Original Article

Prevalence of hyperlipidemia in psoriatic arthritis patients in Riyadh, Saudi Arabia

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ABSTRACT

الأهداف: دراسة مدى انتشار فرط شحميات الدم لدى المرضى الذين يعانون من التهاب المفاصل الصدفي في الرياض، المملكة العربية السعودية، و العلاقة بين التهاب المفاصل الصدفي وفرط شحميات الدم.

المنهجية: أجرينا دراسة بأثر رجعي في السجلات الطبية لمرضى التهاب المفاصل الصدفي خلال الفترة من يناير 2010م إلى مايو 2023م في مركزين طبيين في الرياض. أدرجنا المرضى الذين تزيد أعمارهم عن 18 عامًا والذين لديهم ملف دهني. تم تحديد حالات فرط شحميات الدم باستخدام تعريفات لوحة علاج البالغين III والرابطة الأوروبية لأمراض القلب الوقائية بناءً على نتائج ملف الدهون.

النتائج: اشتملت الدراسة على 141 مريضا يعانون من التهاب المفاصل الصدفي في التحليل. كان معدل انتشار فرط شحميات الدم لدى مرضى التهاب المفاصل الصدفي 40.7% عند التشخيص، و28.7% في الزيارة الأخيرة. كان معدل انتشار فرط شحميات الدم أعلى بكثير عند الذكور منه عند الإناث (56% مقابل 29.4%، $p<0.005$). في حين أن هذه ليست ذات دلالة إحصائية، من بين المرضى الذين تلقوا أدوية بولوجية مضادة للروماتيزم (bDMARD)، كان 31.6% يعانون من انخفاض مستوى شحميات الدم في الزيارة الأخيرة، مقارنة بـ 20% من أولئك الذين لم يتلقوا دواء بيولوجي ($p=0.317$). من بين المرضى الذين تلقوا الأدوية التقليدية المضادة للروماتيزم، كان 30% منهم مصابين بفرط شحميات الدم في الزيارة الأخيرة، مقارنة بـ 25.8% من أولئك الذين لم يتلقوا الأدوية المضادة للروماتيزم المعدلة للمرض ($p=0.813$). وجدنا أن معدلات انتشار انخفاض مستوى شحميات الدم في الزيارة الأولى والزيارة الأخيرة ذات دلالة إحصائية بين المرضى الذين يعانون من أمراض مصاحبة أخرى غير الصدفية (7.6 مقابل 17.3%، $p=0.004$).

الخلاصة: نتائج الدراسة قابلة للمقارنة مع نتائج الدراسات الأخرى التي تظهر عدم وجود تأثير كبير لـ PsA على ملف الدهون. يبدو أن معدل انتشار فرط شحميات الدم لدى مرضى التهاب المفاصل الروماتويدي مشابه لمعدل انتشاره لدى عامة السكان في المملكة العربية السعودية، بناءً على مقارنة غير مباشرة.

Objectives: To estimate the prevalence of hyperlipidemia in patients with psoriatic arthritis (PsA) in Riyadh, Saudi Arabia, and to investigate the relationship between PsA and hyperlipidemia.

Methods: This retrospective study examined medical records of PsA patients from January 2010 to May 2023 at 2 medical centers in Riyadh. Patients over 18 years old with a lipid profile were included. Hyperlipidemia cases were determined using Adult Treatment Panel III (ATP III) guidelines and European Association of Preventive Cardiology definitions based on lipid profile results.

Results: A total of 141 patients were included in the analysis. The prevalence of hyperlipidemia in patients with PsA was 40.7% at diagnosis, and 28.7% at the last visit. The prevalence of hyperlipidemia was significantly higher in males than females (56% versus [vs] 29.4%, $p<0.005$). While not statistically significant, among patients who received a biologic disease-modifying antirheumatic drugs (bDMARD), 31.6% had hyperlipidemia at the last visit, compared to 20% of those who did not receive it ($p=0.317$). Among patients who received conventional disease-modifying antirheumatic drugs (cDMARD), 30% had hyperlipidemia at the last visit, compared to 25.8% of those who did not it ($p=0.813$). The prevalence rates of hyperlipidemia at the first visit and the last visit were found to be statistically significant among patients who have comorbidities other than PsA (7.6 vs. 17.3%, $p=0.004$).

