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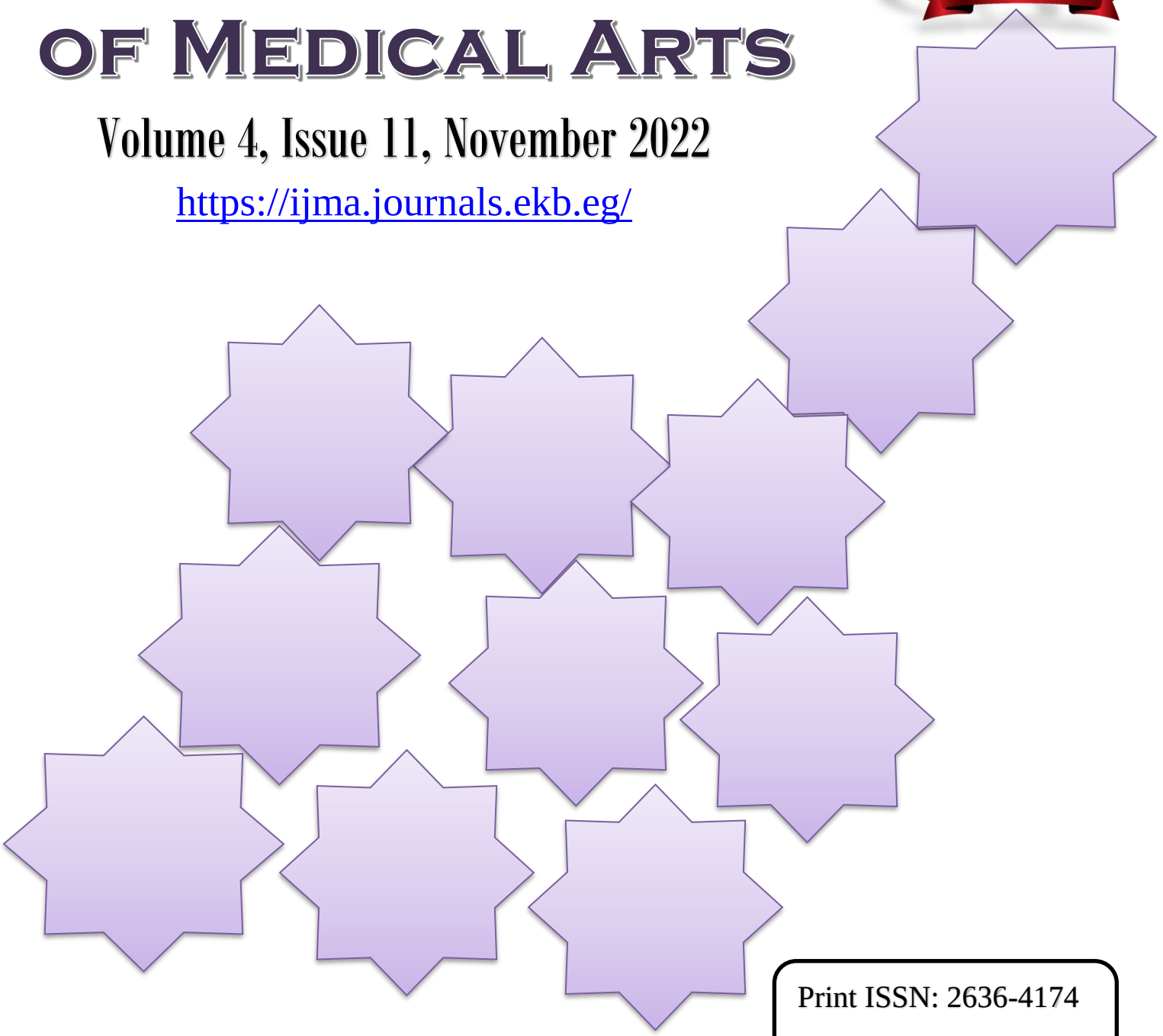

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Original Article

Assessment of Retinal Vasculature in Patients with Psoriasis

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ABSTRACT

Background: Psoriasis is a chronic inflammatory skin disease that results from excessive proliferation of the underlying epidermis; however, the etiology of this disease is still unknown. Even though vision-threatening ophthalmic complications are very rare, about 10% of people with psoriasis have eye problems. In addition, ophthalmic complications of psoriasis are numerous and have a non-specific nature, such as blepharitis, conjunctivitis, keratitis, and xerosis. Therefore, ophthalmic involvement in psoriasis remains clinically underappreciated.

