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Evaluation of Iraqi patients with psoriatic diseases and their systemic impact on disease activity.

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Abstract

Background Psoriasis (PsO) and psoriatic arthritis (PsA) are immune-mediated inflammatory disorders that may share immunological and genetic features. Due to their inflammatory nature, psoriatic diseases significantly affect kidney and liver health. **Aim** The study aimed to evaluate the kidney and liver characteristics of PsO and PsA patients. **Methods** This case-control study includes 137 patients (70 PsO and 67 PsA) and 120 healthy controls. WBCs were counted and ESR was measured using an auto-hematology analyzer (BC-700 Series, Mindray, China), while serum concentrations of ALT, AST, SCr, and BUN were tested using Cobas c311 analyzer (Roche, Germany). **Results** The present study findings displayed a significant difference in only two markers: ESR (22.6 ± 16.1 *vs*. 14.2 ± 11.6; $p = 0.001$) and SCr (2.74 ± 1.24 *vs*. 0.76 ± 0.22; $p = 0.009$) levels were significantly higher in PsA patients than in PsO patients. Results also showed a positive association between ESR and disease activity in psoriatic patients. **Conclusion** Creatinine levels were higher in PsA than in PsO patients, and ESR was elevated in both groups, influencing disease activity

Key words: Psoriasis, Psoriatic arthritis, Autoimmunity, inflammatory markers, kidney impairment.

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Introduction

Psoriasis (PsO) is a chronic inflammatory skin condition character-rized by keratinocyte hyper-proliferation and immune cell infiltr-ation (1,2). It is widely recognized as a T-cell systemic disease modified by genetic susceptibility accompanied by environmental factors (3). Environ-mental factors, including alcohol, diet, obesity, drugs, stress, infection and smoking, are pivotal in the development and progression of PsO. Furthermore, these factors exhibit the differentiate PsA from PsO clinically due to overlapping phenotypes. They are collectively termed Psoriatic disease (PsD) because they share pathogenesis and common immunopathogenic pathways (5). The incidence of PsD is higher among adults than in children, and the age distribution is bimodal, ranging from 18-29 and 50-69 years. It has been indicated that PsO affects females and males equally. Still recent research on PsA has revealed a female predominance, with ratios of 1.2 to 2, possibly due to a potential to mutually influence each other, either augmenting or impeding their individual effects (4).

Psoriatic arthritis (PsA), which is inflammatory condition affecting skin and joints, is associated with 30% of PsO patients. It is characterized by a spectrum of musculoskeletal manifestations, including peripheral joints, axial skeleton, and enthesis, highlighting the significant burden of PsA in patients with PsO. It can be challenging to
selection bias or limited access to healthcare (6).Psoriatic diseases (PsO and PsA) exhibit distinct clinical characteristics that vary by gender and patient demographics. PsA affects the musculoskeletal system, skin, and nails, with skin lesions often preceding arthritis in approximately 86.5% of cases, typically by a mean interval of 10.1 years (7). Gender differences are notable; women tend to experience high disease activity as well as functional impairment compared to men, who often present with more

severe joint involvement (8). The disease duration averages around 4.2 years, indicating potential delays in diagnosis (7). Comorbidities, such as liver and kidney dysfunction, are prevalent with a significant incidence reported in PsD.

Psoriasis can lead to renal dysfunction, particularly in moderate to severe forms of the disease which is recognized as an independent risk factor for chronic kidney disease as well as end-stage kidney disease. The mechanism linking PsD to kidney injury is not fully understood. However, it is hypothesized that the systemic inflammation associated with PsO contributes to vascular damage can impair kidney function and may include immune-mediate damage and nephrotoxic effects from certain PsO treatments (9). In terms of liver function, psoriatic patients have also been linked to abnormalities in liver enzymes, particularly in those with severe PsO. Studies suggested that up to half of individuals with PsO may have liver disease.

Additionally, elevated levels of liver enzymes were noticed in PsA patients, these disturbances can occur even in the absence of identifiable risk factors, suggesting a complex interplay between psoriatic patients and liver dysfunction (10). Thus, careful monitoring of both liver and kidney functions is essential in managing psoriatic disease. However, other comorbidities such as obesity and hypertension can adversely affect treatment outcomes in patients with PsD. The existence of these comorbidities is related to lower rates of remission, emphasizing the need for comprehensive management approaches that address both the joint and skin manifestations of PsD, as well as associated health risks (11).