Conclusion: The study results are comparable to those of other studies showing no significant effect of PsA on the lipid profile. The prevalence of hyperlipidemia in PsA patients appears similar to that of the general population in Saudi Arabia, based on indirect comparison.

Keywords: lipid profile, medical records, prevalence, retrospective study, Riyadh, Saudi Arabia

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Psoriatic arthritis (PsA) is a chronic inflammatory musculoskeletal condition commonly seen in patients with psoriasis. It is a complex condition that involves articular and extra-articular manifestations such as peripheral arthritis, spondylitis, enthesitis, dactylitis, and skin/nail diseases.[1] Psoriatic art-hritis patients often present with additional concurrent comorbidities due to shared risk factors, such as impaired physical function and activity, chronic systemic inflammation, and its treatment.[2] On the other hand, metabolic syndrome, which is a constellation of central obesity, atherogenic hyperlipidemia, hypertension, and poor glucose tolerance, has received much attention in recent years. Metabolic syndrome has been linked to a condition of persistent and low-grade inflammation.[3] The literature suggests that patients with rheumatologic diseases, including gout, systemic lupus erythematosus, rheumatoid arthritis (RA), and ankylosing spondylitis, have an increased prevalence of metabolic syndrome.[4] It is important to note that while psoriasis symptoms are mainly restricted to the skin, PsA presents as an inflammatory arthropathy.[3]

Several studies have investigated the prevalence of hyperlipidemia in patients with PsA, but the results have been inconsistent. A cross-sectional survey of Han et al[5] found that hyperlipidemia prevalence was 27.8% in PsA compared to 23.7% in the matched control group. Jafri et al[6] studied the prevalence of hyperlipidemia among PsA and RA patients compared to a randomly matched control group. They found that hypertension, hyperlipidemia, and diabetes increased among PsA and RA patients compared to the control group.[7] Radner et al[8] compared the prevalence of hyperlipidemia in PsA to that in RA and psoriasis. They found that the prevalence of hyperlipidemia was 11.4% in PsA compared to 9.9% in RA and 10.4% in psoriasis.[6]

The prevalence of hyperlipidemia in patients with PsA has been investigated in several studies, but results have been inconsistent. This study aims to estimate the prevalence of hyperlipidemia in PsA patients in Riyadh, Saudi Arabia. The study findings could provide insight into the relationship between PsA, its treatment, and hyperlipidemia.

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The primary objective is the prevalence of hyperlipidemia in PsA, in Saudi Arabia. While the secondary objective is to compare the lipid profile results between patients with PsA on biologic and those who are not on biologic.

Methods. This study is an observational study that utilized the medical records of patients diagnosed with PsA from January 2010 to May 2023 at 2 medical centers in Riyadh: Prince Mohammed Bin Abdulaziz Hospital and Prince Sultan Military Medical City.

This study included patients diagnosed with psoriatic arthritis who were at least 18 years old and had a lipid profile. Patients without a documented laboratory investigation of lipid profile were excluded from the study.

Cases of hyperlipidemia were determined based on the patient's lipid profile results, according to the definitions of the Adult Treatment Panel III (ATP III) hyperlipidemia classifications and the European Association for Cardiovascular Prevention and Rehabilitation (EACPR).[9,10] Whether those patients were on statin or not.

We reviewed the medical records of patients registered with PsA from January 2010 to May 2023, applying the eligibility criteria. The electronic health records system used by the participating centers was used to collect the data.

Data collected from the medical records included medical record number, age, gender, lipid profile (including LDL [low-density lipoprotein], triglyceride, total cholesterol, and HDL [high-density lipoprotein] at diagnosis and last visit), comorbidities such as diabetes mellitus, hypertension, and other comorbidities. The following items have been documented: smoking status, previous cardiovascular or cerebrovascular accidents (CVA), skin, axial, or peripheral involvement, use of biological drugs, use of any medications that may alter lipid profiles such as statins, and duration of use of biological and conventional disease-modifying antirheumatic drugs (DMARDs).

