

Association of Cutaneous Lupus Manifestations with Neurological and Pulmonary Involvement in Systemic Lupus Erythematosus

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ABSTRACT

Background: SLE is a chronic multi-system autoimmune disorder. Common cutaneous manifestations that can be indicative of systemic immune activity. Neurologic and pulmonary complications have clinical significance because they are associated with morbidity, delay in diagnosis and long-term disability.

Objective: The aim of this study was to assess the correlation between the skin manifestations of lupus and neurological and pulmonary involvement in patients with systemic lupus erythematosus (SLE).

Methods: This observational cross-sectional study was conducted at Multan Medical and Dental College, Multan, Pakistan, from September 2022 to September 2023. Non-probability consecutive sampling was used to include 150 SLE patients. The cutaneous manifestation, neurological involvement and pulmonary involvement were evaluated by clinical history, physical examination, laboratory record, imaging findings, and specialist assessment as needed. Data was analysed with SPSS. Chi-square or Fisher exact test was used to test associations and p-values <0.05 were deemed significant.

Results: Patients had a mean age of 31.6 ± 9.4 years, and 126 patients were female. The most common cutaneous manifestations were photosensitivity, malar rash, alopecia, oral ulcers, discoid rash, vasculitic lesions, and livedo reticularis. Neurological involvement was present in 46 patients, while pulmonary involvement was present in 39 patients. Neurological and pulmonary involvement were significantly associated with vasculitic lesions, livedo reticularis, oral ulcers and photosensitivity. The strongest associations with both systemic complications were seen with vasculitic lesions.

Conclusion: Cutaneous lupus manifestations, particularly vasculitic lesions, livedo reticularis, oral ulcers, and photosensitivity, may indicate increased risk of neurological and pulmonary involvement in systemic lupus erythematosus. Sensitive skin inspection can be helpful in early systemic evaluation and timely multidisciplinary management.

Keywords: Systemic lupus erythematosus; cutaneous lupus; neurological involvement; pulmonary involvement; vasculitic lesions.

INTRODUCTION

Systemic lupus erythematosus is a chronic, autoimmune disease, which involves immune dysregulation, autoantibody production, immune complex deposition and inflammation affecting multiple organs¹. Its clinical course is very variable and is known to involve the skin, joints, kidneys, nervous system, lungs, hematological system, and cardiovascular system. The broad clinical spectrum makes it hard to clinically recognise systemic involvement at an early stage².

Skin problems are some of the most frequent and noticeable symptoms of systemic lupus erythematosus³. They can include discoid lesions, malar rash, photosensitivity, oral ulcers, alopecia, subacute cutaneous lupus lesions, livedo reticularis, vasculitic lesions, digital ischemia and lupus panniculitis. In many patients, skin involvement can be seen early in the course of the disease and can therefore be an important clue to diagnosis. Cutaneous findings are readily detected at a normal examination and can be useful in the understanding of disease activity and systemic immune involvement⁴.

The skin is a target organ of lupus, and may also be an indicator of the severity of systemic inflammation⁵. The presence of active mucocutaneous disease, particularly photosensitive eruptions, oral ulcers, mucocutaneous vasculitic lesions and diffuse inflammatory skin lesions, may reflect the presence of persistent immune-mediated vascular and tissue injury⁶. These mechanisms also play a role in the occurrence of severe systemic complications. Thus, some manifestations of lupus on the skin may be clinically significant and not merely dermatologic, and may help to determine if involvement of internal organs exists⁷.

Central nervous system manifestations are among the most challenging and severe of the Systemic Lupus Erythematosus

manifestations⁸. Can manifest as headache, seizures, psychosis, cognitive dysfunction, mood disturbance, peripheral and cranial neuropathy, stroke-like episodes, movement disorders and transverse myelitis⁹. The diagnosis of neurological lupus can be complicated as the symptoms can mimic infection, metabolic disturbances, drug toxicity, vascular disorders and primary psychiatric disorders. Unrecognized, this may lead to permanent neurological brain damage, diminished quality of life and increased morbidity¹⁰.

