


Symptom clustering in patients with childhood-onset systemic lupus erythematosus

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Abstract

Aims: To: (a) explore the prevalence of the symptoms perceived by patients with childhood-onset systemic lupus erythematosus; (b) identify the symptom clusters occurring in patients with childhood-onset Systemic lupus erythematosus; and (c) examine the association of the burden of each symptom cluster with sleep quality and depression.

Background: Systemic lupus erythematosus is an inflammatory autoimmune disease that may result in patients' perception of various symptoms, with possible negative effects on their quality of life. Understanding the prevalence of symptoms perceived by childhood-onset Systemic lupus erythematosus patients and the disease's symptom clusters may be helpful in managing such burdensome symptoms.

Design: A correlational study design was used for this study in 2016.

Methods: Self-reported data from the Systemic lupus erythematosus symptom checklist were used to assess the symptoms perceived by patients. Symptom clusters were analysed using cluster analysis.

Results: Seventy-five patients were included in this study. The most prevalent and burdensome symptom perceived by patients was fatigue. Five clusters were derived, including symptoms related to pain and itching; bruises and stomach complaints; weight gain; body image and circulatory problems; and fatigue. A poor sleeper may perceive a greater symptom burden in all five of the symptom clusters, except for cluster #3, which refers to symptoms related to weight gain.

Conclusion: Five symptom clusters were identified. It is hoped that this study will give useful knowledge for understanding the symptom clusters for patients with Systemic lupus erythematosus and for improving nursing care quality.

KEYWORDS

childhood-onset, nursing, symptom cluster, systemic lupus erythematosus

1 | INTRODUCTION

Systemic lupus erythematosus (SLE) is an inflammatory autoimmune disease with variations in organ involvement. It results in many

symptoms originating from the disease itself or from its treatment. About 15% of SLE patients were diagnosed during childhood, referred to as childhood-onset SLE (SLEc) (Bundhun, Kumari, & Huang, 2017; Hersh et al., 2010). In a systematic review and meta-

analysis, Bundhun et al. (2017) compared the clinical features between childhood-onset and adult-onset SLE and found that the manifestations of the disease in SLEc patients was more aggressive, with greater renal involvement, haematological symptoms, seizures and ocular problems. Patients with SLEc also had a longer disease duration, a higher mortality rate, and were more likely to be on prednisolone and other immunosuppressive therapies than adult SLE patients (Hersh et al., 2010; Joo, Park, Won, & Bae, 2016). In general, moderate to high doses of corticosteroid and immunosuppressant drugs are administered to children and adolescents with SLE for treatment and for controlling disease activity (Huang et al., 2010). Thus, SLEc patients may perceive more symptoms such as fatigue, sleep problems, hair loss and bone marrow suppression related problems (Robinson, Cook, & Currie, 2011). Because of the above-described characteristics of SLEc, there is a need to understand the prevalence of symptoms and symptom clustering in clinical practice.

The concept of symptom clusters was highlighted and investigated in oncology patients for symptom management, as patients usually present multiple symptoms simultaneously (Dodd, Miaskowski, & Lee, 2004; Miaskowski, Dodd, & Lee, 2004). In clinical experience, patients with SLEc who are undergoing treatment usually suffer from multiple symptoms simultaneously and generally do not perceive a single symptom. However, to date, no research has focused on the concept of symptom clusters for the SLEc population. An understanding of the clustering symptoms and of the prevalence of the symptoms perceived by SLEc patients may be helpful in managing such burdensome symptoms and in improving these patients' quality of care.

1.1 | Background

The advanced treatments available for SLE have dramatically improved patient prognosis. The cumulative survival rate at 5 years for SLEc patients is greater than 90% (Fatemi, Matinfar, Saber, & Smiley, 2016; Huang et al., 2010). This has increased by approximately 50% from a survival rate of 40% in the 1950s (Robinson et al., 2011). Despite such improvements in the prognosis of the disease, children with SLE still have significant morbidity of long-term complications such as renal disease, circulatory disease, chronic immune suppression and musculoskeletal problems (Robinson et al., 2011). One study on the comorbidities of paediatric SLE patients in Taiwan showed that infection was the most common comorbidity in these patients, followed by musculoskeletal disease, cardiovascular disease, ocular disease and renal disease respectively (Chan, Yu, Yeh, Horng, & Huang, 2016). The comorbidities of SLEc may increase the severity and diversity of the signs and symptoms that patients perceive.