Therefore, the current study aimed to examine the characteristics of PsO and PsA patients. In addition, some clinical parameters of PsO and PsA in terms of their impact on PsD disease activity were investigated.

Materials and methods

Patients

The present study included 70 patients with PsO, 67 patients with PsA, and 120 healthy controls (HC). Patients and HC were characterized in terms of age and sex. In addition, patients were characterized further in terms of age at onset, disease duration, body mass index (BMI), family history, cigarette-smoking, medication, psoriasis area and severity index (PASI; PsO patients), disease activity in psoriatic arthritis (DAPSA; PsA patients), nail psoriasis, hemoglobin (Hb), white blood cell (WBC) count, erythrocyte sedimentation rate (ESR), and renal (serum creatinine (SCr) and blood urea nitrogen (BUN)) and liver (aspartate transaminase (AST) and alanine aminotransferase (ALT)) function parameters.

Methods

WBCs were counted and ESR was measured using an auto-hematology analyzer (BC-700 Series, Mindray, China) following the manufacturer's instructions. Serum concentrations of ALT, AST, SCr, and BUN were tested using Cobas c311 (Roche, Germany) a clinical chemistry analyzer.

Statistical analysis

Study results were subjected to a statistical evaluation with IBM SPSS Statistics 25.0, data were expressed as mean values ± standard deviation (SD) of the samples. Graphs were plotted with Graph-Pad Prism 9.4.1.

Results

Age and Sex

The mean age of PsO patients was significantly lower than that of PsA patients or HC (34.9 ± 1.0 vs. 42.3 ± 12.8 and 39.5 ± 13.4 years; $p < 0.001$ and $p = 0.015$, respectively), while the difference was not significant between PsA patients and HC ($p = 0.155$), as shown in Figure1. When patients (PsO and PsA) and HC were classified according to sex, no significant difference was obtained ($p = 0.443$) (Table 2).

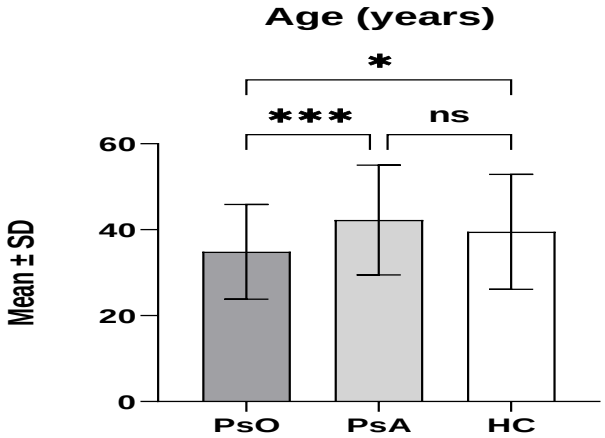

Figure 1: Column-bar plot of age in PsO and PsA patients and HC. Column indicates mean. Bar indicates standard deviation (SD). *p < 0.05; ***p < 0.001; ns: Not significant (p > 0.05).

Age at onset and disease duration

The age at onset was significantly lower in PsO patients compared to PsA patients (25.9 ± 11.7 *vs*. 35.6 ± 13.2 years; p < 0.001) (Figure 2). The disease duration was significantly higher in PsO patients compared to PsA patients (8.96 ± 0.82 *vs*. 6.63 ± 0.84 years; p = 0.048) (Figure 3). When the patients were classified into two disease duration groups (≤ 5 and > 5 years), the frequency of these groups was significantly different between PsO and PsA patients (p = 0.022). In fact, 62.9% of PsO patients experienced the disease for more than five years, while the corresponding frequency in PsA patients was lower (43.3%), as shown in Table2.

