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ORIGINAL ARTICLE

Does the onset of psoriasis in childhood or adulthood affect cardiovascular comorbidity?

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ABSTRACT

BACKGROUND: Psoriasis is a chronic, immune-mediated inflammatory disease with a prevalence of 2-3% in the general population and 0.7-1.2% among children in Western countries. It is often associated with comorbidities, particularly cardiovascular and metabolic diseases. This study aims to investigate the correlation between the onset of psoriasis during childhood (COP) and the prevalence of cardiovascular and metabolic comorbidities in adulthood, focusing on patients aged 30-50 years.

METHODS: A cross-sectional, multicenter study was conducted involving 1922 psoriasis patients from 12 centers across Türkiye. Data collected included demographic information, disease characteristics, cardiovascular and metabolic comorbidities, laboratory parameters, and treatment history. Metabolic syndrome (MetS) was diagnosed based on established criteria, and logistic regression analysis was used to identify factors associated with comorbidities.

RESULTS: Among the patients, 34.5% had the onset of psoriasis before the age of 18. The average duration of the disease was 28.28±53.42 years. The prevalence and age of onset of MetS were similar in both COP and AOP groups. Although the onset age of obesity was earlier in COP patients, no direct connection between the onset of psoriasis and obesity prevalence was established. Total cholesterol, LDL-cholesterol, and HOMA-IR levels were higher in the AOP group. The use of systemic and biological treatments was significantly higher in COP patients, with earlier initiation of biological treatments.

CONCLUSIONS: The prevalence and age of onset of MetS were similar in COP and AOP patients. The onset age of obesity was earlier in COP patients, emphasizing the importance of weight management in pediatric psoriasis. Early and aggressive treatment targeting systemic inflammation may improve long-term outcomes by reducing comorbidities in psoriatic patients. This study highlights the need for a comprehensive treatment approach addressing both skin symptoms and associated systemic conditions.

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KEY WORDS: Psoriasis; Metabolic diseases; Cardiovascular system; Child.

Psoriasis is a chronic, immune-mediated, inflammatory disease that manifests in individuals with genetic predisposition. The prevalence of this disease is estimated to be 2-3% in the general population and 0.7-1.2% among children in Western countries. Notably, the onset of the disease occurs during childhood in approximately one-third of psoriasis patients.[1, 2] In recent years, there has been growing evidence linking psoriasis with cardiovascular diseases in adult patients. Conditions such as ischemic heart disease, atherosclerosis, diabetes, hypertension, dyslipidemia, insulin resistance, obesity, and metabolic syndrome (MetS) have been identified as associated comorbidities in individuals with psoriasis.[3]

Studies revealed a two fold higher risk of arteriovenous disease in individuals with psoriasis, and this risk appears to be independent of conventional cardiovascular risk factors. Notably, it is more prevalent in severe forms of the disease and is particularly pronounced in patients under 50 years of age.[4-6] Several genes associated with cardiovascular risk have been identified in patients with psoriasis, suggesting a potential genetic predisposition.[7] The link between psoriasis and cardiovascular disease (CvD) is, in part, explicable through shared inflammatory pathways.

Here, it is postulated that psoriasis may contribute to cardiovascular comorbidity *via* systemic inflammation and insulin resistance, leading to endothelial dysfunction, subsequent atherosclerosis, and ultimately culminating in myocardial infarction or stroke. Obesity, a recognized risk factor for psoriasis, is indicated to induce systemic inflammation.[8, 9] While the impact of cardiovascular risk factors in childhood-onset psoriasis (COP) is a less well-known area compared to adult-onset psoriasis (AOP), recent studies have emphasized an increased prevalence of obesity and insulin resistance in children with psoriasis compared to their peers.[1, 10] The association between the age of onset of the disease and cardiovascular/metabolic comorbidities has been addressed only by Mahe *et al.* in the literature. Their study revealed that, in individuals with psoriasis starting in childhood, parameters such as body mass index, obesity, waist circumference, diabetes, dyslipidemia, metabolic syndrome, hypertension, and familial cardiovascular diseases were found to be lower when compared to those with adult-onset disease.[11] In our study, we aim to investigate whether the onset of psoriasis during childhood (COP) is correlated with the prevalence of cardiovascular and metabolic comorbidities in adulthood, focusing on patients within a similar age group (30-50 years old).