Another important systemic involvement of lupus is pulmonary. May involve pleuritis, pleural effusion, interstitial lung disease, pulmonary hypertension, lupus pneumonitis, shrinking lung syndrome, pulmonary embolism and diffuse alveolar hemorrhage¹¹. The initial symptoms of respiratory involvement are often non-specific and include cough, dyspnea, chest pain, fatigue and decreased exercise tolerance. Pulmonary disease is clinically silent in a few patients, until imaging or pulmonary function testing shows advanced changes. So it is vital that the patients at risk are identified early so that investigation and management can be done in time¹².

It is clinically relevant that cutaneous lupus manifestations may be associated with neurological or pulmonary involvement¹³. Livedo reticularis, vascular inflammation, or vascular thrombosis may be indicated by cutaneous vasculitis, livedo reticularis, digital ischemia and ulcerative lesions. Such pathological mechanisms might be involved in neuropsychiatric and pulmonary manifestations of lupus. Likewise, photosensitivity that occurs repeatedly, mucocutaneous disease that is active and oral ulcers can be signs of systemic immune activation, and this can lead to a higher risk for internal organ involvement¹⁴.

Understanding that skin lesions can be seen as a sign of underlying disease processes can help in making clinical decisions¹⁵. Detailed dermatological examination can be helpful in identifying patients who may need referral to a neurologic

Received on 12-10-2023

Accepted on 29-12-2023

specialist, chest imaging, pulmonary function testing, echocardiography, autoantibody evaluation, or specialist referral. This can be helpful in a resource-constrained environment, where more in-depth investigations can not always be immediately carried out in all patients¹⁶.

In systemic lupus erythematosus, the skin is a common site of involvement and cutaneous findings have been used as a diagnostic hallmark but have not been sufficiently studied in regards to neurologic and pulmonary involvement in the clinical setting. This association might be useful for physicians in detecting systemic complications by visible skin manifestations. The present study was thus undertaken to assess the correlation between the skin lesions and nervous system and pulmonary involvement among S.L.E. patients^{17,18}.

MATERIALS AND METHODS

This observational cross-sectional study was conducted to evaluate the association of cutaneous lupus manifestations with neurological and pulmonary involvement in patients diagnosed with systemic lupus erythematosus. The study was carried out at Multan Medical and Dental College, Multan, Pakistan, over a period of one year, from September 2022 to September 2023. To see if there was any correlation between dermatological manifestation which is visible and nervous system involvement, respiratory system involvement.

The study included 150 patients with SLE. Patients were included from out and in patients clinical departments of Multan Medical & Dental College, Multan. A non-probability consecutive sampling technique was used and all patients that met the selection criteria during the study period were sampled until the desired sample size was achieved.

Patients included in the study were those over 18 years of age with a definite diagnosis of systemic lupus erythematosus. Male and female patients were selected. Patients with available clinical evaluation for cutaneous manifestations, neurological involvement and pulmonary involvement were included. Patients with incomplete clinical records were excluded. Neurologic disorders secondary to systemic lupus erythematosus were also excluded, as were those with previous traumatic brain injury, diabetic neuropathy, central nervous system infection, and/or primary psychiatric disorder. Patients with chronic pulmonary disease other than lupus (such as chronic obstructive pulmonary disease, active pulmonary tuberculosis, bronchiectasis, or lung malignancy) were excluded. In addition, patients with skin eruptions caused by drugs who did not have lupus were ruled out of the study.

The study proforma was used for data collection. Demographic data comprised age, gender, place of residence, disease duration, family history of autoimmune diseases, smoking status and treatment history. Clinical data consisted of cutaneous lupus manifestations, neurological symptoms, pulmonary symptoms, history of disease flare, and ongoing or past treatment with steroid or immunosuppressive treatment. Detailed history taking and clinical examination was conducted for all the patients.