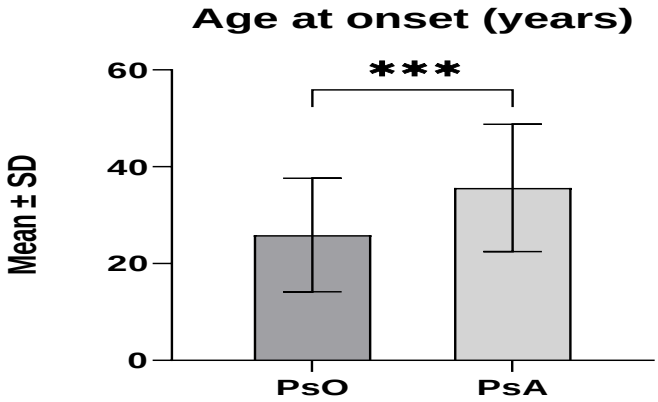

Figure 2: Column-bar plot of age at onset in PsO and PsA patients. Column indicates mean. Bar indicates standard deviation (SD); ***p < 0.001.

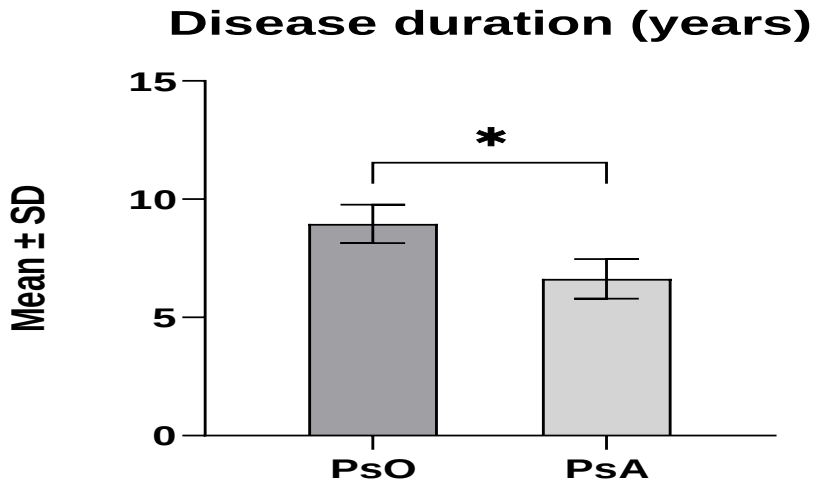

Figure3: Column-bar plot of disease duration in PsO and PsA patients. Column indicates mean. Bar indicates standard deviation (SD); *$p < 0.05$.

Body mass index

The BMI showed no significant difference between PsO and PsA patients (28.9 ± 5.5 *vs*. 28.5 ± 5.7 kg/m^2; $p = 0.679$) (Figure 3). The BMI showed no significant difference between PsO and PsA patients (28.9 ± 5.5 *vs*. 28.5 ± 5.7 kg/m^2; $p = 0.679$) (Figure 3). However, it was interesting to note that approximately 70.0% of both groups of patients were categorized as O/O (Table 2).

Table 1: Patients (PsO and PsA) and healthy controls (HC) classified according to age group and sex.

Age group	PsO (n = 70)		PsA (n = 67)		HC (n = 120)	
	n	%	n	%	n	%
< 40 years	49	70.0	28	41.8	63	52.5
≥ 40 years	21	30.0	39	58.2	57	47.5
Statistical analysis	$X^2 = 11.338$; D.F. = 2; $p =$ **0.003** (Significant)					
Sex						
Male	35	50.0	28	41.8	49	40.8
Female	35	50.0	39	58.2	71	59.2
Statistical analysis	$X^2 = 1.629$; D.F. = 2; $p = 0.443$ (Not significant)					

Disease activity/severity According to the scores of PASI and DAPSA, 20.0% of PsO patients were categorized as active/severe disease, while a significantly higher frequency was observed in PsA patients (58.2%; $p < 0.001$) (Table 2). **Medication** According to medication, most PsO and PsA patients were under therapy (95.7 and 86.6%, respectively), while newly diagnosed patients (ND) accounted for only 4.3 and 13.4%, respectively. However, no significant different between the two groups of patients was obtained in this regard ($p = 0.058$) (Table 2).

