Utility of the Siriraj Psoriatic Arthritis Screening Tool, the Thai Psoriasis Epidemiology Screening Tool, and the Early Arthritis for Psoriatic Patients Questionnaire to Screen for Psoriatic Arthritis in an Outpatient Dermatology Clinic Setting, and Identification of Factors Significantly Associated with Psoriatic Arthritis

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ABSTRACT

Objective: To assess the clinical utility of the Psoriasis Epidemiology Screening Tool (PEST), the Early Arthritis for Psoriatic Patients (EARP) questionnaire, and the Siriraj Psoriatic Arthritis Screening Tool (SiPAT) as screening tools for psoriatic arthritis (PsA), and to identify factors significantly associated with PsA.

Methods: This cross-sectional study included adult psoriasis patients who attended the outpatient clinic at Siriraj Hospital and had not been diagnosed with PsA during 1 March 2017 to 28 February 2018. Participants completed the EARP, PEST, and SiPAT, after which musculoskeletal history was taken, and examination and radiography were performed. Diagnosis of PsA was based on Classification Criteria for Psoriatic Arthritis. Receiver operator characteristic (ROC) curves, sensitivity, and specificity were used to determine assessment tool performance. Logistic regression analysis was used to identify factors associated with PsA.

Results: Eighty-seven patients with a mean age of 45.90±14.75 years were enrolled. Twenty-six (29.88%) patients were diagnosed as PsA. According to ROC values, EARP had the best discriminative power (0.83) for distinguishing between psoriatic patients with and without PsA (SiPAT: 0.78, PEST: 0.77). SiPAT had the highest sensitivity (92.3%), followed by EARP (84.6%) and PEST (50.0%); whereas, PEST had the highest specificity (82.0%), followed by EARP (62.3%) and SiPAT (54.1%) for detecting PsA. Multivariate analysis revealed body surface area involvement >10% to be the only independent predictor of PsA (OR: 2.99, 95% CI: 1.09-8.21).

Conclusion: SiPAT is an effective and simple to use tool for screening PsA in psoriasis patients. Body surface area involvement >10% is a significant predictor of PsA.

Keywords: Factors associated with PsA; Psoriasis Epidemiology Screening Tool (PEST); screening tools for psoriatic arthritis; the Early Arthritis for Psoriatic Patients (EARP) questionnaire; the Siriraj Psoriatic Arthritis Screening Tool (SiPAT) (Siriraj Med J 2019; 71: 405-413)

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INTRODUCTION

Psoriatic arthritis (PsA) is a multidimensional musculoskeletal inflammatory disease that is associated with psoriasis (Ps). The prevalence of PsA in Ps was reported to range from 6 to 42%.[1] Early detection and intervention is important for good long-term outcome in terms of achieving remission, stopping and reversing structural change, and regaining and preserving function.[2] Most patients present with Ps before developing PsA.[1] Thus, dermatologists and general practitioners play an important role in the identification of PsA. However, up to 40% of patients with Ps had undiagnosed PsA.[3] A simple and effective PsA screening tool is, therefore, needed. Currently available screening tools include the Psoriatic Arthritis Screening and Evaluation (PASE) questionnaire[4], the Psoriasis Epidemiology Screening Tool (PEST)[5], and the Early Arthritis for Psoriatic Patients (EARP) questionnaire[6] for patients with Ps, and the Toronto Psoriatic Arthritis Screen II (ToPAS II) questionnaire[7] for both Ps patients and the general population. The reported variation in the performance of these tools may be due to patient musculoskeletal manifestations.[8-9] PsA-related musculoskeletal manifestations are divided into the following 3 groups: spinal inflammation, peripheral arthritis, and enthesitis. The Siriraj Psoriatic Arthritis Screening Tool (SiPAT), which focuses on the evaluation of musculoskeletal manifestations, is a composite tool that was developed via the adoption of 2 questions from the EARP questionnaire, and 1 question from PEST.[10] The copyright owners of the PEST and EARP tools granted formal permission for these assessments to be translated into Thai language and validated.[10] A previous study showed the sensitivity and specificity to be 91% and 69% for SiPAT; 83% and 79% for EARP; and, 72% and 90% for PEST, respectively (all Thai versions).[10] However, there are two notable reasons why the aforementioned sensitivities may have been overestimated. First, that study included both diagnosed and undiagnosed PsA patients. Second, it was performed in a psoriasis clinic where the majority of patients would have severe skin disease and/or musculoskeletal symptoms. Accordingly, the aim of this study was to investigate the clinical utility of the SiPAT, the PEST, and the EARP questionnaire to screen for PsA in an outpatient dermatology clinic setting, and to identify factors significantly associated with PsA.