Aim of the work: The objective of the current study was to evaluate the retinal vasculature in patients with moderate to severe psoriasis.

Patients and methods: A descriptive cross-sectional study conducted on a total of 30 patients with moderate to severe psoriasis according to the psoriasis area severity index [PASI] score collected from the Damietta Al-Azhar dermatology clinic and the Damietta dermatology and venerology hospital.

Results: Most of the studied cases were associated with no associated comorbidities [60%], followed by psoriatic arthritis [13.3%], and lastly rheumatoid arthritis, peptic ulcer, cholecystitis, and cardiac disease, representing 6.7% of each. In the context of dry eye, the current study demonstrated that: 36.7% plus one, 30% plus two, 26.7% plus three, and 6.7% plus four have dry eye. Psoriasis severity has been demonstrated to be significantly correlated with hyperemia, dry eye, cataracts, and normal retinal vasculature.

Conclusion: We concluded that retinal vasculature affection had a negligible relationship with psoriasis. However, dry eye and conjunctival hyperemia were significantly correlated with the degree of psoriasis [as revealed by PASI score].

Keywords: Psoriasis; Psoriasis area severity index; Conjunctivitis; Uveitis

INTRODUCTION

Psoriasis is a chronic inflammatory disease of the skin, scalp, nails, and joints that occurs in 0.09% to 11.4% of the population. It is usually diagnosed on the basis of its typical clinical appearance [1].

The interplay of genetic, immunological, and environmental factors has been implicated in the development of psoriasis. Psoriasis has been associated with various comorbidities, including cardiovascular diseases, metabolic syndrome, inflammatory bowel disease, and psychiatric disorders. A recent study has shown that ophthalmic complications are estimated to occur in approximately 10% of psoriasis patients, and those with pustular psoriasis and psoriatic arthritis have the highest risk for these complications [2].

Ocular lesions are more common in males, and they often occur during psoriasis exacerbations [3].

Although psoriasis has been known to be associated with the risk of blepharitis, dry eye, conjunctivitis, and uveitis, fewer data are available concerning changes in the posterior compartment of the eye. **Enos *et al.*** [4] have found peripheral retinal vascular leakage in patients with moderate to severe psoriasis, suggesting early ocular inflammation in the pathogenic process of psoriasis. Investigating the retinal complications associated with psoriasis in my study would provide important information for clinical assessment and optimal management.

So, the aim of this work was to evaluate the retinal vasculature in patients with moderate to severe psoriasis.

PATIENTS AND METHODS

This was an observational, descriptive, cross-sectional study on 30 patients with moderate to severe psoriasis as determined by the psoriasis area severity index [PASI] score obtained from the Damietta Al-Azhar dermatology clinic and the Damietta dermatology and venerology hospital. The included patients were thoroughly dermatologically examined and then referred to the Department of Ophthalmology, Al-Azhar University Hospital, for a complete ophthalmic examination, fundus examination, and fluorescein angiography.

The study included patients with moderate-to-severe psoriasis according to the PASI score as follow [5]:

Area of region affected	Area Score
None:	0
<10%	1
10-29%	2
30-49%	3
50-69%	4
10-89%	5
90-100%	6

The study excluded psoriatic patients below 18 years old, pregnant and lactating women, patients with other co-morbidities such as diabetes, hypertension, and immunological disorders like lupus erythematosus disease, and patients with contraindications to fluorescein angiography such as fluorescein allergy, renal failure, significant cardiac diseases, and moderate-to-severe asthma.

Entire cases were subjected to a full history, taking into account age, gender, occupation, and clinical data such as duration of disease, systemic comorbidities, treatment received, family history, and personal history. The patients had been exposed to clinical examination to assess the degree of psoriasis based on the PASI score.

Ethical Considerations: The study was approved by an ethics committee of Damietta Faculty of Medicine IRB [00012367], Al-Azhar University, Egypt. A written informed consent was obtained from all participants in this research. Confidentiality and personal privacy were respected at all levels of the study. The collected data was not used for any purpose other than scientific research.