Table 2: Patients (PsO and PsA) classified according to disease duration, body mass index, disease activity and medication

Disease duration	PsO (n = 70)		PsA (n = 67)	
	N	%	N	%
≤ 5 years	26	37.1	38	56.7
> 5 years	44	62.9	29	43.3
	X^2 = 5.269; D.F. = 1; p = **0.022** (Significant)			
Body mass index				
Normal weight	21	30.0	20	29.9
Overweight/obese	49	70.0	47	70.1
	X^2 = 0.011; D.F. = 1; p = 0.985 (Not significant)			
Disease activity/severity				
Mild/moderate	56	80.0	28	41.8
Active/severe	14	20.0	39	58.2
	X^2 = 20.916; D.F. = 1; p < **0.001** (Significant)			
Medication				
Newly diagnosed	3	4.3	9	13.4
Medicated	67	95.7	58	86.6
Statistical analysis	X^2 = 3.584; D.F. = 1; p = 0.058 (Not significant)			

Family history

Family history of psoriatic disease and/or arthritis was observed in 58.6 and 59.7% of PsO and PsA patients, respectively, and the difference was not significant between the two groups of patients (p = 0.893) (Table 3).

Cigarette-smoking

The frequency of cigarette-smoking was similar in PsO and PsA patients (32.9 and 32.8%, respectively), and not statistically significant different was obtained (p = 0.998) (Table 3).

Baseline laboratory parameters

Both groups of psoriatic disease patients (PsO and PsA) were tested for the following laboratory parameters: Hb, WBC count, ESR, ALT, AST, BUN and SCr. Comparison between PsO and PsA patients revealed only two significant differences: ESR (22.6 ± 16.1 *vs*. 14.2 ± 11.6; p = 0.001) and SCr (2.74 ± 1.24 *vs*. 0.76 ± 0.22; p = 0.009) levels were elevated significantly in PsA compared to PsO patients (Table 4)

Table 3: PsO and PsA patients classified according to Cigarette-smoking, family history and Nail psoriasis.

Cigarette-smoking	PsO (n = 70)		PsA (n = 67)	
	N	%	N	%
Yes	23	32.9	22	32.8
No	47	67.1	45	67.2
Statistical analysis	X^2 = 0.010; D.F. = 1; p = 0.998 (Not significant)			
Family history				
Yes	41	58.6	40	59.7
No	29	41.4	27	40.3
Statistical analysis	X^2 = 0.018; D.F. = 1; p = 0.893 (Not significant)			
Nail psoriasis				
Yes	22	31.4	34	50.7
No	48	68.6	33	49.3
Statistical analysis	X^2 = 5.286; D.F. = 1; p = **0.021** (Significant)			

Table 4: Distribution of baseline laboratory parameters in PsO and PsA patients.

Parameter	PsO (n = 70)		PsA (n = 67)		p-value
	Mean	SD	Mean	SD	
Hb (g/dL)	13.0	3.2	13.1	2.3	0.859[ns]
WBC count (× 10^9/L)	7.9	2.7	9.3	8.1	0.155[ns]
ESR (mm/h)	14.2	11.6	22.6	16.1	**0.001*****
ALT (U/L)	23.9	13.2	26.9	20.4	0.311[ns]
AST (U/L)	23.0	11.2	23.9	11.9	0.675[ns]
BUN (mg/dL)	25.1	9.6	25.1	11.0	0.988[ns]
SCr (mg/dL)	0.76	0.22	2.74	1.24	**0.009****

**p < 0.01; ***p < 0.001; ns: Not significant (p > 0.05).

Correlation analysis

Correlation analysis was conducted between the scores of disease activity/severity (PASI and DAPSA) and the baseline laboratory parameters in PsO and PsA patients. There was no significant correlation between PASI or DAPSA and these parameters, except ESR, which showed a significant positive correlation (r = 0.260 and 0.623; p = 0.031 and < 0.001, respectively) (Table 5).

Table 5: Correlation analysis of the scores of disease activity/severity (PASI and DAPSA) and the baseline laboratory parameters in PsO and PsA patients.

Parameter	Disease activity/severity scores			
	PASI		DAPSA	
	r	p-value	r	p-value
Hb (g/dL)	0.014	0.908	-0.045	0.720
WBC count (× 10^9/L)	0.178	0.144	-0.167	0.179
ESR (mm/h)	**0.260**	**0.031***	**0.623**	**< 0.001*****
ALT (U/L)	0.006	0.958	0.048	0.703
AST (U/L)	-0.030	0.809	0.097	0.441
BUN (mg/dL)	0.235	0.051	0.099	0.433
SCr (mg/dL)	-0.092	0.454	0.016	0.904

r: Correlation coefficient; *p < 0.05; ***p < 0.001.