Patients who are diagnosed with SLE may suffer from numerous physical and psychological symptoms. The symptoms perceived by SLEc patients may be due to the disease itself and treatments such as corticosteroid and immunosuppressant agents. Common symptoms perceived by SLEc patients include fatigue, fever, weight loss, arthritis or arthralgia, haematological problem, skin rash and multi-

Why is this research or review needed?

- Patients who are diagnosed with SLEc may suffer from numerous physical and psychological symptoms, which may have a negative impact on their quality of life.
- Patients with SLEc who are undergoing treatment seldom present with a single symptom, usually presenting with multiple symptoms simultaneously.
- An understanding of the clustering symptoms and of the prevalence of the symptoms perceived by SLEc patients may be helpful in managing such burdensome symptoms.

What are the key findings?

- The most prevalent and burdensome symptom perceived by patients was fatigue.
- Five clusters were identified among SLEc patients, i.e., symptoms related to pain and itching; bruises and stomach complaints; weight gain; body image and circulatory problems; and fatigue.
- Sleep quality and depression can have a significant impact on the symptom clusters perceived by SLEc patients.

How should the findings be used to influence policy/practice/research/education?

- Healthcare providers should be aware of the prevalence of symptoms perceived by SLEc patients and how the symptoms are clustered.
- An initial understanding of SLEc patients' clustering symptoms could be helpful in assessing and managing such burdensome symptoms and improving the quality of care in clinical practice.

systemic manifestations (Robinson et al., 2011). Fatigue, pain and musculoskeletal distress are the most frequently reported by SLE patients (Pettersson et al., 2012). Furthermore, patients experience lower sleep efficiency and a greater number of awakenings than healthy people (Valencia-Flores et al., 2010). Besides the physical symptoms, SLEc patients may also suffer from psychological problem such as depression (Schattner, Shahar, Lerman, & Shakra, 2010; Zakari et al., 2012). Kohut et al. (2013), who examined the prevalence of depression and its risk factors, indicated that 26% of children and 44% of younger adults with SLEc had symptoms of depression. Moreover, the management of prednisolone dosages for SLE was significantly associated with the symptoms of depression perceived by patients (Kohut et al., 2013).

Both the physical and psychological symptoms perceived by SLE patients may have a negative impact on their quality of life (Pettersson et al., 2012). Fatigue and depressive symptoms can significantly predict a poorer health-related quality of life (Donnelly et al.,

2017; Piga et al., 2017). The ultimate goal of SLE treatment for SLEc patients is to control and maintain the disease activity, decrease patients' symptom distress and improve their quality of life. Thus, the healthcare provider may need to pay more attention to the symptoms experienced by these patients and to help them overcome these burdensome symptoms.

2 | THE STUDY

2.1 | Aim

The aims of this study are: (a) to explore the prevalence of the symptoms perceived by patients with SLEc; (b) to develop the symptom clusters occurring in patients with SLEc; and (c) to examine the association of the burden of each symptom cluster with sleep quality and depression.

2.2 | Designs

This is a descriptive correlational study design project. A questionnaire survey approach was conducted in 2016.

2.3 | Participants

The inclusion criteria for the study participants were: (a) patients diagnosed with SLE, with an age of diagnose at less than 18 years; and (b) outpatients who are regularly followed at clinics. Patients were excluded if they were: (a) not willing to participate in this study; (b) had complications with other chronic illnesses at the time of the data collection; and (c) were hospitalized due to an acute stage of disease or disease recurrence. The reason for excluding hospitalized patients was to increase the similarity of participants in this study. Children who are hospitalized for acute-stage disease or disease recurrence treatment may perceive more distressing symptoms than those in receipt of maintenance treatment at home, which may have an impact on the results of the study.