Statistical analysis: Data was fed into the computer and analyzed with IBM SPSS, which was released in 2013. IBM SPSS Statistics for Windows, Version 22.0 Armonk, NY: IBM Corp. Qualitative data were described using numbers and percent. After testing for normality with the Kolmogorov-Smirnov test, quantitative data were described using the mean and standard deviation. The obtained results were judged significant at the 0.05 level. For comparing two or more groups, use the Chi-Square test, Fischer exact test, or Monte Carlo test. t-test was used to compare two independent groups. A one-way ANOVA was used to compare more than two independent groups.

RESULTS

Table [1] shows that the mean [SD] age of the studied cases was 43.13 years. Sixty percent of the studied cases are males. Sixty percent had no associated comorbidities, 13.3% had psoriatic arthritis, 6.7% had rheumatoid arthritis, peptic ulcer, cholecystitis, & cardiac disease each. The mean duration of psoriasis was 20.57 years. Mean PASI score was 19.88. 80% of the patients had received topical treatment; 26.7% had methotrexate treatment, 13.3% received NBUVB, 6.7% had cyclosporine, and 6.7% had acitretin.

Table [2] illustrates that 6.7% of the studied cases had hyperemic conjunctiva, 36.7% had plus one, 30% had plus two, 26.7% had plus 3 and 6.7% had plus 4 dry-eye. Two cases had cataract, 6.7% had photophobia. All cases had normal intraocular pressure. Right visual acuity was distributed as following; 36.7% had visual acuity 6/6, 30% had visual acuity 9/6, 20% had visual acuity 36/6, 6.7% had VA 12/6, and 6.7% had VA 18/6. Left visual acuity was distributed as follows: 40% had visual acuity 9/6, 30% had visual acuity 6/6, 10% had visual acuity 36/6, 6.7% had VA 18/6, 6.7% had VA 60/6, and 6.7% had cataract. Myopic fundus was detected in 6.7% of the studied cases.

Table [3] illustrates a statistically significant relation between PASI score and eye signs except for left visual acuity. Higher mean PASI score was detected among cases with hyperemic conjunctiva than normal [28.25 versus 19.29, p=0.016]. Higher mean PASI score was detected among cases with a higher grade of dry eye; mean PASI score among cases with plus+ dry eye was [17.25] versus plus +++ dry eye [22.53], with a statistically significant relation between them. The mean PASI score among cataract cases was higher than in cases with normal lens. The mean PASI score of photophobic pupils was higher than that of round active pupils [28.25 versus 19.29]. PASI score was detected among cases with visual acuity 36/6 than cases with visual acuity 6/6. Mean PASI score was higher among normal fundus than myopic fundus [20.45 versus 12]. Regarding psoriasis duration, there was a significant relation between psoriasis duration and eye signs except for left visual acuity and fundus changes. Higher mean psoriasis duration was detected among cases with hyperemic conjunctiva than normal [31.5 versus 19.78, p=0.024]. Higher mean psoriasis duration was detected among cases with higher grade of dry eye; mean Psoriasis duration among cases with plus+ dry eye was [15.45] versus plus ++++dry eye [31.5] with significant relation between them. Mean psoriasis duration among cataract cases was higher than in cases with normal lens [31.5 versus 19.78]. Photophobic pupils had a longer mean psoriasis duration than round active pupils [31.5 versus 19.78]. The mean psoriasis duration was longer in cases with visual acuity 36/6 than in cases with visual acuity 6/6. Duration was higher among myopic fundus than normal fundus [20.39 vs. 23].

Table [4] shows a statistically significant relation between associated comorbidities and affected visual acuity. Among cases with associated comorbidities; 50% had 36/6 visual acuity ,16.7% had 18/6 visual acuity and 33.3% had 9/6 visual acuity for right eye. Similarly, on left side; 20% had 60/6 VA, 20% had 36/6 VA and 60% had 9/6 visual acuity.