Discussion

Age distribution is bimodal in PsO with two groups: early-onset and late-onset groups. Approximately 70% of PsO patients acquire the PsO before the age of 40 years. On the other hand, there is a linear relationship between age and PsA prevalence (12). These studies are agreeing with the present study findings. In the current study, PsO patients included 35 (50.0%) males and females, PsA patients included 28 (41.8%) males and 39 (58.2%) females, and HC comprised 49 (40.8%) males while 71 (59.2%) females (Table1).

However, these results did not show any statistical significance. This agrees with the findings of other studies, revealing that PsO and PsA affect males and females equally. However, these studies indicated a significant difference between the effects of the disease on each sex (13). Furthermore, sex may contribute to PsD through its effect on sex hormones, immune function, and treatment outcomes (14). Concerning disease duration, it was significat higher in PsO patients compared to PsA patients (8.96 ± 0.82 *vs*. 6.63 ± 0.84 years; $p = 0.048$) (Figure 3). The patients were classified into two disease duration groups (≤ 5 and > 5 years), significant results were obtained, as shown in Table2, and they are in line with other studies where PsO is well-known to be a clear risk for PsA, which explains why PsO patients tend to have an earlier onset than PsA patients. According to research, patients with PsO onset at an earlier age are at greater risk of developing PsA later in life (15). It is worth noting that PsA occurs most often in patients diagnosed with PsO before arthritis development. Only 15% of PsA patients have arthritis that begins before PsO is diagnosed. However, there is often a significant delay in identifying PsA with a third to a half of patients experiencing a two-year delay and many patients experiencing a delay greater than two years (16).

The BMI showed no significant difference between PsO and PsA patients However, 70.0% of both groups of patients were categorized as O/O (Table 2). Since 70.0% of patients are overweight or obese, obesity can be considered a risk factor for overall PsD but not statistically significant differentiate obtained among the groups of the disease (Table 2). It has been exhibited that obesity have a significant part in exacerbating inflammatory diseases via the induction of inflammation and alteration of immune responses. Besides, there is evidence suggesting that obesity results in immune dysregulations in many conditions, including inflammatory diseases, thereby worsening treatment responses and disease outcomes (17).

Concerning PsD, several research studies revealed that obesity plays an integral role in the severity and the pathogenesis of psoriatic disease (18).

There is a bidirectional association between PsO and obesity, with each condition exacerbating the other (19). Furthermore, a cohort study showed that PsO patients with increased BMI are in a greater risk to develops PsA. Moreover, Researchers have found that overweighted and obese psoriatic patients have higher disease severity, with obesity increasing the production of proinflammatory cytokines.

Intestinally, a study revealed that weight loss interventions, which include diet and exercise, improve PsO, highlighting the potential benefits of managing obesity in psoriatic disease (20).

The PASI and DAPSA scores are measuring tools that help estimate the activity of disease in PsO and PsA patients, respectively. PASI combines disease severity (redness, thickness, and scaling) and the percentage of the affected area, while the DAPSA score is provided by joint symptoms, C-reactive protein assessment, and pain (21). The outcomes of present study reveal a

significant difference between PsO plus PsA patients with active/severe disease activity 41.8% *vs* 80.0%, respectively (Table 2), indicating a better treatment response in PsO than PsA patients. Studies have observed changes in levels of biomarkers, such as proinflammatory cytokines, in response to different treatments in PsA patients (22). In general, while both conditions (PsO and PsA) are impacted by treatments, individual response patterns and biomarkers in PsA highlight the complexity of treatment outcomes in this specific patient population (23,24).

According to medication no significant different between the two groups of patients was obtained in this regard ($p = 0.058$) (Table 2). In PsD, the use of biological treatment has revolutionized the treatment of disease by targeting pivotal pathways involved in inflammation. Several studies have shown the effectiveness and safety of biological inhibitors in managing PsD, resulting in a significant reduction in clinical symptoms (25). As part of their mechanism of action, these biologics target specific elements of the immune system that contribute to PsD development, such as Th17 cells (26). Enbrel (etanercept) is a TNF-α inhibitor that has proven to have a crucial role in the treatment of PsD. It has demonstrated clinically significant benefits for patients with PsA and PsO, with sustained improvement observed over 36 weeks (27).

