammatory bowel disease is a special chronic inflammatory disease related to autoimmune diseases, mainly including Crohn's disease and ulcerative colitis. The biological pathways of psoriasis and IBD partially overlap, with Th17 and related cytokines such as IL-17, IL-23, TNF-α, and Treg cells involved in the pathogenesis pathway, which further confirms the important connection between the pathogenesis of psoriasis and IBD [39]. Among atopic diseases, asthma was the most common (52.5%). According to a retrospective cohort analysis in Taiwan, patients with psoriasis were associated with an increased risk of developing asthma compared to patients without psoriasis (HR = 1.49, 95% CI: 1.18–1.88) [40].

This study has several limitations. Selection bias may affect the results. The reporting of comorbidities in psoriasis patients was based on the patient's history and available medical records. No active screening or confirmatory investigations for these conditions were performed. The records in the database might have had missing information. Meanwhile, this study was conducted at a single centre, and the results were influenced by regional factors and hospital treatment preferences. Therefore, there may be overestimation or underestimation of the incidence of comorbidities.

Conclusions

The distribution of psoriasis comorbidities and complications varies among different subtypes of psoriasis. Lifestyles such as smoking and alcohol abuse, as well as gender, are also associated with the occurrence of psoriasis comorbidities. The findings highlight the need for comprehensive management and monitoring of psoriasis patients, while also taking into account the potential effects of adopting a healthier lifestyle. Overall, this study provides valuable insights into the common comorbidities observed among psoriasis inpatients, emphasizing the importance of a multidisciplinary approach to the management of psoriasis.

Although overlapping chronic inflammatory processes are currently believed to be the main mechanism of psoriasis complications, the specific pathways, regulatory mechanisms, and inflammatory factors involved remain unclear. In addition, previous research on the mechanism of psoriasis comorbidities has mainly focused on cardiovascular diseases and endocrine metabolic diseases, while there is less research on the mechanism of psoriasis comorbidities in other fields, which is a research field that needs to be explored in the future. In conclusion, further research is necessary to unravel the intricate mechanisms linking psoriasis with its comorbidities and to develop targeted interventions that have the potential to significantly improve patient outcomes and quality of life.

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Conflict of interest

The authors declare no conflict of interest.

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