Clinical assessment of cutaneous lupus manifestations was done. The documented dermatological findings were malar rash, discoid rash, photosensitivity, oral ulcers, alopecia, vasculitic lesions, livedo reticularis, digital ischemic changes, subacute cutaneous lupus lesions and lupus panniculitis. Each of the cutaneous manifestations was noted as either present or not. Individuals with more than one skin finding were recorded as having such.

Neurological involvement was determined by in depth history and neurological examination. Neurological manifestations documented in the study were: headache, seizures, psychosis, mental dysfunction, mood and behavioral changes, peripheral neuropathy, cranial neuropathy, stroke-like episodes, movement disorder and transverse myelitis. Where available and clinically indicated, neuro-imaging, electroencephalography, cerebrospinal fluid analysis and nerve conduction studies were reviewed.

Pulmonary involvement was evaluated by clinical history, pulmonary examination, imaging findings (when available), pulmonary function (when available) and specialist evaluation (if needed). All pulmonary manifestations reported were pleuritis, pleural effusion, interstitial lung disease, pulmonary hypertension, lupus pneumonitis, shrinking lung syndrome, pulmonary embolism, and diffuse alveolar hemorrhage. Also described were respiratory symptoms including cough, dyspnea, pleuritic chest pain, hemoptysis and decreased exercise capacity.

Laboratory and radiological findings were noted from patient files pertinent to the current study. Laboratory parameters were complete blood count, C reactive protein, renal function tests, urine analysis, antinuclear antibody, anti-double-stranded DNA antibody, complement levels and antiphospholipid antibody profile when available. When clinically indicated, the following radiological tests were reviewed: Chest X-ray, High resolution computed tomography of the chest, Echocardiography, computed tomography and magnetic resonance imaging of the brain.

The main finding of the study was the correlation between cutaneous manifestations of lupus and neurological involvement. The secondary outcome was the relationship between the cutaneous manifestation of lupus and lung involvement. Each skin lesion was considered on its own and its association with neurological and pulmonary complications was determined.

Data entered and analysed by using SPSS software. Quantitative variables (age, duration of disease) were presented as mean \pm standard deviation. Qualitative variables like sex, cutaneous manifestations, neurological involvement, and pulmonary involvement were reported as frequency and percentage. The chi-square test or Fisher's exact test was used to determine the association between cutaneous manifestations and neurological or pulmonary involvement. Statistically significant results were set at p-values of <0.05 .

The study was started after approval of the institutional review board of Multan Medical and Dental College, Multan. All participants gave informed consent. Throughout the study, patient confidentiality was respected and data was only used for the study.

RESULTS

The study included 150 patients with systemic lupus erythematosus. The average age of the patients was 31.6 ± 9.4 years. Most patients were female, with 126 females and 24 males, giving a female predominance of 84.0%. The average disease duration was 4.2 ± 2.6 years. 29 patients had a family history of autoimmune diseases. In 64 patients, recurrent flares of lupus were reported. Corticosteroid therapy was being used by 118 patients, while 72 patients were receiving immunosuppressive therapy at the time of evaluation. The demographic and baseline clinical characteristics of the study population are shown in Table 1.

Skin changes were frequently seen in SLE patients. The most frequent cutaneous finding was photosensitivity, which was present in 92 patients, followed by malar rash in 86 patients and alopecia in 74 patients. Oral ulcers were seen in 61 patients and discoid rash in 38 patients. Vasculitic lesions were present in 34 patients, livedo reticularis in 21 patients, digital ischemic changes in 16 patients, subacute cutaneous lupus lesions in 18 patients, and lupus panniculitis in 9 patients. The distribution of cutaneous manifestations of lupus is shown in Table 2.

46 patients (30.7%) had neurological involvement. The most frequent neurological complication was chronic headache (24 patients). Fifteen patients had peripheral neuropathy, 11 patients had seizures, 10 patients had mood or behavioral changes, 8 patients had cognitive dysfunction, 5 patients had psychosis, 4 patients had stroke-like episodes, 3 patients had cranial neuropathy, and 2 patients had transverse myelitis. This summary is presented in Table 3.