Materials and methods

This cross-sectional, multicenter study involving adults with psoriasis was conducted from across 12 centers. The disease onset before the age of 18 was defined as childhood-onset psoriasis, while disease onset at or after the age of 18 was categorized as adult-onset psoriasis.

The selection of study centers followed the nomenclature of units for territorial statistics level 1. Türkiye, divided into 12 regions, includes Istanbul, West Marmara, Eastern Marmara, Aegean, Mediterranean, West Black Sea, East Black Sea, West Anatolia, Central Anatolia, Northeastern Anatolia, Middle East Anatolia, and Southeastern Anatolia. Each of these regions served as a study center for the comprehensive evaluation of psoriasis in the respective geographic areas.

Patient evaluation

All psoriasis patients aged between 30-50 years who were monitored in 12 centers over a six-month period were included in the study. A specially designed case follow-up form was administered to all participants.

Data collected included information about patients (age, gender, smoking, alcohol use, comorbidities, etc.), psoriasis-related details (onset age, clinical features, joint involvement, treatment history and durations), cardiovascular risk factors and diseases (hypertension, angina pectoris, myocardial infarction, stroke, angiography, arrhythmia, stent, thromboembolism, pulmonary artery disease, etc.), metabolic diseases (obesity, diabetes, dyslipidemia, insulin resistance), onset age, hepatobiliary diseases (HBV, HCV, hepatitis, cholelithiasis, hepatosteatosis), psychiatric comorbidities (depression, anxiety, suicide), etc.

For all patients, metabolic laboratory parameters (fasting blood glucose, insulin, total cholesterol, fasting triglycerides, HDL-Cholesterol, LDL-cholesterol), insulin resistance (HOMA-IR), inflammatory markers (C-reactive protein, sedimentation rate), liver enzyme levels (ALT, AST), kidney function tests (creatinine) were assessed.

Excess weight was defined as BMI >25 kg/m^2, and obesity was defined as BMI >30 kg/m^2. Diabetes mellitus was diagnosed when fasting blood glucose was >126 mg/dL or postprandial glucose was >200 mg/dL or in individuals using insulin and antidiabetic medications. Participants were classified as hypertensive when systolic blood pressure was ≥140 mmHg or diastolic blood pressure was ≥90 mmHg or when they reported using antihypertensive medication.

A diagnosis of metabolic syndrome (MetS) was as-

signed to patients meeting three out of five criteria: Fasting blood glucose ≥100 mg/dL (or receiving medication for hyperglycemia), Blood pressure ≥130/85 mmHg (or receiving medication for hypertension), Triglycerides ≥150 mg/dL (or receiving medication for hypertriglyceridemia), HDL <40 mg/dL in men or <50 mg/dL in women (or receiving medication for low HDL), Waist circumference ≥102 cm in men or ≥88 cm in women. Patients meeting the following criteria were diagnosed with dyslipidemia: Hypercholesterolemia (total cholesterol ≥250 mg/dL or a documented diagnosis of hypercholesterolemia) ± hypertriglyceridemia (plasma triglycerides ≥150 mg/dL or a documented diagnosis of hypertriglyceridemia).

Results

The study included a total of 1955 patients aged between 30-50 from 12 centers.

Data from 1922 patients were analyzed and are presented in Table I. Among the patients, 675 (34.5%) had the onset of the disease before the age of 18. The average duration of the disease was found to be 28.28±53.42 years. A family history of psoriasis in first-degree relatives was present in 30.7% of patients. The frequency of a family history of psoriasis was significantly higher in COP compared to AOP (COP: 33.7%, AOP: 29.4%, P=0.048).