Statistical analysis. The statistical analysis for this study was conducted using the Statistical Package for Social Sciences (SPSS) version 29.0 (IBMCorp, Armonk, NY, USA). The prevalence of hyperlipidemia was estimated based on the patient's lipid profile, including LDL, triglycerides, total cholesterol, and HDL. Hyperlipidemia was defined according to the ATP III hyperlipidemia classifications and the European Association for Cardiovascular Prevention and Rehabilitation (EACPR). Normal distribution of continuous variables was assumed for variables of

skewness between (-1 to 1). For skewed variables, skewness was further assessed using the Shapiro-Wilk test and the Kolmogorov-Smirnov test. Data were analyzed using descriptive statistics, including frequency, mean, standard deviation, and percentage. Missing values exceeding 5% of the total sample size were excluded from the analysis and valid percent of the complete data were reported. Comparisons between groups were made using the Chi-square test, and if assumptions were not satisfied, the Fisher exact test was used. For a comparison of hyperlipidemia between the first and the last visit, the McNemare test for related samples was used. A *p*-value of <0.05 was considered statistically significant.

The study protocol was approved by the Institutional Review Board of the Prince Sultan Medical City and Prince Mohammed Bin Abdulaziz Hospital. Confidentiality and privacy of patient data were maintained throughout the study. All data were used for research purposes only and reported in aggregate form to ensure that individual patient information was protected. The study was conducted in compliance with the principles of the Declaration of Helsinki and the International Conference on Harmonization Guidelines for Good Clinical Practice.

Results. A total of 141 patients with PsA were included in the analysis. The age ranged from 18 to 82 with a mean of 47.1 years old, and a standard deviation of 12.3 years. Table 1 presents the baseline hyperlipidemia status among PsA patients in relation to medical comorbidities. The distribution of hyperlipidemia across different age groups at the first visit reveals a higher prevalence among older individual, indicating a positive correlation with advancing age of hyperlipidemia in older age group and predominantly higher in male than in female. Hyperlipidemia is significantly higher among diabetic patients and those taking statin. This can be explained by the fact that patients on statin often exhibit higher baseline lipid profile.

The lipid profiles on the first and last visits are presented in Table 2. The prevalence of abnormal LDL was found to be significantly higher at the first visit compared to the last visit (17.3% versus [vs] 7.6%, *p*=0.004). No clear explanation for that, it is most likely due to the control of hyperlipidemia by anti-lipid agents.

Table 3 shows the use of bDMRADs, cDMRADs, and the duration of treatment. The majority of patients (47.3%) used anti-tumor necrosis factor (TNF) as the bDMARDs class, while the rest used IL-12/23 inhibitors, IL-17 inhibitors, or targeted synthetic DMARDs. The duration of bDMARD use ranged from less than a year to more than 5 years, with the majority of patients (44.9%) using the drug for 1-5 years. Methotrexate was the most common cDMARD class, used by 58.2% of patients. The duration of cDMARD use ranged from less than a year to more than 5 years, with the majority of patients (64.2%) using the drug for 1-5 years.

Additional medications used by the patients included statin by 39.3%. Statins were primarily used for primary prevention (62.3%). Biologic DMARDs use was used by 71.6%, while 54.5% received more than one biologic drug. About half (49.2%) used a biologic with cDMARDs. The general calculated prevalence of hyperlipidemia decreased from 40.7% at the first visit to 28.7% at the last visit.

Table 4 compares hyperlipidemia at the last visit according to receiving bDMARDs or cDMARDs. The table shows that among patients who received bDMARDs, 31.6% had hyperlipidemia at the last visit, compared to 20% of those who did not receive bDMARDs. The difference was not statistically

Table 1 - Baseline hyperlipidemia status among PsA patients in relation to medical comorbidities.

