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Prevalence of Psoriatic Arthritis in Nagano Prefecture, Japan, and Efficacy of the Psoriasis Epidemiology Screening Tool: A Real-World Survey

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Pain, stiffness, and swelling are the main joint symptoms of psoriatic arthritis (PsA); however, they are also common symptoms of other joint diseases. Therefore, it is challenging to distinguish PsA from other joint diseases. To evaluate the prevalence of PsA and the frequency of joint symptoms in psoriasis patients, we conducted a prefecture-wide survey using the Psoriasis Epidemiology Screening Tool (PEST), a patient questionnaire for screening PsA to assess joint symptoms. Data were collected from 764 psoriasis patients, all of whom visited hospitals (55.1%) or clinics (44.9%) in Nagano Prefecture, Japan. The proportion of psoriasis patients with PsA was 6.5% (50 of 764); four patients (1.2%) with PsA were treated in clinics, while 46 patients (10.9%) were treated in hospitals. Based on the responses to the PEST, 18.1% of patients with psoriasis had joint symptoms. In contrast, 73.2% of psoriasis patients with joint symptoms did not have PsA. The PEST showed 52% sensitivity and 93.4% specificity for PsA. In addition, fingernail alterations were common in PsA. The proportion of the population with PsA was lower than reported previously in Japan. This may have been due to the enrollment of a large number of patients treated in clinics. Many patients with PsA were treated at hospitals, which likely reflects the tendency of patients with joint symptoms to receive intensive treatment in hospitals. In addition, based on the lower sensitivity of the PEST in this study, further studies are necessary to establish the validity of the PEST.

Keywords: fingernail alterations; joint symptoms; psoriasis; Psoriasis Epidemiology Screening Tool (PEST); psoriatic arthritis

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Introduction

Psoriasis is a chronic inflammatory skin disease with a prevalence rate of 2% in Europe and North America (Boehncke and Schön 2015) but 0.34% in Japan (Kubota et al. 2015). Although psoriasis is widely recognized as a skin disease, it also occurs in patients with arthritis, a condition referred to as psoriatic arthritis (PsA). PsA has a significant impact on the quality of life of patients. PsA should always be kept in mind in psoriasis patients with joint symptoms, and should be differentiated from other diseases with similar joint symptoms.

Skin symptoms appear earlier than joint symptoms in 70%-80% of PsA patients (Gottlieb et al. 2006; Ogdie et al. 2013). Therefore, it would be beneficial for dermatologists to be able to identify individuals that may have PsA. However, joint symptoms in psoriasis patients may be underestimated because it is not easy for dermatologists to distinguish PsA from other comorbid joint diseases. As diagnostic methods for PsA are not fully established, the development of tools to aid in diagnosis of PsA is required. Psoriatic lesions on the head, fingernails, and gluteal cleft are commonly associated with PsA (Wilson et al. 2009). Several reports indicated that psoriasis patients with fingernail lesions are at increased risk of developing PsA (Soltani-Arabshahi et al. 2010; Eder et al. 2016; Yan et al. 2018). In addition, screening tools based on patient questionnaires have been established (Dominguez et al. 2010). One such questionnaire is the Psoriasis Epidemiology Screening Tool (PEST) (Ibrahim et al. 2009), which consists of five ques-

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tions. However, it is unclear what proportion of PsA patients are identified by the PEST.

In this study, we performed a prefecture-wide survey to investigate the prevalence of PsA, the percentage of psoriasis patients with PsA and joint symptoms, and skin symptoms specifically affecting PsA patients in Japan. In addition, we assessed the utility of the PEST as a tool for PsA diagnosis.