While the onset of the disease in childhood did not increase the rate of psoriatic arthritis (PsA) (COP: 15.3%, AOP: 16.4%, P=0.521), the age at which arthritis was diagnosed was significantly earlier in COP (COP: 33.3±7.9 years, AOP: 35.7±7.4 years, P=0.015). Widespread plaque psoriasis and erythrodermic psoriasis were significantly more common in those with disease onset before the age of 18 (COP: 60.7%, AOP: 47.1%, P<0.001 and COP: 5.1%, AOP: 1.5%, P<0.001). In contrast, inverse psoriasis, palmoplantar plaque, and pustular psoriasis were more frequent in AOP (COP: 0.4%, AOP: 1.6%, P<0.001; COP: 2.4%, AOP: 7.4%, P<0.001 and COP: 3.3%, AOP: 1.3%, P<0.001).

The rate of systemic treatment was significantly higher in COP patients (COP: 75.5%, AOP: 56.2%, P<0.001). Additionally, in this group, the rate of using biological treat-

TABLE I.—*Demographic and clinical characteristics of patients by gender and age of disease onset.*

Characteristics	Female	Male	P value	COP	AOP	P value
Gender (F/M)	935 (47.8%)	1020 (52.2%)	0.004*	353 (52.3%) / 322 (47.7%)	582 (45.5%) / 698 (54.5%)	0.004*
Patient age, years	40±6.7	40.7±6.4	0.019*	39.6±6.5	40.8±6.5	0.000*
Age of disease onset, years	23.5±13	24.4±12.2	0.120	11.2±9.1	30.7±8.2	0.000*
Disease duration	29.5±55.3	27.1±51.6	0.669*	36.4±59.8	24±49.3	0.000*
Cigarettes	344 (36.8%)	658 (64.4%)	0.000*	288 (42.7%)	713 (55.7%)	0.000*
Cigarettes (years)	14.2±8.1	16.4±7.9	0.000*	166 (24.9%)	345 (27.1%)	0.238
Alcohol	37 (4.0%)	163 (15.9%)	0.000*	88 (13.1%)	112 (8.8%)	0.003*
First PASI <10	349 (48.7%)	352 (43.3%)	0.037*	155 (27.6%)	545 (56.4%)	0.000*
Family history psoriasis	309 (33.1%)	293 (28.8%)	0.037*	226 (33.7%)	376 (29.4%)	0.048*
BMI, kg/m^2	27.69±5.49	27.94±4.37	0.011*	27.61±5.13	27.94±4.82	0.065
Clinical types						
Plaque, limited	294 (31.6%)	294 (28.8%)	0.159	158 (25.8%)	430 (33.7%)	0.000*
Plaque, common	445 (47.8%)	564 (55.3%)	0.001*	408 (60.7%)	601 (47.1%)	0.000*
Guttate	40 (4.3%)	28 (2.7%)	0.065	25 (3.7%)	42 (3.3%%)	0.604
Palmoplantar plaque	64 (6.9%)	46 (4.5%)	0.030*	16 (2.4%)	94 (7.4%)	0.000*
Palmoplantar pustular	33 (3.5%)	20 (2.0%)	0.036*	6 (0.9%)	47 (3.7%%)	0.000*
Pustular	28 (3.0%)	19 (1.9%)	0.106	22 (3.3%%)	24 (1.9%%)	0.060
Erythrodermic	16 (1.7%)	37 (3.6%)	0.012*	34 (5.1%%)	19 (1.5%%)	0.000*
Inverse	11 (1.2%)	12 (1.2%)	1.000	3 (0.4%%)	20 (1.6%%)	0.028*
Psoriatic arthritis	178 (19.1%)	135 (13.2%)	0.000*	103 (15.3%%)	209 (16.4%%)	0.521
PSA diagnosis age	34.9±8.1	34.9±7.1	0.952	33.3±7.9	35.7±7.4	0.015*
Nail	275 (29.4%%)	458 (44.8%%)	0.000*	243 (36.0%%)	489 (38.2%%)	0.345
Treatment duration						
Systemic treatment	527 (59.7%)	637 (66.2%)	0.003*	488 (75.5%)	674 (56.2%)	0.000*
Biological	220 (24.4%)	230 (23.5%)	0.621	206 (31.6%)	243 (19.8%)	0.000*
Non-biological systemic	553 (60.2%)	666 (65.7%)	0.012*	460 (69%)	758 (60%)	0.000*
First conventional age	33.2±8.2	33.6±7.8	0.219	29.1±7.1	36.2±7.3	0.000*
First biological age	36.7±7.4	37.5±6.7	0.199	34.7±7.1	38.5±6.6	0.000*