Variables	Hyperlipidemia at the first visit		*P*-value
	Yes	No	
Age groups at the first visit (n=101)			
<30 Years old	4 (23.5%)	13 (76.5%)	0.055
30-60 Years old	41 (47.1%)	46 (52.9%)	
>60 Years old	3 (21.4%)	11 (78.6%)	
Gender (n=101)			
Male	28 (56%)	22 (44%)	0.005
Female	20 (29.4%)	48 (70.6%)	
Diabetes mellitus (n=101)			
Yes	19 (61.3%)	12 (38.7%)	0.010
No	29 (33.3%)	58 (66.7%)	
Hypertension (n=101)			
Yes	20 (57.1%)	15 (42.9%)	0.024
No	28 (33.7%)	55 (66.3%)	
Ischemic heart diseases (n=101)			
Yes	3 (42.9%)	4 (57.1%)	1.000
No	45 (40.5%)	66 (59.5%)	
Other comorbidities (n=102)			
Yes	22 (42.3%)	30 (57.7%)	0.851
No	26 (39.4%)	40 (60.6%)	
Smoking status (n=99)			
Yes	3 (75%)	1 (25%)	0.305
No	45 (40.2%)	67 (59.8%)	
Statin use			
Yes	31 (62%)	19 (38%)	<0.001
No	17 (25%)	51 (75%)	

Table 2 - Patients lipid profile results on the last visits.

Variables	First visit		Last visit		*P*-value
	Normal	High	Normal	High	
Cholesterol	115 (84.6%)	21 (15.4%)	97 (89.8%)	11 (10.2%)	0.167
Low-density lipoprotein	105 (82.7%)	22 (17.3%)	97 (92.4%)	8 (7.6%)	0.004
High-density lipoprotein	103 (81.1%)	24 (18.9%)	90 (84.1%)	17 (15.9%)	0.332
Triglycerides	114 (87.0%)	17 (13.0%)	94 (88.7%)	12 (11.3%)	1.00

significant (p=0.317). Similarly, there was no significant association between the use of more than one bDMARD and hyperlipidemia at the last visit (p=0.464). Among patients who received cDMARDs, 30% had hyperlipidemia at the last visit, compared to 25.8% of those who did not receive cDMARDs. The difference was not statistically significant (p=0.813). Further adjustment for gender and hyperlipidemia at the first visit did not show any statistical difference.

Table 5 sub-statistical analysis that compared lipid profiles in patients with comorbidities and without which revealed that the prevalence of hyperlipidemia in PsA patients without comorbidities was 29.5% in comparison to those without hyperlipidemia 70.5%. Most of the patient included in the study were in remission with 30% have a mild disease activity and 6% moderate disease activity.

Table 6 compare the current data of hyperlipidemia in PsA patients indirectly to the previous study which revealed lower prevalence among PsA patients. This can be explained by the fact that PsA patients follow regular treatment regimens and are considered a subgroup within hyperlipidemia cases.[11]

Discussion. The prevalence of hyperlipidemia in PsA has been investigated in many previous studies due to the fact that PsA is a chronic inflammatory disease with increased oxidative stress that can affect lipid metabolism. Our study showed 40.7% hyperlipidemia among PsA patients at the time of diagnosis. This result was comparable to other studies which were conducted in Spain involving 358 patients suffering from PsA reported that hypercholesterolemia was present in 41.6% of participants. When the PsA results were compared with psoriasis, the prevalence of hypercholesterolemia was higher in PsA patients (47.6% in PsA and 39.8% in psoriasis) and this is explained by the higher inflammatory markers in PsA.[10] Indirect comparison with previous study carried out in Saudi Arabia by Alnozha et al[11] and the prevalence of hyperlipidemia of general population in central area in Saudi Arabia was TC 23.3% and TG 22.7%. Another indirect comparison with study done in Saudi Arabia by Alzaheb et al[12] on the prevalence of hyperlipidemia in type 2 diabetes the result of hyperlipidemia was 66.5% which is higher than our study population

Table 3 - Classes and duration of bDMARDs and cDMARDs taken by the patients (N=141).