MATERIALS AND METHODS

Adult psoriasis patients aged 18 years or older who attended the outpatient dermatology clinic, Siriraj Hospital during 1 March 2017 to 28 February 2018, and that had never been diagnosed with PsA were asked to voluntarily participate in this cross-sectional study. Siriraj Hospital is Thailand's largest university-based national tertiary referral center. The protocol for this study was approved by the Siriraj Institutional Review Board, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand (Si 659/2012), and written informed consent was obtained from all participants. This study complied with the principles set forth in the 1964 Declaration of Helsinki and all of its subsequent amendments.

All enrolled patients were asked to individually complete (i) the validated Thai version of PEST, (ii) the validated Thai version of EARP, and (iii) the SiPAT.[10] These three questionnaires were provided not only as three separate forms, but they were also given in random order to avoid completion bias. Table 1 shows all of the questions contained in the three questionnaires. The EARP and PEST contain 10 and 5 questions, respectively, with a score of 1 for each positive answer and a score of 0 for each negative answer. A score of 3 or higher for each of these two questionnaires was considered to indicate that the patient was positive for PsA. The SiPAT consists of 3 questions designed to elicit information about the presence of inflammatory back pain, peripheral arthritis, and heel enthesitis. A positive answer was scored as 1, and a negative answer was scored as 0. A SiPAT score of 1 or higher was considered to indicate that the patient was positive for PsA.

An evaluation of patient medical records and physical examinations were then performed. Current non-steroidal anti-inflammatory drugs (NSAIDs) use was defined as current use or drug discontinuation for less than 2 weeks before recruitment. Musculoskeletal examination was performed independently by one expert rheumatologist (PC). Rheumatoid factor (RF), and radiography of the cervical spine, lumbar spine, pelvis, hands, and feet were performed. All radiography results were interpreted by one expert rheumatologist (PC). The expert rheumatologist (PC) who examined patients and evaluated patient data was blinded to patient questionnaire data from the EARP, PEST, and SiPAT. PsA was diagnosed by a rheumatologist according to the Classification Criteria for Psoriatic Arthritis (CASPAR).[11] Patterns of PsA, including peripheral arthritis, axial inflammation, and enthesitis, were defined using patient history, physical examination of joint/musculoskeletal pain, and radiography.

Sample size calculation and statistical analysis

Using an estimated specificity of about 60% and

TABLE 1. The questions asked on the Early Arthritis for Psoriatic Patients (EARP) questionnaire, the Psoriasis Epidemiology Screening Tool (PEST) questionnaire, and the Siriraj Psoriatic Arthritis Screening Tool (SiPAT). A 'yes' answer receives a score of 1, and a 'no' answer receives a score of 0.

Assessment tools	Yes	No
EARP*		
1. Do your joints hurt?	1	0
2. Have you taken anti-inflammatory drugs more than twice a week for joint pain within the last 3 months?	1	0
3. Do you wake up at night because of low back pain?	1	0
4. Do you feel stiffness in your hands for more than 30 minutes in the morning?	1	0
5. Do your wrists and fingers hurt?	1	0
6. Do your wrists and fingers swell?	1	0
7. Does one finger hurt and swell for more than 3 days?	1	0
8. Does your Achilles tendon swell?	1	0
9. Do your feet or ankles hurt?	1	0
10. Do your elbows or hips hurt?	1	0
PEST**		
1. Have you ever had a swollen joint (or joints)?	1	0
2. Has a doctor ever told you that you have arthritis?	1	0
3. Do your fingernails or toenails have holes or pits?	1	0
4. Have you had pain in your heel?	1	0
5. Have you had a finger or toe that was completely swollen and painful for no apparent reason	1	0
SiPAT***		
1. Do you wake up at night because of low back pain?	1	0
2. Do your wrists and fingers swell?	1	0
3. Have you had pain in your heel?	1	0

*,**Formal permission to validate and translate these two assessment tools into Thai language was obtained from the copyright owners. The validated Thai versions of these two questionnaires were used in this study. ***Items contained in the SiPAT questionnaire were adopted from items 3 and 6 of the EARP, and from item 4 of the PEST. Its validated version was used in this study.

a 95% confidence interval (CI) of 60% ± 12% from previous study, a sample size of 65 subjects without PsA was required for this study.[10] Based on an estimated prevalence of PsA of about 25%, a total of 88 subjects with Ps was calculated.