Of the total number of patients, 39 (26.0%) had pulmonary involvement. The most common pulmonary complication was pleuritis which was reported in 22 patients. 16 patients had pleural

effusion. Interstitial lung disease occurred in 10 patients, pulmonary hypertension in 8 patients, lupus pneumonitis in 5 patients, pulmonary embolism in 3 patients, shrinking lung syndrome in 2 patients and diffuse alveolar hemorrhage in 1 patient. The frequency of pulmonary manifestations is shown in Table 4.

Results of the correlation between skin lesions and neurologic involvement indicated that there was a significant relationship between vasculitic skin lesions and neurologic complications. Neurological involvement was observed in 19 patients with vasculitic lesions and 27 patients with non-vasculitic lesions. This association was statistically significant with a p-value of < 0.001. Neurological involvement was also significantly associated with photosensitivity (35/92 patients photosensitive vs. 11/58 patients non-photosensitive). Neurological involvement was also significantly associated with oral ulcers and livedo reticularis. Malar rash and alopecia were more common among patients with neurological involvement, but the associations were not statistically significant. This detailed association is presented in Table 5.

The correlation between the cutaneous findings and the pulmonary involvement showed that there was a significant correlation between vasculitic lesions and the pulmonary involvement. Of the 116 patients who did not have vasculitic lesions, 22 had pulmonary involvement, whereas 17 of 34 patients with vasculitic lesions had pulmonary involvement. There was also a strong association between pulmonary involvement and photosensitivity and oral ulcers. Pulmonary involvement was significantly associated with livedo reticularis, indicating that vascular-pattern skin lesions may be associated with a greater risk for systemic organ disease. No significant relationship was found between pulmonary involvement and malar rash, alopecia and discoid rash. These findings are presented in Table 6.

Overall comparison showed that patients with vasculitic skin lesions were the most frequently affected in both neurological and pulmonary involvement. Neurological involvement was seen in 19 patients, pulmonary involvement in 17 patients, and vasculitic lesions were detected in 34 patients. Patients with photosensitivity and oral ulcers had higher rates of systemic involvement than those without photosensitivity or oral ulcers. These findings suggest that active inflammatory and vascular cutaneous manifestations may be associated with a higher burden of neurological and pulmonary disease in systemic lupus erythematosus, as shown in Tables 5 and 6.

Table 1: Demographic and Baseline Clinical Characteristics of Study Participants

Variable	Frequency / Mean ± SD	Percentage
Total patients	150	100.0
Mean age, years	31.6 ± 9.4	—
Female	126	84.0
Male	24	16.0
Mean disease duration, years	4.2 ± 2.6	—
Family history of autoimmune disease	29	19.3
Recurrent lupus flares	64	42.7
Current corticosteroid use	118	78.7
Immunosuppressive therapy	72	48.0

Table 2: Frequency of Cutaneous Lupus Manifestations Among Patients With Systemic Lupus Erythematosus

Cutaneous Manifestation	Frequency	Percentage
Photosensitivity	92	61.3
Malar rash	86	57.3
Alopecia	74	49.3
Oral ulcers	61	40.7
Discoid rash	38	25.3
Vasculitic lesions	34	22.7
Livedo reticularis	21	14.0
Subacute cutaneous lupus lesions	18	12.0
Digital ischemic changes	16	10.7
Lupus panniculitis	9	6.0

Table 3: Frequency of Neurological Manifestations in Study Participants

Neurological Manifestation	Frequency	Percentage
Any neurological involvement	46	30.7
Persistent headache	24	16.0
Peripheral neuropathy	15	10.0
Seizures	11	7.3
Mood or behavioral changes	10	6.7
Cognitive dysfunction	8	5.3
Psychosis	5	3.3
Stroke-like episodes	4	2.7
Cranial neuropathy	3	2.0
Transverse myelitis	2	1.3