Variables	n	%
bDMARDs drug class (first drug) (n=100)		
Anti-TNF	87	87.0%
IL17	8	8.0%
IL23	2	2.0%
IL12 and IL 23	1	1.0%
Targeted synthetic DMARDs	2	2.0%
Duration of use of bDMARDs (first drug) (n=91)		
<1 Year	11	12.1%
1-5 Years	63	69.2%
>5 Years	17	18.7%
bDMARDs class (second drug) (n=55)		
Anti-TNF	18	32.7%
IL17	26	47.3%
IL23	7	12.7%
Targeted synthetic DMARDs	4	7.3%
Duration of use of bDMARDs (second drug (n=51)		
<1 Year	13	25.5%
1-5 Years	35	68.6%
>5 Years	3	5.9%
bDMARDs class (third drug) (n=24)		
Anti-TNF	5	20.8%
IL17	8	33.3%
IL23	5	20.8%
IL12 and IL 23	2	8.3%
Targeted synthetic DMARDs	4	16.7%
Duration of use of bDMARDs (third drug) (n=21)		
<1 Year	9	42.9%
1-5 Years	12	57.1%
>5 Years	0	0%
cDMARDs (N=141)		
None	55	39.0%
Methotrexate	82	58.2%
Hydroxychloroquine	1	0.7%
Sulphasalazine	3	2.1%
Duration of cDMARDs use (n=81)		
<1 Year	4	4.9%
1-5 Years	52	64.2%
>5 Years	25	30.9%

TNF: tumor necrosis factor, IL: interleukin, b: biologic, c: conventional, DMARDs: Disease-modifying antirheumatic drugs

Table 4 - Comparison of hyperlipidemia at the last visit according to the type of medication used bDMARDs or cDMARDs.

Variables		Hyperlipidemia at the last visit		*P*-value
		Yes	No	
Use of a bDMARDs (n=101)	Yes (%)	24 (31.6%)	52 (68.4%)	0.317
	No (%)	5 (20%)	20 (80%)	
Patient used more than one bDMARDs (n=76)	Yes (%)	12 (27.9%)	31 (72.1%)	0.464
	No (%)	12 (36.4%)	21 (63.6%)	
Disease-modifying antirheumatic drugs (cDMARDs) (n=101)	Yes (%)	21 (30%)	49 (70%)	0.813
	No (%)	8 (25.8%)	23 (74.2%)	
Patient used a bDMARDs and cDMARDs (n=94)	Yes (%)	16 (30.8%)	36 (69.2%)	1.000
	No (%)	13 (31%)	29 (69%)	

b: biologic, c: conventional, DMARDs: disease-modifying antirheumatic drugs

Table 5 - Prevalence of hyperlipidemia in patients with and without comorbidity at first and last visits.

Variables	Comorbidity	No comorbidity
Hyperlipidemia at first visit		
Yes	35 (47.3%)	13 (29.5%)
No	39 (52.7%)	31 (70.5%)
Hyperlipidemia at last visit		
Yes	18 (25.7%)	11 (35.5%)
No	52 (77.3)	20 (64.5%)
P-value	<0.001	1.000

Table 6 - Indirect comparison of prevalence of hyperlipidemia among patients with PsA and general population.

Variables	PsA	General population
Total cholesterol	15.4%	23.3%
Triglycerides	13%	22.7%
Low-density lipoprotein	17.3%	-
Low high-density lipoprotein	18.3%	-