2.4 | Data collection

2.4.1 | Measures

The SLE symptom checklist

The SLE Symptom Checklist (SSC) was originally developed to capture patients' perceived and rated burden associated with 38 highly prevalent symptoms experienced by SLE patients (Grootscholten et al., 2003). The measures included in the SCC were in two parts. First, the participants were asked if a symptom had occurred in the past month — referred to as prevalence. Second, if the participants answered that a symptom had occurred in the past month, then the subject was asked to rate the burden that they perceived from this specific symptom. A four-point Likert scale, ranging from 0 for "not burdensome" to 4 for "extremely burdensome," was used to assess the symptom burden. In the report by Grootscholten et al. (2003),

reliability using Cronbach's alpha coefficient and test-retest reliability, and construct validity with significant correlation with other instruments, were described as good. The SSC was translated from English to Chinese and back-translated for this study to establish the semantic equivalence of the translated SSC and the original instrument.

The Pittsburgh sleep quality index

The Pittsburgh sleep quality index (PSQI) is a validated multidimensional measure that assesses individuals' quality of sleep, including subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication and daytime dysfunction. The PSQI differentiates "poor" from "good" sleep over the past month. A global sum of five or more indicates a poor sleeper. The PSQI has shown a sound reliability and validity with a Cronbach's alpha of 0.83 and a test-retest correlation coefficient of 0.85 (Buysse, Reynolds, Monk, Berman, & Kupfer, 1989).

Beck depression inventory-II

The Beck depression inventory-II (BDI) was developed by Beck, Ward, Mendelson, Mock, and Erbaugh (1961) and is a 21 item self-reported questionnaire for assessing the severity of depression in patients. The BDI employed a four-point scale that ranged from none to severe (0–3). The higher the BDI score, the more severe the depression perceived by the patient. The reliability and validity of the BDI have been well established by Beck and his colleagues; in terms of reliability, it achieved a mean coefficient alpha of 0.81 for non-psychiatric participants and a high association with another depression instrument for concurrent validity (Beck, Steer, & Garbin, 1988). The BDI cut-off point suggestion is: a score less than 10 means no or minimal depression, 10–18 means mild to moderate depression, 19–29 means moderate to severe depression and 30–63 means severe depression (Beck et al., 1988). The BDI score was re-categorized into two groups in this study: a non-depressed group (a score less than 10), and a depressed group (a score greater than or equal to 10).

Demographic Questionnaire

Demographic characteristics were collected including age, gender, disease information and treatment information from medical records.

2.5 | Procedures

A trained data collector at an outpatient clinic approached eligible patients from a medical centre in northern Taiwan. The patients received verbal and written explanations of the study design and procedures before they were asked about their willingness to participate in the study. After participant assent was obtained, a questionnaire pack was distributed to the patients, including the SSC, PSQI, BDI and demographic questionnaires. The patients were instructed to complete the questionnaires in a quiet area at the clinic during their waiting time for a clinic follow-up and to return the questionnaires after completion. If the patients could not complete the data collection during that time, a post-paid envelope was provided, and they were instructed to mail their questionnaires.

2.6 | Ethical considerations

The study was conducted following approval from the hospital's institutional review board, which assured that ethical regulatory requirements and standards were met for this study. The hospital's established procedures for protecting participants' confidentiality were strictly followed for the data collection procedure. All the eligible patients received both written and oral information about the study. The data collection proceeded after participant assent was obtained. All collected questionnaires were stored in a locked office. Information identifying participants on the questionnaires was stored separately, in a locked box, from the other materials.

2.7 | Data analysis

We used cluster analysis to classify the symptoms. Symptoms that seldom present in patients with SLEc may not be reliable for conducting analytic procedures. Thus, symptoms reported in the SSC with a prevalence below 30% were deleted from the cluster analysis procedure. Cluster analysis, an agglomerative hierarchical clustering using the centroid method with the cosine similarity measure, was adapted to establish the number of clusters. Initially, each symptom was considered as a cluster size of one. Thereafter, similar clusters estimated at the distance between the two mean vectors of the clusters were joined together until all clusters were merged into a single cluster (Sharma, 1996). A symptom cluster was defined by identifying a group of similar symptoms experienced by the patients. Following the identification of the symptom clusters, a *t* test was used to examine how sleep quality and depression effects each of the symptom clusters.