Methods

Patients and study design

The study was approved by the Ethics Committee of Shinshu University School of Medicine (approval number: 2271). A total of 60 dermatologists from 33 medical facilities (20 clinics and 13 hospitals) in Nagano Prefecture, Japan, participated in this study from May 2013 to August 2014. Rheumatologists did not participate in the study. Nagano Prefecture has a population of approximately 2,100,000. This survey was based on the results of a medical questionnaire and dermatological examination of 764 psoriasis patients. A diagnosis of psoriasis was based on medical records and physical examination. The diagnosis of PsA was made by dermatologists with reference to the Classification of Psoriatic Arthritis (CASPAR) criteria (Gottlieb et al. 2006; Ogdie et al. 2013). The questionnaire consisted of two sections: one for the dermatologist and another for the patient. The questionnaire for dermatologists asked about the patient's age and sex, type of psoriasis, duration of illness, current treatment, smoking history, and evaluation of skin lesions on the head, fingernails, and gluteal cleft. The questionnaire for patients included the PEST, the area and severity of skin lesions, and the degree of joint pain. The Japanese translation of the PEST questionnaire was used in this study. The PEST consists of five questions: (1) "Have you ever had a swollen joint (or joints)*?*"; (2) "Has a doctor ever told you that you have arthritis*?*"; (3) "Do your fingernails or toenails have holes or pits*?*"; (4) "Have you had pain in your heel*?*"; and (5) "Have you had a finger or toe that was completely swollen and painful for no apparent reason*?*" (Ibrahim et al. 2009).

Statistical analysis

Statistical comparisons between patients with PsA and those with other types of psoriasis were performed using Student's *t* test or the Chi-squared test. In all analyses, $p < 0.05$ was taken to indicate statistical significance.

Results

Prevalence of psoriatic arthritis in patients with psoriasis

Data from medical records and clinical examinations were collected from 764 patients with psoriasis: 343 patients (44.9%) attending clinics and 421 (55.1%) attending hospitals. Fifty patients (31 male, 18 female, and one unidentified) had been diagnosed with PsA; the percentage of psoriasis patients with PsA was 6.5% (Table 1). In Nagano Prefecture, the prevalence of PsA per 100,000 population was 2.3. The numbers of patients with other subtypes of psoriasis were as follows: psoriasis vulgaris, 684 (89.5%); pustular psoriasis, 9 (1.2%); guttate psoriasis, 13 (1.7%); psoriatic erythroderma, 8 (1.0%).

Table 1. Composition of psoriasis patients.

Type	Number of patients	Ratio (%)
Psoriasis vulgaris	684	89.5
Psoriatic arthritis	50	6.5
Pustular psoriasis	9	1.2
Guttate psoriasis	13	1.7
Psoriasis erythroderma	8	1.0

Characteristics of patients with PsA

The mean age of PsA patients at the time of the study was 51.7 (standard deviation 13.4) years and the average duration of illness was 13.1 (10.8) years; 62% were male (Table 2). In contrast, the average age of patients with other subtypes of psoriasis was 59.9 (15.6) years and the average duration of illness was 11.9 (10.8) years; 71.4% were male. PsA patients were significantly younger than those with other subtypes of psoriasis (Student's *t* test, $p < 0.0005$).

Four and 46 patients with PsA were treated in clinics and hospitals, respectively; thus, the majority of PsA patients were treated in the latter. However, 339 and 375 patients with other subtypes of psoriasis were treated in clinics and hospitals, respectively.

Treatments for PsA and other subtypes of psoriasis were as follows: biologics, 34% and 6.0% (17 and 43 cases), respectively; immunosuppressants (mostly cyclosporin A), 16% and 4.6% (8 and 33 cases), respectively; etretinate, 4% and 7.7% (2 and 55 cases), respectively; and methotrexate, 4% and 0.1% (2 and 1 case), respectively. Phototherapy was performed in 6% and 8.8% (3 and 63 cases) of patients with PsA and other subtypes of psoriasis, respectively. The proportions of patients treated with topical agents alone were 34% and 71.7% (17 and 512 cases), respectively.

Prevalence of joint symptoms in patients with psoriasis

The frequency of joint symptoms was calculated based on the number of patients who responded "yes" to queries 1, 4, and 5 (one or more positive answers). Joint symptoms were found in 18.1% (138 cases), 74% (37 cases), and 14.1% (101 cases) of those with psoriasis, PsA, and other subtypes of psoriasis, respectively (Fig. 1). Query 2 was not included in the assessment of joint symptoms because it did not ask about subjective symptoms.