Table [1]: Demographic and disease characteristics of the studied cases

		N=30 %
Age/years	Mean ± SD [Min-Max]	43.13±11.71 [22-60]
Sex	Male	18 [60%]
	Female	12 [40%]
Comorbidities	No	18 [60%]
	Rheumatoid arthritis	2 [6.7%]
	Psoriatic arthritis	4 [13.3%]
	Peptic ulcer	2 [6.7%]
	Cholecystitis	2 [6.7%]
	Cardiac	2 [6.7%]
Duration of psoriasis/years	Mean ± SD [Min-Max]	20.57±7.23[10-33]
PASI score	Mean ± SD [Min-Max]	19.88±5.22 [10.7-28.61]
Treatment received	Topical treatment	24 [80%]
	Narrow-band UVB [NBUVB]	4 [13.3%]
	Methotrexate	8 [26.7%]
	Cyclosporine	2 [6.7%]
	Acitretin	2 [6.7%]

Table [2]: Distribution of the studied cases according to eye signs of affection

		n=30	%
Conjunctiva	Normal Hyperemic	28 2	93.3 6.7
Cornea [dry eye]	+ ++ +++ ++++	11 9 8 2	36.7 30.0 26.7 6.7
Lens	Normal Cataract	28 2	93.3 6.7
Pupil	round reactive photophobic	28 2	93.3 6.7
Anterior chamber [clear quiet]		30	100.0
IOP [normal]		30	100.0
Right visual acuity	6/6 9/6 12/6 18/6 36/6	11 9 2 2 6	36.7 30.0 6.7 6.7 20.0
Left visual acuity	6/6 9/6 18/6 36/6 60/6 Cataract	9 12 2 3 2 2	30.0 40.0 6.7 10.0 6.7 6.7
Fundus	normal myopic fundus	28 2	93.3 6.7

Table [3]: Relation eye signs with PASI and with psoriasis duration score among studied cases

		PASI score	test of significance	Psoriasis duration/years	test of significance
Conjunctiva	Normal Hyperemic	19.29 ± 4.87 28.25 ± 0.49	t=2.56 p=0.016*	19.78 ± 6.82 31.50 ± 2.12	t=2.38 p=0.024*
Cornea [dry eye]	+ ++ +++ ++++	17.25 ± 4.53 ^{AB} 18.90 ± 5.99 ^{C} 22.53 ± 1.57 ^{A} 19.88 ± 6.56 ^{BC}	F=4.77 P=0.009*	15.45 ± 5.22 ^{AB} 25.11 ± 5.23 ^{A} 19.75 ± 6.56 ^{C} 31.50 ± 2.12 ^{BC}	F=7.79 P=0.001*
Lens	Normal Cataract	19.29 ± 4.87 28.25 ± 0.49	t=2.56 p=0.016*	19.78 ± 6.82 31.50 ± 2.12	t=2.38 p=0.024*
Pupil	Round reactive Photophobic	19.29 ± 4.87 28.25 ± 0.49	t=2.56 p=0.016*	19.78 ± 6.82 31.50 ± 2.12	t=2.38 p=0.024*
Right visual acuity	6/6 9/6 12/6 18/6 36/6	18.94 ± 4.95 ^{A} 17.61 ± 4.32 ^{B} 15.60 ± 0.0 ^{C} 19.50 ± 0.0 ^{D} 26.58 ± 2.63 ^{ABCD}	F=5.28 P=0.003*	16.73 ± 5.02 ^{AB} 20.44 ± 4.28 ^{CE} 10.0 ± 0.0 ^{ACF} 20.0 ± 0.0 ^{D} 31.50 ± 0.0 ^{BDEF}	F=16.74 P<0.001*
Left visual acuity	6/6 9/6 18/6 36/6 60/6	19.61 ± 4.43 17.66 ± 5.84 24.0 ± 0.0 19.03 ± 0.81 23.20 ± 0.0	F=1.16 P=0.354	17.11 ± 6.82 20.83 ± 7.07 15.0 ± 0.0 20.0 ± 0.0 30.0 ± 0.0	F=2.07 P=0.118
Fundus	Normal Myopic fundus	20.45 ± 4.94 12.0 ± 0.0	t=2.38 p=0.024*	20.39 ± 7.46 23.0 ± 0.0	t=0.486 p=0.631

F: One Way ANOVA test, t: Student t test, *statistically significant, similar superscripted letters denote significant difference between studied groups within same column