3 | Results

3.1 | Characteristics of participants

The participants in this study included 75 patients with SLEc (Table 1). They included 67 females and 8 males; 35 were students, and over 50% were either employed or unemployed. The mean age of the patients was 23.01 years (range 9.08–37.52, *SD* 5.78 years). The mean duration of their illness since diagnosis was 122.05 months (range 6–234, *SD* 55.4). The mean level of haemoglobin in the patients was 12.15 gm/dl (range 6.7–15.8, *SD* 1.72).

3.2 | Prevalence of Symptoms

The prevalence of each symptom perceived by the SLEc patients is presented in Table 2. The most prevalent symptom was fatigue (*N* = 53; 70.7%), followed by three symptoms with the same occurrence percentage (*N* = 43; 57.3%): hair loss, more appetite and mood changes. Almost 50% of the patients described that they had perceived the problem of weight gain (*N* = 37; 49.3%). The most burdensome symptom reported by the SLEc patients was fatigue, followed by hair loss and mood changes. The burden of “more appetite” was ranked in fourth place.

TABLE 1 The characteristic of the patients with SLEc

	N (%)	Mean (SD)	Range
Age (years)	75	23.01 (5.78)	9.58–37.20
Sex			
Male	8 (10.70%)		
Female	67 (89.30%)		
Education (years)	75	13.57 (3.01)	4–18
Occupation			
Student	35 (46.70%)		
Employee	22 (29.30%)		
Unemployed	18 (24.00%)		
Disease duration (months)	75	122.05 (55.4)	6–234
Haemoglobin (g/dl)	75	12.15 (1.72)	6.7–15.8

3.3 | Symptom clusters

Five clusters were derived from the analytic procedure of cluster analysis, as shown in Table 3 and Figure 1. Figure 1 shows that each symptom was initially viewed as a single cluster, and some of the symptoms later merged quickly, meaning that patients were more likely to perceive those symptoms simultaneously—for example, the symptoms of “painful joint” and “painful muscle.” The right side of Figure 1 shows all symptoms grouped together according to the centroid method. According to the plot, five clusters can be identified. The symptoms in each of the five clusters resulting from the statistical analysis are listed in Table 3 and are described as follows:

- Cluster #1 Symptoms related to pain and itching (four items): painful joints, painful muscles, headache and itch.
- Cluster #2 Symptoms related to bruises and stomach complaints (two items): spontaneous bruises and stomach complaints.
- Cluster #3 Symptoms related to weight gain (four items): chubby cheeks/face, more appetite, weight gain and nightmares.
- Cluster # 4 Symptoms related to body image and circulatory problems (three items): white fingers in cold weather, hair loss and sensitivity to sunlight.
- Cluster #5 Symptoms related to fatigue (five items): fatigue, mood changes, loss of concentration, disturbed memory and vulnerable skin.

3.4 | Factors associated with each symptom cluster

Table 4 lists the results of the way sleep quality and depression have an impact on each of the five clusters in patients with SLEc. Patients with poor sleep quality reported a statistically higher symptom burden in all clusters compared with patients with good sleep quality, with the exception of cluster #3 (weight gain). However, compared with patients without depressive symptoms, patients with depressive symptoms reported a statistically higher symptom burden only in cluster #5 (symptoms related to fatigue).