Aside from reducing the clinical signs and symptoms, it has also been found to improve the response criteria for PsD, disease activity, and target lesion response. Furthermore, several short-term and long-term studies have demonstrated Enbrel's safety and efficacy, making it a viable treatment option for PsD patients (28).

According to Family history of psoriatic disease the difference was not significant between the two groups of patients ($p = 0.893$) (Table 3). The family history of the PsD has a significant impact on the onset, severity, and phenotype of the disease. In Japan, China, and the multicenter international database, it has been discovered that patients with a family history of PsO and PsA more possible to develop the disease earlier, have a long disease duration, and have nail involvement (29,30). However, not all psoriatic patients have a family history of the disease, research from multiple studies shows that a portion of PsD do have family history of PsO and PsA, but not all patients share this familial link (31).

Smoking is one of leading causes of preventable deaths throughout the world. It is an environmental factor that is thought to trigger PsO and is associated with many chronic diseases (32,33). It is widely suggested that smoking adversely affects the development of PsO and PsA, the efficacy of treatment, and the overall health of patients. According to research, smoking increases the risk of PsO in the general population, while reducing the risk of PsA in patients with PsO (34). Though, the result of current study (Table3), did not discover such a significant association, which disagreed with observational studies that suggested smoking like risk factor for PsO while agreed with genetic studies, which failed to demonstrate a causal relationship between smoking and PsD using Mendelian randomization design (35).

Psoriatic arthritis patients often have nail involvement, and studies have shown a strong association between nail psoriasis and the disease. A recent study suggests that nail psoriasis is a strong predictor of PsA, ranging from 41-93% (36). Furthermore, the results of ultrasonographic studies indicate that patients with PsA exhibit more morphological changes in the nail unit than HC, emphasizing the significance of evaluating nail psoriasis in PsA patients (37). Overall, these findings emphasize the close relationship between nail involvement and

PsA, agreeing with the present study outcomes. Data from the current study indicate differences in two of the seven laboratory parameters, with higher levels of ESR and SCr in PsA compared to PsO (Table4). As for ESR, it is an inflammatory marker that measures disease activity and severity in different pathological states, such as inflammatory disease (38).

Research reveals that PsA patients exhibit greater concentrations of inflammatory markers compared to those with skin PsO. Besides, a study by Kim *et al* indicated that ESR and C-reactive protein were elevated significantly in patients with PsA compared to patients with PsO (39). The PsA patients may have higher inflammatory markers due to joint inflammation, contributing to more severe inflammatory responses compared to PsO (40). Serum creatinine level is an important marker used to evaluate renal function, especially in psoriatic patients undergoing treatment, and studies have shown that SCr levels differ between patients with PsO and PsA. The SCr concentrations were found to be significantly higher in patients with PsA, with an average level of 3.36 mg/dL, than in those with PsO (41).

In a comparative study of patients with rheumatoid arthritis (RA) and PsA, there were similar patterns between the two disease groups, but PsA patients had higher SCr levels during disease relapse, suggesting an association between PsA and renal function parameters abnormalities (42).

The results of the correlation analysis (Table5) highlight the functional relationships between the studied parameters. Of note are disease activity/severity and ESR. The positive association between ESR and disease activity in psoriatic patients can be attributed to the inflammatory nature of these conditions (43). Several studies have demonstrated that ESR levels are significantly correlated to disease activity scores such as DAPSA and DAS28-ESR (44). An elevated ESR level is associated with higher disease activity in PsA, indicating increased inflammation. In addition, ESR is commonly used as a general marker of systemic inflammation, reflecting the presence of inflammatory cytokine and acute-phase reactants in the body, which are raised during active disease states in PsA (45). There is also a positive correlation between PASI score and ESR levels, suggesting that higher PASI scores are associated with higher ESR levels.

Specifically, the study found a positive correlation between PASI values and several inflammatory markers, including ESR, in patients with PsO (46).

Conclusions

Serum concentration of creatinine is elevated in patients with PsA. The inflammatory marker ESR was significantly higher in PsO and PsA patients and impacted the disease activity.

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