PsA: psoriatic arthritis.
*Statistically significant difference.

ment was higher, and the age at the initiation of biological treatment was statistically earlier (P<0.001 and P<0.001).

Cardiovascular and metabolic diseases

When evaluating the frequency of cardiovascular comorbidities, a history of angiography was shown to be more common in AOP (COP: 1.2%, AOP: 3.0%, P=0.013). In terms of metabolic comorbidities, the prevalence of dyslipidemia and metabolic syndrome (MS) was significantly higher in AOP (COP: 14.9%, AOP: 19.3%, P=0.017, and COP: 5.1%, AOP: 9.3%, P<0.001). The onset age of dyslipidemia and obesity was significantly earlier in patients with COP (P=0.006, P=0.017) (Table II).

Laboratory findings

In general laboratory tests, total cholesterol, LDL-cholesterol, and HOMA-IR levels were found to be higher in those with adult-onset disease (respectively P<0.001; P<0.001; P<0.001). ALT and AST levels were higher in patients with childhood-onset disease (respectively P<0.001; P<0.001). Triglycerides, ALT, AST, and HOMA-IR levels, a marker of insulin resistance, were found to be higher in males compared to females (P<0.001, P<0.001; P<0.001; P=0.031) (Table III).

Logistic regression analysis of factors associated with cardiovascular and metabolic comorbidities

It was determined that being over 40 years old increased the likelihood of cardiovascular comorbidities by 2.6 times, and depression increased it by 2.2 times. For metabolic comorbidities, it was found that the onset of the disease after the age of 18 increased the likelihood by 4.7 times, being over 40 years old increased it by 1.3 times, having a disease duration of over 20 years increased it by

TABLE II.—*Comparison of cardiovascular and metabolic comorbidities according to gender and age of disease onset.*