PsA: psoriatic arthritis

result. Another retrospective study reported that the prevalence of hyperlipidemia was 34.6% in psoriasis patients with comorbid PsA versus 28.5% in the matched control group. Vanaclocha et al[13] studied a group of 246 individuals diagnosed with PsA revealed elevated concentrations of HDL-C, while other lipid profiles were within the normal range. In comparison to a large study conducted in South Korea including 15484 patients that observed 14.8% of PsA patients were suffering from hyperlipidemia, this may indicate the effect of genetics on the presence of hyperlipidemia in PsA patients.[15] Furthermore, the prevalence of hyperlipidemia was found to be higher among males compared to females. This gender discrepancy can be attributed to hormonal differences and genetic predisposition, which have been previously reported as influencing factor for lipid metabolism.[16] The results of our study are in line with various previous studies which confirmed that PsA is a systemic disease and is associated with a higher risk of metabolic syndrome such as hyperlipidemia.[17] Our results have shown that the hyperlipidemia rate decreased to 28.7% at the last visit. The percentage of patients with abnormal LDL levels was significantly lower at the last visit compared to the first visit (7.6 vs 17.3%, p=0.004). This may indicate the effect of hyperlipidemia treatment and the disease control on the lipid profile, though in this study we could not find a significant association between the type of PsA medications (DMARDs and bDMARDs) and the prevalence of hyperlipidemia. The use of biological disease-modifying antirheumatic drugs (bDMARDs) and conventional DMARDs (cDMARDs) was examined. While a substantial proportion of patients received bDMARDs (71.6%), no statistically significant association was found between bDMARD use and hyperlipidemia at the last visit. Similarly, the use of multiple biologic drugs or a combination of biologic and cDMARDs did not show significant associations with hyperlipidemia. These findings suggest that, in the context of PsA management, the use of bDMARDs and cDMARDs might not have a direct impact on hyperlipidemia prevalence. However, a previous study has shown that physical exercises can increase the antioxidative activities of enzymes and lower cholesterol concentrations of serum oxidized lipids and HDL-C.[18] The treatment of lipid alterations has been advocated in recent research in PsA patients with hyperlipidemia.[19]

However, these observation needs to be investigated further by prospective studies to investigate the effect of disease control on the lipid profile. Tekin et al[9] reported that patients with PsA have several alterations in their lipid profile including increased triglycerides, low-density lipoprotein cholesterol (LDL-C), and total cholesterol (TC) with reduced concentrations of high-density lipoprotein cholesterol (HDL-C), apolipoprotein A and apolipoprotein B.[19]

Although the exact mechanism that underlies hyperlipidemia in psoriatic arthritis remains poorly understood, inflammation has emerged as a major player in this association. Inflammatory cytokines such as interleukin (IL)-1, IL-6, and tumor necrosis factor (TNF)- in PsA can lead to alterations in the composition of lipoproteins. These structural changes include the formation of neo-epitopes which trigger HDL alterations and the production of autoantibodies.[20]

Currently, the therapeutic approach for PsA encompasses not only the maintenance of joint function but also the reduction of symptoms related to physical functioning, such as enthesitis and dactylitis, as well as improvements in nail and skin conditions.[21] Lipid-lowering drugs are also used to lower the levels of lipids in the blood of PsA patients.

Study limitation. The main limitation of our study is that the exclusion value exceeded 5% of the total sample. Secondly, the study did not extensively explore the impact of lifestyle factors, such as diet and physical activity, which could contribute to hyperlipidemia development. Thirdly, this study has no control group; however, an indirect comparison with previous study was done.

It is recommended that healthcare providers who treat patients with psoriatic arthritis monitor lipid levels regularly and provide appropriate management for hyperlipidemia. This may involve lifestyle changes, such as diet and exercise, as well as medication, such as statins. Additionally, the study emphasizes the importance of considering gender differences when managing hyperlipidemia in patients with psoriatic arthritis. Future studies should utilize a prospective design and involve multiple centers with a larger sample size to investigate the association between PsA, DMARDs, and hyperlipidemia.

In conclusion, our study result is comparable to other studies in different countries. indirect comparison with previous study of prevalence of hyperlipidemia in average population was comparable. However, hyperlipidemia needs to be screened and monitored, especially in the presence of comorbidities like hypertension and diabetes and longer disease duration; further prospective studies will need to assess the effect of disease control on hyperlipidemia.

This study is a significant contribution to scientific evidence in the context of the prevalence of hyperlipidemia in patients with psoriatic arthritis, particularly in the Saudi population where little research has focused on this aspect. However, this study did not extensively explore the impact of lifestyle factors, such as diet and physical activity which could contribute to hyperlipidemiadevelopment.

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