Table 4: Frequency of Pulmonary Manifestations in Study Participants

Pulmonary Manifestation	Frequency	Percentage
Any pulmonary involvement	39	26.0
Pleuritis	22	14.7
Pleural effusion	16	10.7
Interstitial lung disease	10	6.7
Pulmonary hypertension	8	5.3
Lupus pneumonitis	5	3.3
Pulmonary embolism	3	2.0
Shrinking lung syndrome	2	1.3
Diffuse alveolar hemorrhage	1	0.7

Table 5: Association of Cutaneous Manifestations With Neurological Involvement

Cutaneous Manifestation	Neurological Involvement Present n (%)	Neurological Involvement Absent n (%)	p-value
Photosensitivity present	35 (38.0)	57 (62.0)	0.014
Photosensitivity absent	11 (19.0)	47 (81.0)	—
Malar rash present	30 (34.9)	56 (65.1)	0.181
Malar rash absent	16 (25.0)	48 (75.0)	—
Alopecia present	26 (35.1)	48 (64.9)	0.226
Alopecia absent	20 (26.3)	56 (73.7)	—
Oral ulcers present	27 (44.3)	34 (55.7)	0.003
Oral ulcers absent	19 (21.3)	70 (78.7)	—
Discoid rash present	14 (36.8)	24 (63.2)	0.347
Discoid rash absent	32 (28.6)	80 (71.4)	—
Vasculitic lesions present	19 (55.9)	15 (44.1)	<0.001
Vasculitic lesions absent	27 (23.3)	89 (76.7)	—
Livedo reticularis present	12 (57.1)	9 (42.9)	0.006
Livedo reticularis absent	34 (26.4)	95 (73.6)	—

Table 6: Association of Cutaneous Manifestations With Pulmonary Involvement

Cutaneous Manifestation	Pulmonary Involvement Present n (%)	Pulmonary Involvement Absent n (%)	p-value
Photosensitivity present	31 (33.7)	61 (66.3)	0.008
Photosensitivity absent	8 (13.8)	50 (86.2)	—
Malar rash present	25 (29.1)	61 (70.9)	0.346
Malar rash absent	14 (21.9)	50 (78.1)	—
Alopecia present	23 (31.1)	51 (68.9)	0.183
Alopecia absent	16 (21.1)	60 (78.9)	—
Oral ulcers present	24 (39.3)	37 (60.7)	0.004
Oral ulcers absent	15 (16.9)	74 (83.1)	—
Discoid rash present	12 (31.6)	26 (68.4)	0.403
Discoid rash absent	27 (24.1)	85 (75.9)	—
Vasculitic lesions present	17 (50.0)	17 (50.0)	<0.001
Vasculitic lesions absent	22 (19.0)	94 (81.0)	—
Livedo reticularis present	10 (47.6)	11 (52.4)	0.018
Livedo reticularis absent	29 (22.5)	100 (77.5)	—

Overall, the results demonstrated that cutaneous manifestations were highly prevalent among patients with systemic lupus erythematosus. Almost one-third of the patients had neurological involvement and about one-fourth had pulmonary involvement. There was significant correlation between neurological and pulmonary involvement and vasculitic lesions, livedo reticularis, oral ulcers, and photosensitivity. These results suggest that certain cutaneous manifestations of lupus can provide clinically useful clues to the presence of systemic manifestations that put a patient at risk for lupus complications.

DISCUSSION

The present study evaluated the association of cutaneous lupus manifestations with neurological and pulmonary involvement among patients diagnosed with systemic lupus erythematosus¹. Results revealed that skin lesions were very common among the study population, major dermatological findings being photosensitivity, malar rash, alopecia, oral ulcers, discoid rash, vasculitic lesions and livedo reticularis. Neurological involvement was observed in 30.7% of patients, while pulmonary involvement was observed in 26.0% of patients. The data presented here show the multisystem involvement of systemic lupus erythematosus and the clinical relevance of careful dermatological evaluation in patients with lupus^{2,3}.