Parameters	Female	Male	P value	COP	AOP	P value
Cardiovascular comorbidity	68 (7.3%)	63 (6.2%)	0.330	122 (18.1%)	203 (15.8%)	0.094
CV disease onset age	35.8±8.8	39.2±7.4	0.029*	37.8±9.1	37.2±7.8	0.378
CAD	23 (2.5%)	37 (3.6%)	0.136	24 (3.6%)	36 (2.8%)	0.364
CAD age onset	39.6±4.9	41.9±5.8	0.007*	41.3±4.8	41.2±5.8	0.892
MI	6 (0.6%)	6 (0.6%)	0.879	1 (0.1%)	11 (0.9%)	0.056
MI age	40.8±3.6	46.2±3.1	0.017*	44	43.7±4.4	0.873
Angiography	18 (1.9%)	28 (2.7%)	0.233	8 (1.2%)	38 (3.0%)	0.013*
Angiography age	41.9±5	41.5±5.8	0.861	42.6±3.8	41.5±5.8	0.888
Bypass	3 (0.3%)	1 (0.1%)	0.276	1 (0.1%)	3 (0.2%)	0.689
CVD	3 (0.3%)	1 (0.1%)	0.276	1 (0.1%)	3 (0.2%)	0.689
CVD age	41.5±2.1	25	0.221	25	41.5±2.1	0.221
Stents	6 (0.6%)	10 (1.0%)	0.407	3 (0.4%)	13 (1.0%)	0.068
Stent age	40.8±3.6	43.6±3.2	0.083	44.3±2.5	42.3±3.6	0.466
Arrhythmia	31 (3.3%)	13 (1.3%)	0.002*	16 (2.4%)	28 (2.2%)	0.794
Arrhythmia age	34.9±6.5	36.6±9.2	0.297	36.7±8.7	34.7±6.6	0.250
PAH	4 (0.4%)	5 (0.5%)	0.840	4 (0.6%)	5 (0.4%)	0.530
PAH age	42.7±2.9	35.8±7.1	0.154	37.3±7.5	40.7±5.5	0.593
Thromboembolism	3 (0.3%)	4 (0.4%)	0.793	2 (0.3%)	5 (0.4%)	0.741
Thromboembolism age	29.5±4.9	41±7.4	0.165	37±15.6	37.3±6.4	1.000
CHF	5 (0.5%)	0 (0%)	0.019*	0 (0.0%)	5 (0.4%)	0.104
CHF age	33.7±20.6				33.7±20.6	
Metabolic comorbidities						
Obesity	157 (16.8%)	135 (13.2%)	0.027*	86 (12.8%%)	206 (16.1%%)	0.056
Obesity age	31.3±8.6	28.9±9.3	0.041*	24.6±8.5	32.8±8	0.000*
Dyslipidemia	151 (16.2%)	196 (19.2%)	0.076	100 (14.9%%)	247 (19.3%%)	0.017*
Dyslipidemia age	39.1±7	37±6.3	0.001*	36.3±6.7	38.6±6.6	0.006*
Metabolic syndrome	82 (9.4%)	60 (6.3%)	0.016*	33 (5.1%%)	109 (9.3%%)	0.001*
Metabolic syndrome age	39±7.1	37.2±6.3	0.145	37.5±7.3	38.5±6.7	0.509
DM	89 (9.5%)	75 (7.4%)	0.083	46 (6.9%%)	118 (9.2%%)	0.078
DM age	38.8±6.7	39.8±7.2	0.261	37.7±8.1	39.6±6.6	0.217
HT	120 (12.8%)	112 (11.0%)	0.205	82 (12.2%%)	150 (11.7%%)	0.732
HT age	39.1±6.5	40.2±6.4	0.172	38.7±6.7	39.9±6.4	0.247

CAD: coronary artery disease; MI: myocardial infarction; CVD: cerebrovascular disease; PAH: pulmonary arterial hypertension; CHF: congestive heart failure; DM: diabetes mellitus; HT: hypertension.
*Statistically significant difference.

TABLE III.—*Comparison of laboratory findings according to gender and age of disease onset.*

Parameters	Female	Male	P value	COP	AOP	P value
Fasting blood glucose	96.6±27.2	97.3±24.8	0.062	96.8±27.7	97.1±25	0.542
Insulin	10.6±9	12.4±13.3	0.064	10.7±11.5	12±11.4	0.000*
Triglyceride	141.5±75.3	179.2±103	0.000*	159±82	162.6±98	0.446
Total cholesterol	189.8±44.2	192.7±42.8	0.094	185±40.6	194.7±44.6	0.000*
HDL-cholesterol	51.5±13.2	43.4±12.5	0.000*	47.2±13.2	47.2±13.6	0.588
LDL-cholesterol	118±36.2	120.3±35	0.096	112±34.3	123±35.7	0.000*
ALT	22.7±16.4	30.5±19	0.000*	29.7±21.1	25.2±16.3	0.000*
AST	22.4±12.1	25.7±13.4	0.000*	27.4±16.4	22.4±10.3	0.000*
CRP	5.2±8	5.3±9.8	0.773	5.2±7.1	5.3±9.8	0.106
HOMA-IR	2.62±2.73	3.18±4.20	0.031*	2.68±3.64	3.04±3.53	0.000*

*Statistically significant difference.