Descriptive statistics were used to summarize patient demographic and clinical data. Pearson's Chi-square test or Fisher's exact test was used to compare categorical data. Independent t-test and Mann-Whitney U test were used to compare continuous parametric and continuous non-parametric data, respectively. Receiver operating characteristic (ROC) curves were generated and analyzed to evaluate the diagnostic performance of the EARP, PEST, and SiPAT questionnaires. The area under the ROC curve (AUC) measured how well each questionnaire could distinguish between psoriatic patients with and without PsA. An AUC of 0.5 indicated no distinguishable difference between the two conditions, while an AUC of 1 reflected a clear and absolute distinguishable difference between PsA and no PsA.[12] Logistic regression was employed to identify factors significantly associated with PsA. Variables with a *p*-value less than or equal to 0.2 in univariate analysis were entered into multivariate analysis to identify independent predictors of PsA. A *p*-value less than or equal to 0.05 in multivariate analysis was regarded as being statistically significant. Data were analyzed using PASW Statistics version 18 (SPSS, Inc., Chicago, IL, USA).

RESULTS

Eighty-eight participants were initially enrolled; however, one participant was excluded before any investigations were performed due to age less than 18 years. Eighty-seven patients with a mean age of 45.90±14.75 years were enrolled in this study. The most common underlying diseases were hypertension (30%), dyslipidemia (27.6%), and diabetes mellitus (13.8%). Primary, secondary, vocational, and tertiary education was completed in 16, 21, 9, and 41 patients, respectively. All patients were able to answer all of the questions on all three questionnaires (18 questions in total) within 5 minutes. According to CASPAR criteria, 26 (29.9%) patients had newly established PsA. Of patients with no PsA, 34 (55.7%) patients had other musculoskeletal diseases, including mechanical back pain (14 patients), knee osteoarthritis (10 patients), hand osteoarthritis (5 patients), heel pain related to activity (4 patients), and gout (1 patient). Six (23.1%) patients with PsA also had other musculoskeletal diseases, including mechanical back pain (4 patients), knee osteoarthritis (1 patient), and coexisting mechanical back pain and knee osteoarthritis (1 patient). The data in Table 2 shows longer disease duration, presence of psoriatic nail, and body surface area (BSA) involvement >10% to be significantly more common in patients with PsA. Moreover, the EARP, PEST, and SiPAT scores obtained from psoriatic patients with PsA were significantly higher than the scores obtained from psoriatic patients without PsA.

The diagnostic performance of the three questionnaires for detecting PsA and patterns of PsA is shown in Table 3. According to area under the ROC curve (AUC) values, the EARP questionnaire demonstrated the best discriminative power (0.83) for distinguishing between psoriatic patients with and without PsA (SiPAT: PEST: 0.77). All three questionnaires performed well in all patterns of PsA, except in purely axial inflammation. The SiPAT had the highest sensitivity (92.3%), followed by EARP (84.6%) and PEST (50.0%). Conversely, the PEST had the highest specificity (82.0%), followed by EARP (62.3%) and SiPAT (54.1%), regardless of musculoskeletal patterns. For subgroup of PsA pattern analysis, the sensitivity of EARP and SiPAT were still good in the three major musculoskeletal patterns regardless of combinations of other patterns, except pure axial inflammation. Conversely, the sensitivity of PEST were lower than EARP and SiPAT in the three major musculoskeletal patterns regardless of combinations of other patterns, especially axial pattern. In addition, the PEST could not detect any PsA patients with pure axial inflammation.