Table [4]: Relation between eye signs and associated comorbidities among studied cases

		Associated Comorbidities		Test of Significance
		No [n=18]	Yes [n=12]	
Conjunctiva	Normal Hyperemic	18[100] 0	10[83.3] 2[16.7]	FET=3.21 P=0.152
Cornea [dry eye]	+ ++ +++ ++++	7[38.9] 5[27.8] 6[33.3] 0	4[33.3] 4[33.3] 2[16.7] 2[16.7]	MC=3.88 P=0.274
Lens	Normal Cataract	18[100] 0	10[83.3] 2[16.7]	FET=3.21 P=0.152
Pupil	round reactive photophobic	18[100] 0	10[83.3] 2[16.7]	FET=3.21 P=0.152
Right visual acuity	6/6 9/6 12/6 18/6 36/6	11[61.1] 5[27.8] 2[11.1] 0 0	0 4[33.3] 0 2[16.7] 6[50]	MC=20.74 P<0.001*
Left visual acuity	6/6 9/6 18/6 36/6 60/6	9[50] 6[33.3] 2[11.1] 1[5.6] 0	0 6[60] 0 2[20] 2[20]	MC=12.03 P=0.017*
Fundus	Normal Myopic fundus	16[88.9] 2[11.1]	12[100] 0	FET P=0.503

FET: Fischer exact test, MC: Monte Carlo test, *statistically significant

Case I: A 43-year-old male patient with psoriasis for 20 years, associated with psoriatic arthritis, had a PASI score of 19.5, on topical treatment only. On ophthalmic examination: normal eye, normal fundus.

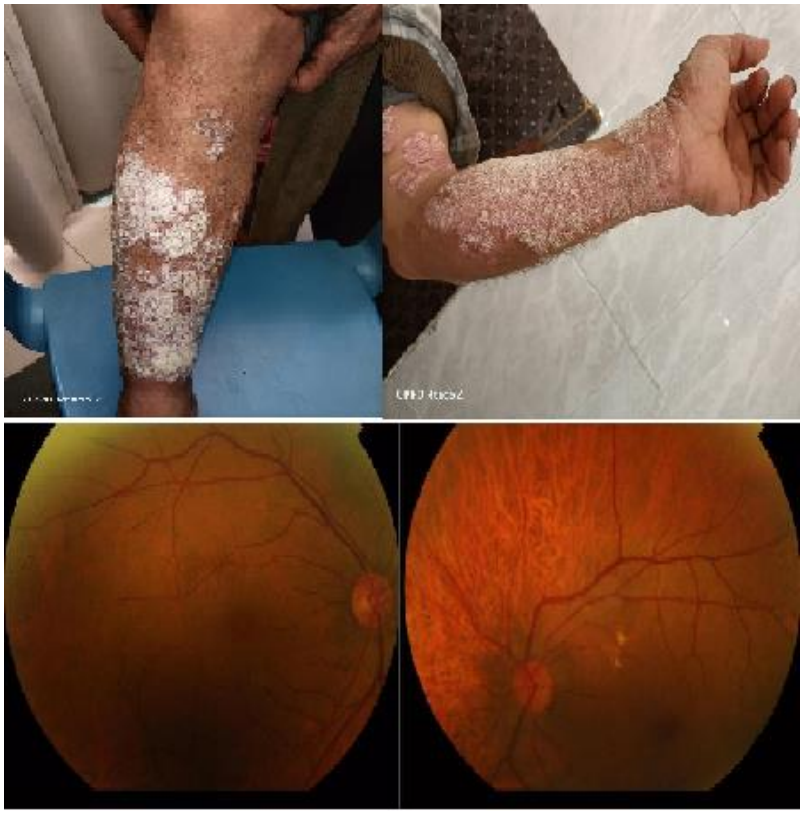

Figure [1]: Psoriasis in the leg and forearm. On ophthalmic examination, normal eye and normal fundus

Case II: Male patient aged 58 years complain of psoriasis for 15 years with no associated comorbidities, PASI score 12,2, on narrow band UVB. On ophthalmic examination: [++] dry eye, normal fundus as shown in figure [2].