Photosensitivity was the most frequent cutaneous manifestation and occurred in 61.3% of participants³. Malar rash was present in 57.3%, alopecia in 49.3%, and oral ulcers in 40.7% of patients. The findings are in line with the pattern of mucocutaneous involvement in SLE in which the appearance of skin and mucosal lesions may be an early and visible sign of disease activity⁴. The present study reveals that skin involvement is an important clinical feature of lupus which should not be treated as a dermatological problem alone due to its high prevalence⁵.

One of the most important results of the study was that there was a strong correlation between some of the skin manifestations and neurological involvement⁶. Patients with vasculitic lesions, livedo reticularis, oral ulcers and photosensitivity were more likely to have neurological involvement. The highest correlation was found in patients with vasculitic lesions: 55.9% of patients with vasculitic lesions had neurological involvement, whereas only 23.3% of patients without vasculitic lesions had neurological involvement⁷. This discovery indicates that these vascular-pattern skin lesions could be a marker of vascular inflammation in the body and potentially a sign of increased risk of nervous system involvement⁸.

It is possible that the link between the cutaneous vasculitis and neurological lupus can be accounted for by common pathological mechanisms⁹. Under both conditions, immune complex deposition, endothelial injury, complement activation, small vessel inflammation and thrombotic tendency may occur. Neuropsychiatric lupus may include vascular injury and autoantibody-mediated neuronal damage, leading to seizures, cognitive dysfunction, neuropathy, psychosis and stroke-like episodes. Thus, the appearance of vasculitic skin lesions could provide an external sign of vascular damage in the nervous system¹⁰.

In the current study, neurological involvement was also significantly associated with livedo reticularis. In those with lupus, livedo reticularis can be linked to vascular dysfunction or vasculopathy or with antiphospholipid antibody-related thrombosis¹¹. In its association with neurological manifestations, this may suggest a common vascular mechanism particularly in those with stroke-like events, seizures, headache or cognitive symptoms. This finding is an indication for a careful neurological examination in patients with livedo reticularis or other skin lesions with a vascular pattern in the context of lupus¹².

Neurological involvement was also significantly associated with oral ulcers and photosensitivity. These presentations can be seen as evidence of active mucocutaneous disease and immune system activation¹³. Oral ulcers and photosensitive rash are not always a sign of a serious underlying systemic disease, but when they are recurrent or persistent, it can show that there is active inflammation in lupus. These patients should have their symptoms (persistent headache, seizures, mood change, neuropathy, or cognitive complaints) evaluated and not be attributed to a nonspecific cause¹⁴.

In this study, 26.0% of patients had pulmonary involvement¹⁴. The most common pulmonary manifestations were pleuritis and pleural effusion, followed by interstitial lung disease, pulmonary hypertension, lupus pneumonitis, pulmonary embolism, shrinking lung syndrome and diffuse alveolar hemorrhage. This is

a typical finding and shows the wide spectrum of respiratory involvement in SLE. The pulmonary disease can range from mild pleuritic symptoms to life-threatening severe disease¹⁵.

There was also a significant correlation between the presence of skin involvement and lung involvement. Pulmonary complications were significantly associated with vasculitic lesions, with 50.0% of patients with vasculitic lesions having pulmonary involvement as compared with 19.0% of patients without vasculitic lesions¹⁰. Pulmonary involvement was also significantly associated with photosensitivity, oral ulcers and livedo reticularis¹¹. These results indicate that active inflammatory and vascular skin lesions may be associated with increased respiratory system disease activity¹².

The relationship between vasculitic skin lesions and pulmonary involvement could be related to immune-mediated inflammation of pulmonary vascular structures, pleura and interstitial tissue¹³. Systemic inflammatory activity may include pulmonary complications, including pleuritis, interstitial lung disease, pulmonary hypertension and lupus pneumonitis¹⁴. Clinicians should inquire about dyspnea, pleuritic chest pain, cough, hemoptysis, and decreased exercise tolerance in patients with cutaneous vasculitis¹⁵. Chest imaging, echocardiogram and pulmonary function tests may be necessary if symptoms occur¹⁶.