Univariate analysis showed disease duration more than 10 years [odds ratio (OR): 3.03, 95% CI: 1.14-8.03; p=0.026], nail involvement (OR: 5.02, 95% CI: 1.07-23.52; p=0.040), and BSA involvement higher than 10% (OR: 3.58, 95% CI: 1.36-9.41; p=0.010) to be significantly associated with PsA (Table 4). Multivariate analysis revealed BSA involvement >10% to be the only independent predictor of PsA (OR: 2.99, 95% CI: 1.09-8.21; p=0.034) (Table 5).

DISCUSSION

Dermatologists need an effective and simple to use screening tool that can differentiate between Ps patients with and without PsA. Several of the available PsA screening tools, including PASE (15 questions), EARP (10 questions), and ToPAS II (13 questions with pictures), contain at least 10 questions, which may be complicated, and time-consuming for use in a dermatology outpatient clinic setting.[4, 6-7] The Psoriatic arthritis UnclutteRed screening Evaluation-4 (PURE-4) (4 questions) was recently developed for dermatologists to screen for PsA.[13] The overall performance of PURE-4 for diagnosing newly established PsA was good with sensitivity (85.7%) and specificity (83.6%), and an AUC of 0.88.[13] The Simple Psoriatic Arthritis Screening (SiPAS) questionnaire (5 questions), which is another tool that was developed to screen for PsA, was reported to have a sensitivity of 79% and a specificity of 87%.[14]

SiPAT was designed as a short PsA screening tool (3 questions), which is similar to the 4-question PURE-4 and the 5-question SiPAS. The three questions from the PEST and EARP assessments that were considered most relevant to detecting the 3 major patterns of PsA were adopted for use in the SiPAT questionnaire.[10] Regardless of musculoskeletal patterns, the specificity of SiPAT was much lower than that of the PURE-4 and the SiPAS for detecting PsA. The study population in a study that investigated the performance of the SiPAS did not include patients with other rheumatic diseases that can mimic PsA.[14] In contrast, our study included all Ps patients, which included a high proportion of other musculoskeletal diseases, especially mechanical back pain. Seven patients without PsA answered 'yes' for the first question of the SiPAT (*Do you wake up at night because of low back pain?*). Of those 7 patients, six had mechanical back pain, and the one remaining patient had no evidence of musculoskeletal disease. Low back pain is a common symptom in general population. To improve the performance of the SiPAT questionnaire for detecting spinal inflammation, the question used to detect inflammatory back pain should be amended in the future.

TABLE 2. Demographic and clinical characteristics compared between patients with and without psoriatic arthritis (PsA) (N=87).

Characteristics	No PsA (n=61)	PsA (n=26)	*P*-value
Age (yrs), mean±SD	46.0±14.7	45.6±15.3	0.896
Male gender, n (%)	30 (49.2%)	16 (61.5%)	0.290
Age of onset (yrs), n (%)			0.784
<40	38 (62.3%)	17 (65.4%)	
≥40	23 (37.7%)	9 (34.6%)	
Disease duration (yrs), median (IQR, min-max)	7.6 (10.8, 0.6-43.6)	12.2 (14.4, 0.26-40.5)	*0.018*
Psoriatic nail, n (%)	43 (70.5%)	24 (92.3%)	*0.027*
Body mass index ≥25 kg/m^2, n (%)	31 (53.4%)	17 (68.0%)	0.218
Body surface area (BSA) involvement, n (%)			
≤10%	46 (75.4%)	12 (46.2%)	*0.008*
>10%	15 (24.6%)	14 (53.8%)	
PASI, n (%)			
≤10%	49 (80.3%)	18 (69.2%)	0.260
>10%	12 (19.7%)	8 (30.8%)	
Past and current treatment, n (%)			
Only topical treatment	23 (37.7%)	9 (34.6%)	0.784
Systemic treatment + phototherapy	38 (62.3%)	17 (65.4%)	
Methotrexate use for psoriasis, n (%)			
Current	18 (29.5%)	7 (26.9%)	0.807
NSAIDs use, n (%)			
Current	2 (3.3%)	4 (15.4%)	0.063
Past	19 (31.1%)	6 (23.1%)	0.446
Positive rheumatoid factor (RF), n (%)	17/58 (29.3%)	9/25 (36.0%)	0.547
Pattern of PsA*, n (%)			
Peripheral arthritis	-	17 (65.4%)	
Axial inflammation	-	15 (57.7%)	
Enthesitis	-	8 (30.8%)	
Assessment tools, mean±SD			
EARP score	1.9±2.0	4.5±1.9	*<0.001*
PEST score	1.4±1.2	2.7±1.3	*<0.001*
SiPAT score	0.6±0.7	1.5±0.8	*<0.001*