TABLE IV.—*Logistic regression analysis of factors associated with cardiovascular and metabolic comorbidities.*

Parameters	Cardiovascular comorbidities		Metabolic comorbidities	
	OR (95% CI)	P value	OR (95% CI)	P value
Gender	0.750 (0.728-1.273)	0.244	1.123 (1.102-1.144)	0.790
Age (>40)	2.689 (1.743-3.036)	0.000*	1.328 (0.723-2.438)	0.000*
Disease onset (>18)	0.712 (1.087-2.164)	0.255	4.794 (1.005-3.231)	0.015*
Disease duration				
Disease duration 11-20 years	0.633 (0.316-1.259)	0.193	2.144 (1.054-4.358)	0.413
Disease duration >20 years	1.184 (0.659-2.125)	0.572	1.418 (0.754-2.670)	0.024*
Obesity	1.378 (0.748-2.540)	0.304	1.116 (0.621-2.007)	0.000*
Cigarette	1.241 (0.767-2.009)	0.379	0.905 (0.424-1.933)	0.131
Alcohol	0.684 (0.286-1.641)	0.395	1.734 (0.703-4.278)	0.060
Depression	2.240 (1.210-4.147)	0.010*	0.785 (0.392-1.571)	0.121
Anxiety	1.659 (0.660-4.174)	0.282	1.535 (0.819-2.87)	0.742
Family history	0.991 (0.605-1.618)	0.970	0.801 (0.593-1.083)	0.292
Nail involvement	1.227 (0.735-2.047)	0.434	0.973 (0.724-1.307)	0.855
Psoriatic arthritis	1.297 (0.709-2.372)	0.399	1.341 (0.937-1.921)	0.109
Non-biological_systemic drug	1.128 (0.671-1.895)	0.649	1.359 (1.007-1.835)	0.045*
Biological_drug	1.644 (0.965-2.800)	0.068	0.745 (0.521-1.065)	0.436
PASI10	0.697 (0.396-1.228)	0.212	1.057 (0.714-1.566)	0.878
Diffuse plaque type	1.398 (0.753-2.594)	0.288	2.262 (1.587-3.223)	0.000*
Guttate type	0.958 (0.200-4.583)	0.957	0.756 (0.309-1.853)	0.541
Palmoplantar type	0.588 (0.129-2.573)	0.492	3.364 (1.382-8.189)	0.008*
Erythrodermic type	1.867 (0.502-6.949)	0.352	0.433 (0.164-1.146)	0.092
Pustular generalized	0.709 (0.080-6.266)	0.757	0.464 (0.099-2.171)	0.329
Pustular palmoplantar	1.842 (0.409-8.304)	0.427	1.984 (0.560-7.024)	0.288
Inverse type	0.000	0.998	0.771 (0.195-3.052)	0.712

*Statistically significant difference.

1.4 times, having a BMI >30 increased it by 1.1 times, involvement of the scalp increased it by 1.35 times, non-biological systemic treatments increased it by 1.3 times, widespread plaque psoriasis increased it by 2.2 times, and palmoplantar psoriasis increased it by 3.3 times (Table IV).

Discussion

Psoriasis is characterized by a systemic inflammatory response that often leads to comorbidities, particularly cardiovascular disease and MetS Obesity is more prevalent in individuals with psoriasis or psoriatic PsA compared to the general population. The prevalence of metabolic syndrome, which increases the risk of cardiovascular disease, is reported to range between 20-50% in patients with psoriasis, and this risk tends to elevate with the severity of the disease.[12, 13]

In our study, there was an expectation that the prevalence of MetS would be more common and its onset age earlier in patients with COP due to the early onset of circulating proinflammatory cytokines. However, our findings indicate that the prevalence and age of onset of MetS were similar in both COP and AOP groups. Although several studies have reported a positive association between pso-

riasis and hypertension, our study did not find a significant relationship between hypertension and the age of onset of the disease. Additionally, the age of onset of hypertension was similar in both AOP and COP patients. These results suggest that, in our study cohort, the onset age of psoriasis may not be a major determinant of the prevalence or age of onset of MetS and hypertension.