PEST as a PsA screening tool

Each "yes" response to any of the five questions has a value of 1 point, and a score of ≥ 3 indicated a risk of having PsA (Wilson et al. 2009). In this study, PEST scores

Table 2. Characteristics of patients with psoriatic arthritis (PsA).

	PsA	Other subtypes of psoriasis
Total	50	714
Male (%)	31 (62)	510 (71.4)
Female (%)	18	185
Age (Mean ± SD)*	51.7 ± 13.4	59.9 ± 15.6
Duration of illness (Mean ± SD)	13.1 ± 10.8	11.9 ± 10.8
Clinic	4	339
Hospital	46	375
Current therapy		
Biologics (%)	17 (34)	43 (6.0)
Infliximab	3	4
Adalimumab	9	17
Ustekinumab	1	16
Others	4	6
Immunosuppressants (%)	8 (16)	33 (4.6)
Etretinate (%)	2 (4)	55 (7.7)
Methotrexate (%)	2 (4)	1 (0.1)
Topical treatment alone (%)	17 (34)	512 (71.7)
Phototherapy (%)	3 (6)	63 (8.8)
Smoking (%)	9 (18)	186 (26.1)

*$p < 0.0005$ (Student's t test).

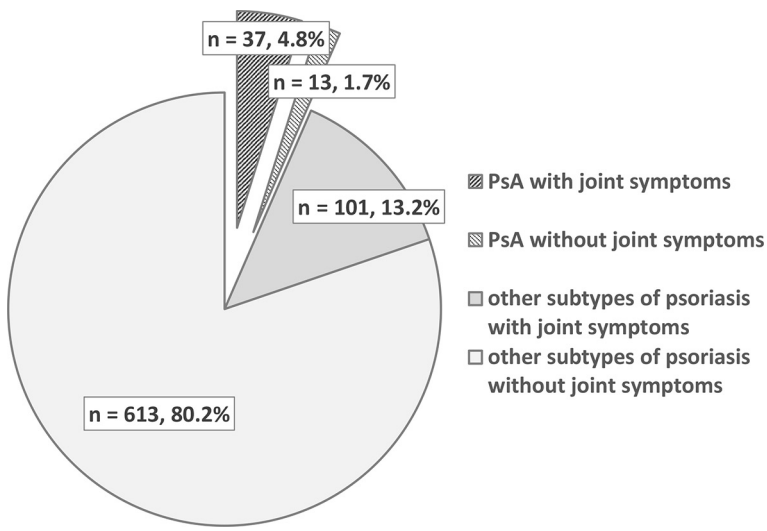

Fig. 1. Prevalence of joint symptoms in patients with psoriasis.
At least one positive response to queries 1, 4, and 5 of the Psoriasis Epidemiology Screening Tool (PEST) defined patients as having joint symptoms. Of 764 patients with psoriasis, 138 (18.1%) had joint symptoms. Of 138 patients with joint symptoms, 37 (26.8%) were diagnosed with psoriatic arthritis (PsA).

were compared with the medical diagnosis: PsA or other subtypes of psoriasis (Table 3, Fig. 2). None of the 764 patients had data missing from any of the five PEST questions. Overall, 73 (9.5%) had a PEST score ≥ 3: 26 patients (52%) with PsA and 47 (6.6%) with other subtypes of psoriasis. The sensitivity and specificity of the PEST for diagnosing PsA were 52% and 93.4%, respectively.

Despite a diagnosis of PsA, 25 patients (50%) responded "no" to query 2 (Table 4), suggesting that half of PsA patients did not fully recognize their condition.

Skin lesions commonly associated with PsA

Finally, we examined the presence of skin lesions on the head, fingernails, and gluteal cleft. The majority of

Table 3. Sensitivity and specificity of the Psoriasis Epidemiology Screening Tool (PEST) score for psoriatic arthritis (PsA).