A *p*-value<0.05 indicates statistical significance

Abbreviations: SD = standard deviation; IQR = interquartile range; PASI = Psoriasis Area & Severity Index; NSAIDS = non-steroidal anti-inflammatory drugs; EARP = Early Arthritis for Psoriatic Patients questionnaire; PEST = Psoriasis Epidemiology Screening Tool; SiPAT = Siriraj Psoriatic Arthritis Screening Tool

*One patient could have one more pattern of PsA

TABLE 3. Diagnostic performance of the Early Arthritis for Psoriatic Patients (EARP) questionnaire, the Psoriasis Epidemiology Screening Tool (PEST), and the Siriraj Psoriatic Arthritis Screening Tool (SiPAT).

Tools	AUC (95% CI)	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	LR+	LR-
All psoriatic arthritis patients (n=26)							
EARP	0.83 (0.73-0.92)	84.6%	62.3%	48.9%	90.5%	2.24	0.24
PEST	0.77 (0.67-0.87)	50.0%	82.0%	54.2%	79.4%	2.78	0.61
SiPAT	0.79 (0.69-0.89)	92.3%	54.1%	46.2%	94.3%	2	0.15
Patients with predominant peripheral arthritis (n=17)							
EARP	0.92 (0.86-0.98)	100%	62.3%	42.5%	100%	2.65	0
PEST	0.85 (0.75-0.95)	70.6%	82.0%	52.2%	90.9%	3.92	0.36
SiPAT	0.83 (0.74-0.93)	100%	54.1%	37.8%	100%	2.17	0
Patients with predominant axial inflammation (n=15)							
EARP	0.75 (0.62-0.89)	73.3%	62.3%	32.4%	90.4%	1.94	0.43
PEST	0.70 (0.57-0.83)	33.3%	82.0%	31.3%	83.3%	1.85	0.81
SiPAT	0.75 (0.62-0.89)	86.7%	54.1%	31.7%	94.3%	1.89	0.25
Patients with predominant enthesitis (n=8)							
EARP	0.87 (0.74-1.00)	87.5%	62.3%	23.3%	97.4%	2.32	0.20
PEST	0.83 (0.69-0.97)	62.5%	82.0%	31.3%	94.3%	3.47	0.46
SiPAT	0.86 (0.75-0.97)	100%	54.1%	22.2%	100%	2.18	0
Patients with pure peripheral arthritis (n=9)							
EARP	0.92 (0.86-0.99)	100%	61.3%	27.3%	100%	2.58	0
PEST	0.84 (0.71-0.96)	66.7%	82.3%	35.3%	94.4%	3.77	0.40
SiPAT	0.81 (0.69-0.93)	100%	51.6%	23.1%	100%	2.07	0
Patients with pure axial inflammation (n=5)							
EARP	0.54 (0.34-0.74)	40.0%	62.3%	8.0%	92.7%	1.06	0.96
PEST	0.56 (0.39-0.73)	0.0%	82.0%	0.0%	90.1%	0	1.22
SiPAT	0.58 (0.31-0.84)	60.0%	54.1%	9.7%	94.3%	1.31	0.74

Patients without PsA (n=61) were included in all subsections of this analysis. There was no patient with pure enthesitis, so it was not further analyzed.

Abbreviations: AUC = area under the curve; CI = confidence interval; PPV = positive predictive value; NPV = negative predictive value; LR+ = positive likelihood ratio; LR- = negative likelihood ratio.

TABLE 4. Univariate analysis for factors associated with psoriatic arthritis (PsA).