Adipose tissue, as a crucial endocrine organ, releases soluble factors involved in inflammation and immunity. The expansion of adipose tissue and its secretion of pro-inflammatory mediators are thought to exacerbate psoriasis. BMI of individuals with psoriasis tends to rise over time. Additionally, being overweight, particularly with abdominal obesity, and obesity are more prevalent in children with psoriasis.[14] This observation suggests a potential link between the progression of psoriasis and an increase in BMI, emphasizing the importance of monitoring and managing weight in individuals with psoriasis, especially in the pediatric population. In spite of this; Heredi *et al.* revealed that late-onset psoriasis was more frequently associated with obesity and elevated waist circumference compared to early-onset forms. Especially in patients aged 75 years with late-onset psoriasis, there was a high risk of obesity, suggesting that obesity could be an acquired factor predisposing individuals to develop psoriasis in old age.[15] Ergun *et al.* revealed that prevalence of being overweight/obese among psoriatics (28%) significantly higher, but being overweight/obese had no significant impact on disease severity and unresponsiveness to topical treatment.[16] Our study did not establish a direct connection between the onset of psoriasis and the prevalence of obesity, we found that the onset age of obesity was earlier in patients with COP. Effective and continuous treatment of psoriasis has been demonstrated to have positive effects on insulin resistance and endothelial dysfunction, suggesting that adequately managing psoriasis could potentially halt the progression towards cardiovascular complications.[17] In a study Ramessour *et al.* found that genetic predictors of CAD and stroke were found to have risk-increasing associations with psoriasis, but not in other immune related inflammatory disease like rheumatoid arthritis.[18] In our study we did not found any association between the onset of disease and CAD.

An association with dyslipidemia has been observed in both adult and pediatric psoriatic patients, including hypertriglyceridemia, hypercholesterolemia, decreased HDL-cholesterol, and increased LDL fraction.[19] In our study, we found that the average total cholesterol and LDL-cholesterol levels were higher in AOP. Although the prevalence of dyslipidemia was higher in AOP patients, the onset age of dyslipidemia was lower in those with early-onset disease. Various studies have consistently demonstrated altered lipid profiles in patients with psoriasis, characterized by reduced HDL levels and/or elevated levels of LDL, very-low-density lipoprotein, and triglycerides.

In a study by Mahe *et al.*, a comparison of cardiometabolic comorbidities between childhood-onset and AOP revealed significantly higher rates of obesity, diabetes mellitus, hypertension, dyslipidemia, and major adverse cardiovascular events (MACE) such as angina, stroke, and myocardial infarction in the AOP group. It is noteworthy that the average age was 50 years old in the AOP group and 39 years old in the COP group.[11]

In a study conducted by Hüseyinova *et al.*, the cardiovascular and laboratory changes of early (<40 years) and late-onset psoriasis patients were evaluated. The late-onset group showed higher rates of hypertension, diabetes mellitus, and obesity. However, it is essential to consider that the average age differed between the groups, with the early-onset group having an average age of 40 and the late-onset group having an average age of 57.[20]

The involvement of systemic inflammatory pathways, such as TNF, IL-6, IL-17, and IL-23, in the pathogenesis of both psoriasis and its comorbidities underscores the potential benefits of early systemic treatment targeting proinflammatory cytokines. The hypothesis is that such treatment not only improves cutaneous symptoms but also reduces systemic inflammation, ultimately leading to better long-term outcomes by mitigating the progression of comorbidities.[21]

In the context of psoriatic disease, methotrexate (MTX) has been associated with a reduction in cardiovascular risk. A meta-analysis examining the effects of MTX on CV risk in patients with rheumatoid arthritis, psoriasis or PsA concluded that MTX was linked to a 21% reduction in overall CV risk and an 18% reduction in the risk of myocardial infarction.[22] Observational studies have indicated that the risk of major adverse cardiovascular events[23] MACE is higher in patients with PsA or psoriasis not receiving conventional synthetic disease-modifying antirheumatic drugs (csDMARDs) or in those with severe PsO. However, some studies, such as an observational study on patients treated with secukinumab (an IL-17 inhibitor), have suggested improvements in left ventricular function and coronary flow reserve.[24]

Biological therapy has been shown to significantly reduce inflammatory activity in psoriasis, as evidenced by measurements of inflammation markers such as CRP,