PEST score	PsA (n)	Other subtypes of psoriasis (n)	Sensitivity (%)	Specificity (%)
≧ 3	26	47	52	93.4
< 3	24	667	-	-

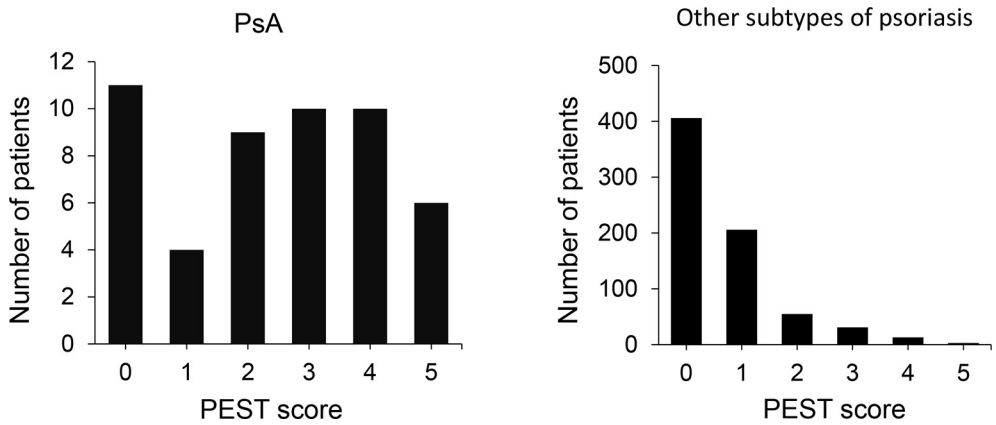

Fig. 2. The Psoriasis Epidemiology Screening Tool (PEST) scores for psoriatic arthritis (PsA) and other subtypes of psoriasis. The PEST scores were based on the responses given by 50 patients with PsA and 714 patients with other subtypes of psoriasis.

Table 4. Sensitivity and specificity of each Psoriasis Epidemiology Screening Tool (PEST) query for psoriatic arthritis (PsA).

PEST query	PsA (n)	Other subtypes of psoriasis (n)	Sensitivity (%)	Specificity (%)
Q1	31	74	62	89.6
Q2	25	49	50	93.1
Q3	28	220	56	69.2
Q4	11	64	22	91.0
Q5	27	71	57	90.1

patients with PsA (35 cases, 70%) had skin lesions on the head, followed by the fingernails (27 cases, 54%) and gluteal cleft (12 cases, 24%) (Fig. 3). Of the patients with other subtypes of psoriasis, 64.3% had skin lesions on the head (459 cases), 29.3% on the fingernails (209 cases), and 15.0% in the gluteal cleft (117 cases). The difference in frequency of fingernail lesions between those with PsA and other subtypes of psoriasis was statistically significant (Chi-squared test, $p < 0.0005$).

Discussion

Occasionally, PsA causes severe pain and irreversible joint deformities that affect quality of life. Therefore, rapid diagnosis and appropriate treatment are important. PsA occurs in about 30% of Caucasians with psoriasis (Boehncke and Schön 2015). However, the proportion in Japan is about half of this value (10.5%-16.9%) (Ohara et al. 2015; Yamamoto et al. 2016, 2017; Masaki et al. 2019; Tsuruta et al. 2019). Here, we found that the proportion of psoriasis patients with PsA (6.5%) was lower than reported previously (Ohara et al. 2015; Yamamoto et al. 2016, 2017; Masaki et al. 2019; Tsuruta et al. 2019), but similar to that in our previous study (5.9%) (Ogawa et al. 2018). This low percentage may have been due to enrollment of a large number of patients treated in clinics. Only four patients (1.2%) with PsA were treated in clinics, while 46 patients (10.9%) were treated in hospitals (Table 2). Therefore, many patients with PsA are treated at hospitals rather than clinics. This likely reflects the tendency of patients with joint symptoms to receive more intensive diagnosis and treatment in hospitals. Previous studies in Japan mainly examined the ratio of PsA patients treated in hospitals (Ohara et al. 2015; Yamamoto et al. 2016, 2017; Masaki et al. 2019; Tsuruta et al. 2019). However, many patients with psoriasis are treated in clinics (Kobayashi et al. 2013). The present study included data from both hospitals (421