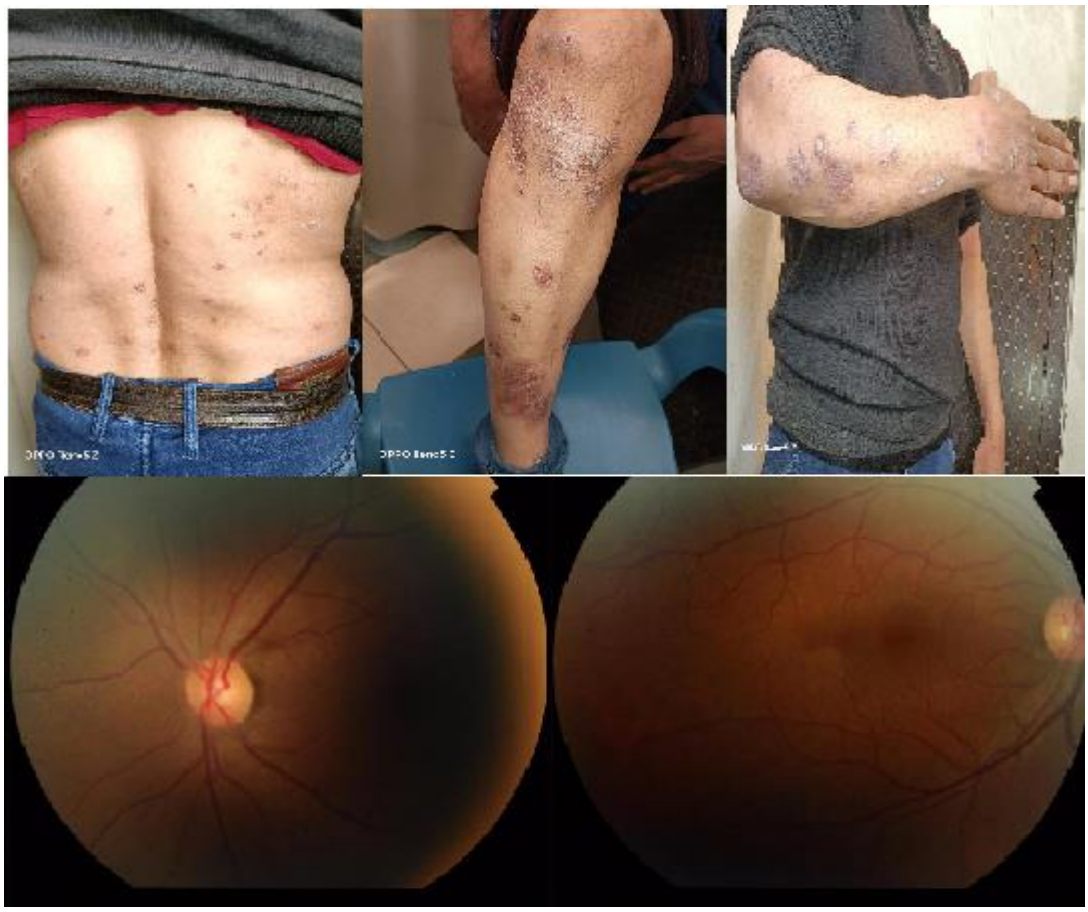

Figure [2]: Psoriasis in the back, leg and forearm. On ophthalmic examination, dry eye and normal fundus

DISCUSSION

Psoriasis is a systemic inflammatory disease of immune dysregulation, and its pathogenesis involves inflammatory mediators such as C-reactive protein [CRP], intracellular adhesion molecule-1 [ICAM-1], tumor necrosis factor-α, interleukin [IL]-1b, IL-6, IL-12, IL-17A, and IL-23 [6]. The inflammatory process might be associated with the development of comorbidity [7]. Likewise, **Lee *et al.*** [8] have demonstrated that; there was no association between psoriasis and any systemic diseases. The overall prevalence of psoriasis is about 2 % of the world population [9, 10]. This disease shows wide variation in severity and in the distribution of skin lesions, with multiple extracutaneous manifestations. Although vision-threatening ophthalmic complications are very rare, it is reported that ocular effects occur in about 10 % of psoriasis patients [11]. In addition, ophthalmic complications of psoriasis are numerous and have a non-specific nature, such as blepharitis, conjunctivitis, keratitis and xerosis [11, 12].