This study has clinical implications. Examination of the skin is easy to do and inexpensive, and can be done in an outpatient setting or in an inpatient setting¹⁷. Some skin findings could be considered high-risk and help to identify patients who may need a more thorough systemic evaluation¹⁸. Where advanced investigations are not available for every patient (as in resource-limited settings), visible cutaneous markers can be used to help guide to early referral and targeted investigation for neurological and pulmonary complications¹⁹.

Another important implication of this study is the need for multidisciplinary care in systemic lupus erythematosus²⁰. Dermatologists, rheumatologists, neurologists, pulmonologists, and internal medicine physicians should work together in the evaluation and management of patients with lupus¹⁰. Patients with vasculitic lesions, livedo reticularis, recurrent oral lesions or widespread photosensitivity should not be treated solely for their skin manifestations¹¹. However, they need to be assessed for potential systemic involvement, especially neurological and pulmonary complications¹².

There are some limitations in this study. The cross sectional design does not allow to conclude a cause-and-effect link between the presence of cutaneous manifestations and the presence of systemic involvement¹³. Neurological symptoms can be non-specific and may overlap with the effects of the medication, psychological stress, an infection or metabolic abnormality¹⁴. Likewise, pulmonary findings can be affected by an infection, an environmental exposure, smoking, or underlying pulmonary disease¹⁵. Other restrictions are that more sophisticated investigations (magnetic resonance imaging, high-resolution computed tomography, pulmonary function tests, echocardiography, complement levels, and antiphospholipid antibody profiling) might not have been widely available for all patients¹⁶.

Despite these limitations, the study offers some clinical evidence that some of the skin manifestations of lupus can be linked to neurological and pulmonary involvement¹⁷. The results indicate that skin examination is a valuable tool in evaluation of systemic lupus¹⁸. Large, prospective studies with a uniform method of assessing disease activity, autoantibody analyses, and extended follow-up are suggested to answer the question of whether there are specific cutaneous findings that may predict future neurological and pulmonary involvement^{19,20}.

CONCLUSION

The current study found that systemic lupus erythematosus patients frequently have skin findings and they may have significant systemic complications. Thirty (30.7%) patients had

neurological involvement and 21 (26.0%) had pulmonary involvement. Neurological and pulmonary involvement was significantly associated with vasculitic lesions, livedo reticularis, oral ulcers and photosensitivity. Vasculitic lesions were the most associated with neurological and pulmonary complications amongst all cutaneous findings. The results indicate that vascular and inflammatory skin lesions can be used as visual signs of systemic disease activity in lupus. Dermatologic examination should therefore be performed carefully to determine patients who might need further neurological and pulmonary evaluation. Prompt identification of high-risk skin findings can facilitate prompt diagnosis, directed investigations, specialist referral and management. Before the diagnosis of systemic lupus erythematosus is made, careful neurological and pulmonary assessment is indicated in patients with systemic lupus erythematosus who have vasculitic lesions, livedo reticularis, a history of recurrent oral ulcers, or extensive photosensitivity. Treatment of SLE patients is recommended to be multidisciplinary to reduce morbidity and improve clinical outcomes.

Competing Interests: The authors declare no competing interests.

Funding: No external funding was received for this study.

Authors' Contributions: NF designed the study and supervised dermatological assessment. UUA contributed to neurological evaluation. SSK assisted in neurological data interpretation. KS contributed to pulmonary assessment. BF supported biochemical and laboratory interpretation. ZHQ performed data organization, statistical review, and manuscript coordination. All authors reviewed and approved the final manuscript.

Acknowledgement: The authors acknowledge the support of Multan Medical and Dental College, Multan, and all patients who participated in this study.

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This article may be cited as: Fatima N., Ansari U. U., Khan S. S., Sardar K., Farooq B., Qureshi Z. H., Association of Cutaneous Lupus Manifestations with Neurological and Pulmonary Involvement in Systemic Lupus Erythematosus. *Pak J Med Health Sci.* 2024; 18(1): 955-959.