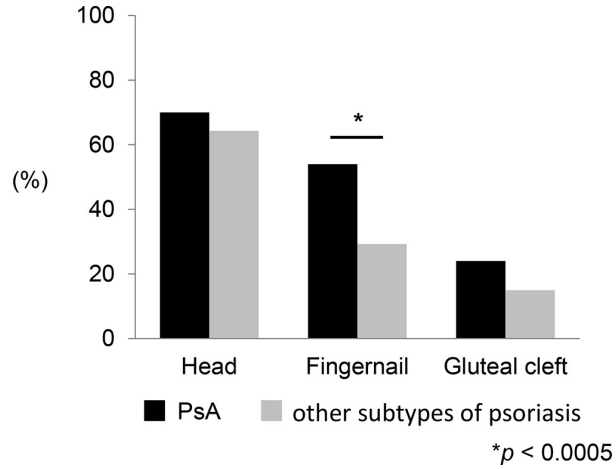

Fig. 3. Proportions of skin lesions in patients with psoriatic arthritis (PsA) and those with other subtypes of psoriasis. Of the three types of skin lesion (head, fingernail, and gluteal cleft), fingernail alterations were significantly increased in PsA patients (*$p < 0.0005$).

patients) and clinics (343 patients), and therefore presents a more real-world view of the prevalence of PsA in Japan.

Occasionally, patients with psoriasis have joint symptoms attributable to joint diseases other than PsA, such as osteoarthropathy and gout. About half of psoriasis patients have joint symptoms attributable to PsA (Mody et al. 2007). In this study, we found that PsA was the cause of joint symptoms in 26.8% of patients; 73.2% of patients with joint symptoms had other subtypes of psoriasis, and we suspect that many joint symptoms were due to osteoarthritis, frozen shoulder, lumbar spondylosis, and tenosynovitis. These diseases are common even in otherwise healthy people. Assessment of joint symptoms in psoriasis patients should be conducted carefully; joint symptoms plus psoriasis do not necessarily mean a diagnosis of PsA.

The unique skin symptoms of PsA are helpful for diagnosis. Psoriatic lesions on the scalp, nails, and gluteal cleft predict progression to PsA (Wilson et al. 2009). The present study suggests that PsA is associated with changes in the fingernails, but not with skin lesions on the scalp or gluteal cleft. A previous study reported similar results (Mease et al. 2019). Our study supports the importance of paying attention to fingernail changes during clinical examinations for psoriasis.

A recent study reported the usefulness of PEST for detection of PsA in the Japanese population with sensitivity of 93.1% and specificity of 78.9% (Setoyama et al. 2021). Previous reports also showed the sensitivity to be higher (52.9%-92.0%) and the specificity to be lower (66.0%-89.7%) (Mease et al. 2014; Kubota et al. 2015; Chiowchanwisawakit et al. 2016; Coates et al. 2016). However, in the present study, the PEST had low sensitivity (52%) and high specificity (93.4%) for PsA, suggesting that it may be useful for definitive diagnosis but not for an exclusive diagnosis. Several factors seemed to influence the lower sensitivity of the PEST in this study. Query 2 is a significant predictor of PsA (Ibrahim et al. 2009), but yielded an exact diagnosis for only half of PsA patients in the present study. Many patients did not fully understand that they had been diagnosed with PsA, even though their doctors had made the diagnosis. It is important for dermatologists to help patients understand the diagnosis of PsA. Query 4 was also reported to be a meaningful predictor of PsA (Chiowchanwisawakit et al. 2016), but only 22% of PsA patients in our study complained of heel pain. Heel pain also occurred in 9% of patients with other subtypes of psoriasis, which may have been due to common diseases, such as plantar fasciitis and osteoarthritis. Several factors may have affected the lower sensitivity of the PEST in this study, and further studies are necessary to establishing the validity of the PEST as a diagnostic tool.

This study had several limitations. Blood tests were not required to differentiate PsA. We evaluated joint symptoms indirectly through the PEST, and there were no radiological assessments. In addition, we examined fingernails, but not toenails.

In conclusion, the present study demonstrated that the real-world prevalence of PsA in Japan is 6.5%, which is lower than reported previously. Furthermore, fingernail changes are associated with PsA. In addition, while the PEST is a simple and useful tool, it requires improvements in sensitivity.

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Conflict of Interest

The authors declare no conflict of interest.

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