Regarding conjunctival affection, of cases were associated with hyperemia which seemed to be significantly correlated with diseases severity. Conjunctivitis manifests as hyperemia, possible yellowish-red lesions in the conjunctival area and xerosis that may involve the cornea [13]. In the context of dry eye, the current study demonstrated that; 36.7% plus one, 30% plus two, 26.7% plus 3 and 6.7% plus 4 dry-eye. It has been demonstrated that; the most common clinical ocular change associated with psoriasis is keratoconjunctivitis sicca [dry eye syndrome], which is present in 18.75% of patients [14, 15].

Psoriasis is a well-recognized cause for anterior and posterior uveitis, dry eye and blepharitis in patients with psoriatic arthritis. Due to the close association of psoriasis to MS and increased cardiovascular abnormalities, more focus has been turned to the changes that happen in the retinal and choroidal circulations in psoriatic patients [16].

A study reported that severe psoriasis appears to be related to increased subfoveal choroidal thickness [SFCT] as a consequence of possible inflammatory cascades that attribute to the pathogenesis of the disease. Psoriasis itself can affect ganglion cell complex thickness and MS may cause additional damage to the retina and macula in psoriasis patients as reported by **Selma *et al***. [17]. This came in accordance with **Her *et al.*** [10] who concluded that; the dry eye symptom was more common in patients with psoriasis. In addition, the patients showed a higher tear film instability and significant degeneration on the ocular surface when compared with the normal controls.

With regard to cataract, the current study demonstrated that, 6.7% of psoriatic cases were associated with cataract. In addition, there were significant correlations between cataract and both PASI score and duration of psoriasis. Several studies have previously reported that patients with psoriasis may develop cataracts [14, 15, 18]. Studies have reported that inflammation might play a role in the pathogenesis of cataract. Patients with higher baseline CRP had an increased risk of cataract [7, 19]. Another study also demonstrated that IL-6 and ICAM-1 were associated with nuclear cataract [20].

In addition, the inflammatory process of psoriasis causes an imbalance between reactive oxygen species production and the quantity of antioxidant molecules [21]. **Barygina *et al.*** [22] demonstrated that oxidative stress markers, protein carbonyl content, and lipoperoxide content in white blood cells were significantly higher while the total antioxidant capacity and the total glutathione level were significantly lower in the psoriatic group than in controls. Oxidative stress further destabilizes and harms the protein component of lens crystals, such as cysteine, methionine, and tryptophan, adding to cataracts. Also, the loss of glutathione from the nuclear region of the lens due to oxidation might hasten the development of cataracts [23].

Furthermore, steroid use is also a possible cause of cataract, specifically posterior sub-capsular cataract [24]. On the contrary, **Cruz et al.** [25] have demonstrated that, cataracts are a common ocular disorder that are closely related to advancing age and cannot be considered exclusively related to psoriasis. In terms of retinal vascularity, the current study found no significant association between psoriasis and retinal vascularity. While **Alkan *et al***. [26] found PVL in 6 psoriasis patients [21.4%] compared to 1 [3.6%] in healthy age-matched controls [p.001, respectively]. The mean VD value were significantly lower in the deep capillary plexus in parafoveal area in group 2 [moderate to severe psoriasis] [35.5 ± 8.7, 28.7 ± 4.6, 35.0 ± 3.5; P < .001, respectively].

Moreover, **Castellino *et al.*** [27] have demonstrated that OCTA imaging showed that superficial wVD and superficial pVD were lower in the psoriasis group in comparison with controls [p = 0.009 and p = 0.01, respectively]. Similarly, deep wVD and pVD were lower in the psoriasis group in comparison with control subjects [p = 0.03 and p = 0.01, respectively]. In a sub-analysis of 47 patients affected by psoriasis without psoriatic arthritis, lower values of wVD and pVD in both superficial and deep capillary plexuses were registered.

Conclusion: We concluded that retinal vasculature affection demonstrated insignificant correlation with psoriasis. However, dry eye and conjunctival hyperemia were significantly correlated with the degree of psoriasis [as revealed by PASI score].

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Conflicts of Interest: The authors have no conflicts of interest to declare that are relevant to the content of this article.

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