Factors	Patients (%)		Odds ratio (95% CI)	*P*-value
	No PsA	PsA		
Sex				
Male	30 (49.2)	16 (61.5)	1.65 (0.65 - 4.22)	0.292
Female	31 (50.8)	10 (29.9)	1	
Obesity, BMI (kg/m^2)				
≥ 25	31 (53.4)	17 (68.0)	1.85 (0.69 - 4.96)	0.221
< 25	27 (46.6)	8 (32.0)	1	
Disease duration (years)				
≥ 10	26 (42.6)	18 (69.2)	3.03 (1.14 - 8.03)	0.026
< 10	35 (57.4)	8 (30.8)	1	
Nail involvement				
Yes	43 (70.5)	24 (92.3)	5.02 (1.07 - 23.52)	0.040
No	18 (29.5)	2 (7.7)	1	
Body surface area (BSA)				
> 10%	15 (24.6)	14 (53.8)	3.58 (1.36 - 9.41)	0.010
≤ 10%	46 (75.4)	12 (46.2)	1	
Psoriasis Area and Severity Index (PASI)				
> 10%	12 (19.7)	8 (30.8)	1.82 (0.638 - 5.16)	0.264
≤ 10%	49 (80.3)	18 (69.2)	1	
Current treatment				
Topical treatment	29 (47.5)	12 (46.2)	1.06 (0.42 - 2.65)	0.906
Systemic treatment + phototherapy	32 (52.5)	14 (53.8)	1	

Abbreviations: CI = confidence interval, BMI = body mass index

TABLE 5. Multivariate analysis for factors associated with psoriatic arthritis.

Variable	Adjusted odds ratio (95%CI)	*P*-value
Disease duration > 10 years	2.63 (0.94-7.37)	0.065
Nail involvement	4.31 (0.87-21.42)	0.075
BSA involvement > 10%	2.99 (1.09-8.21)	0.034

Abbreviations: CI = confidence interval, BSA = Body surface area

Conversely, the sensitivities of the SiPAT were very high, with 90-100% sensitivity for predominant enthesitis and peripheral arthritis in both previous study[10] and the current study. However, no sensitivities and specificities for specific musculoskeletal manifestations were reported for the PURE-4 or the SiPAS. Moreover, they have not been evaluated in other populations, which could show that their diagnostic performance may be decreased from a development step as the previous report.[8] To be a screening tool for detecting early PsA in psoriasis population, the sensitivity of the test might be more important than the specificity.[15] These screening tools are designed to identify Ps patients with probable PsA that need to be evaluated by a rheumatologist. Detection of PsA at an early stage and treatment may result in preventing deformity and good function.[16] In addition, the performance of the screening tools may depend on ability to detect all patterns of PsA.[8] The sensitivity and specificity of EARP and SiPAT for detecting PsA were good and comparable, regardless of PsA patterns in this study. Conversely, the PEST had much lower performance in detecting axial inflammation than EARP and SiPAT. It may result from EARP and SiPAT capturing all three main patterns of PsA while PEST has no question assessing spinal inflammation.

The pathogenesis that contributes to the development of PsA needs to be further elucidated. Four large cohort studies revealed increasing BMI, smoker, and excessive alcohol consumption to be significantly associated with the development of PsA.[17] The diagnosis of PsA in those four cohort studies was based on medical code and patient self-report verified by PASE tool. Moreover, previous case-control studies which PsA were diagnosed by a rheumatologist using CASPAR criteria reported scalp psoriasis, intergluteal and/or perianal psoriasis, >3 affected sites, nail dystrophy, injuries, infections that required antibiotics, and heavy lifting to be significantly associated with the development of PsA; however, the reported associations were inconsistent among studies.[17] The observed variation in associations may be due to variations in patient characteristics. In the present study, we found only severity of Ps (BSA involvement more than 10%) to be an independent predictor of PsA in multivariate analysis which the same as Haroon, *et al* 'study.[8] The mentionable limitations of this study include those associated with studies with a cross-sectional design, including lack of temporal association (risk factors and disease are measured at the same point in time), and a small study population from a single center compared to the larger populations enrolled in multicenter cohort studies.

In conclusion, the results of this study revealed the SiPAT screening tool to have a relatively high sensitivity for detecting PsA in patients with Ps in an outpatient dermatology clinic setting. Although the pathogenesis of PsA and the risk factors for the development of PsA both need to be further studied and elucidated, the findings of our study suggest that treatment of skin psoriasis may prevent the development of PsA.

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