ESR, and fibrinogen.[25] Boskovic *et al.* found that psoriatic patients exhibit various CVD markers, including elevated triglyceride-glucose index, increased noncalcified coronary burden, and higher resistin serum levels, particularly in those with metabolic syndrome and diabetes. Biological therapies, especially IL-17 and IL-12/23 inhibitors, show promise in reducing CV risk by mitigating systemic inflammation and traditional risk factors. While IL-23 inhibitors do not appear to increase CV risk, their efficacy in reducing it remains unproven.[18] In our study, the rate of using systemic conventional and biological treatments, as well as the age of initiating these treatments, was higher in patients with childhood-onset. This difference in treatment patterns may contribute to the hypothesis that the incidence of cardiometabolic diseases is lower in COP patients. It emphasizes the potential role of early and aggressive management in improving outcomes and reducing the burden of comorbidities in psoriatic patients.

Limitations of the study

The observation that the average age of the patients in our study is 40 may indeed be a limiting factor. In this age group, the rate of developing cardiometabolic comorbidities might be less common compared to relatively older ages. In future research, expanding the age range of participants or conducting separate analyses for different age groups could provide a more comprehensive understanding of the relationship between psoriasis, age of onset, and the development of cardiometabolic comorbidities. Additionally, considering other relevant factors such as lifestyle, genetic predispositions, and treatment history could contribute to a more nuanced interpretation of our findings.

Conclusions

Our findings revealed that the prevalence and age of onset of MetS were similar in both COP and AOP groups. Our study did not establish a direct connection between the onset of psoriasis and the prevalence of obesity, though the onset age of obesity was earlier in COP patients. The findings underscore the importance of monitoring and managing weight in individuals with psoriasis, particularly in the pediatric population. Effective and continuous treatment of psoriasis has been demonstrated to positively affect insulin resistance and endothelial dysfunction, potentially halting the progression toward cardiovascular complications. The involvement of systemic inflammatory pathways in the pathogenesis of psoriasis and its comorbidities highlights the potential benefits of early systemic treatment targeting proinflammatory cytokines. The use of biological treatments was higher in patients with COP, suggesting a potential role of early and aggressive management in improving outcomes and reducing the burden of comorbidities in psoriatic patients. This emphasizes the need for a comprehensive approach in treating psoriasis, focusing on both skin symptoms and associated systemic conditions.

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Conflicts of interest

The authors certify that there is no conflict of interest with any financial organization regarding the material discussed in the manuscript.

Authors' contributions

Leyla Baykal Selçuk: data curation, writing- original draft preparation, conceptualization, methodology. Esra Adışen: data curation, writing- original draft preparation. Yusuf Can Edek: data curation. Nuray Keskin: data curation. Ayça Cordan Yazici: data curation, writing- original draft preparation. Melodi Çekiç: data curation. Mehmet Melikoğlu: data curation, writing- original draft preparation. Erdal Pala: data curation. Ahmet Onur Soğuksu: data curation. Müge Güler Özden: data curation, writing- original draft preparation, conceptualization, methodology. Büşra Demirbağ Gül: data curation. Serap Güneş Bilgili: data curation, writing- original draft preparation. Göknur Özaydin Yavuz: data curation, writing- original draft preparation. Melih Akyol: data curation, writing- original draft preparation, conceptualization. Rukiye Yasak Güner: data curation. Tülin Ergun: data curation, writing- original draft preparation. Dilek Seçkin: data curation, writing- original draft preparation, conceptualization, methodology. Emel Bülbül Başkan: data curation, writing- original draft preparation. Serkan Yazici: data curation. Mustafa Aksoy: data curation, writing- original draft preparation. Arzu Kiliç: data curation, writing- original draft preparation. Pelin Hizli: data curation. Sinan Özçelik: data curation. Şeyda E. Saglam: data curation. İlgen Ertam Sağduyu: data curation, writing- original draft preparation. Ayda Acar: data curation, writing- original draft preparation, conceptualization, methodology. Burak Akşan: data curation. Savaş Yayli: data curation, writing- original draft preparation, conceptualization, methodology. All authors read and approved the final version of the manuscript.

History

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