TABLE 2 The prevalence of each symptom in patients with SLEc

Symptom	Overall prevalence (%)	Symptom burden Mean (SD)
Fatigue	53 (70.7%)	1.61 (1.22)
Hair loss	43 (57.3%)	1.31 (1.31)
More appetite	43 (57.3%)	1.09 (1.18)
Mood changes	43 (57.3%)	1.32 (1.30)
Weight gain	37 (49.3%)	1.25 (1.49)
White fingers in cold weather	36 (48.0%)	1.13 (1.34)
Sensitivity to sunlight	36 (48.0%)	1.19 (1.34)
Itch	35 (46.7%)	1.05 (1.21)
Painful joints	34 (45.3%)	0.99 (1.18)
Headache	34 (45.3%)	0.99 (1.17)
Stomach complaints	33 (44.0%)	0.91 (1.08)
Painful muscles	29 (38.7%)	0.83 (1.08)
Vulnerable skin	29 (38.7%)	0.97 (1.31)
Nightmares	28 (37.3%)	0.72 (0.99)
Disturbed memory	28 (37.3%)	0.81 (1.18)
Spontaneous bruises	27 (36.0%)	0.76 (1.11)
Chubby cheeks/face	24 (32.0%)	0.79 (1.28)
Loss of concentration	23 (30.7%)	0.65 (1.06)
Blurred vision	21 (28.0%)	0.65 (1.13)
Ankle oedema	20 (26.7%)	0.69 (1.24)
Pimples	19 (25.3%)	0.55 (1.04)
Muscle weakness	19 (25.3%)	0.53 (0.96)
Muscle cramps	19 (25.3%)	0.60 (1.09)
Nausea/vomiting	18 (24.0%)	0.47 (0.88)
Red and painful eyes	17 (22.7%)	0.43 (0.81)
Less appetite	17 (22.7%)	0.45 (0.92)
Blue/purple stretch marks on the skin	17 (22.7%)	0.49 (1.05)
Fainting	17 (22.7%)	0.47 (0.92)
Facial hair growth	16 (21.3%)	0.43 (0.92)
Poor wound healing	15 (20.0%)	0.45 (0.99)
Skin rash	12 (16.0%)	0.36 (0.86)
Shortness of breath	12 (16.0%)	0.31 (0.74)
Sensitivity to artificial light	12 (16.0%)	0.39 (0.96)
Chest pain	12 (16.0%)	0.29 (0.73)
Ulcers in mouth or throat	5 (6.7%)	0.20 (0.79)
Pain while breathing	5 (6.7%)	0.12 (0.46)
Genital sores	3 (4.0%)	0.12 (0.61)
Fits	2 (2.7%)	0.09 (0.57)

4 | DISCUSSION

The advantage of this study is the use of an analytic procedure to establish symptom clusters in patients with SLEc. The concept of symptom clustering is not well discussed in research about patients with SLE. This study provides the opportunity to examine the

TABLE 3 The symptom clusters for patients with SLEc

Cluster	Symptoms Included
1. Symptoms related to pain and itching (4 items)	Painful joints Painful muscles Headache Itch
2. Symptoms related to bruises and Stomach complaints (2 items)	Spontaneous bruises Stomach complaints
3. Symptoms related to weight gain (4 items)	Chubby cheeks/face More appetite Weight gain Nightmares
4. Symptoms related to body image and circulatory problems (3 items)	White fingers in cold weather Hair loss Sensitivity to sunlight
5. Symptoms related to fatigue (5 items)	Fatigue Mood changes Loss of concentration Disturbed memory Vulnerable skin

grouping of symptoms in patients with SLEc. The results of symptom clustering from this study also have the potential to improve symptom management for patients with SLEc. For example, symptoms that tend to occur together may imply shared causes or origins; thus, it might be possible to deal with one symptom and simultaneously relieve the patient of all symptoms in a group.

4.1 | Limitations

The potential limitations of this study should be noted. First, the heterogeneity of the study participants might diminish the generalizability of the study results. As one of the inclusion criterion was that participants had to be SLEc patients who were diagnosed before the age of 18, the study is characterized by a wide range of patient ages (mean = 23.01; range 9.08–37.52 years) and illness duration (mean = 122.05; range 6–234 months). Moorthy et al. (2017) conducted a longitudinal study on the relationship between health-related quality of life and the disease parameters of SLEc. The findings indicated that disease activity and disease damage were not significantly different across the time continents throughout the 3-year period. However, there was an elevated trend in the disease activity and disease damage of SLEc patients during the 3-year period. Fatemi, Matinfar, and Smiley (2017) also indicated a reduction in the survival rate in a 23-year follow-up design project. We believe that the issue of the wide range of patient ages and illness duration in our study may potentially have an impact on the generalizability of the study results. Further studies on symptom clusters with a homogeneous disease duration and patient age are needed.

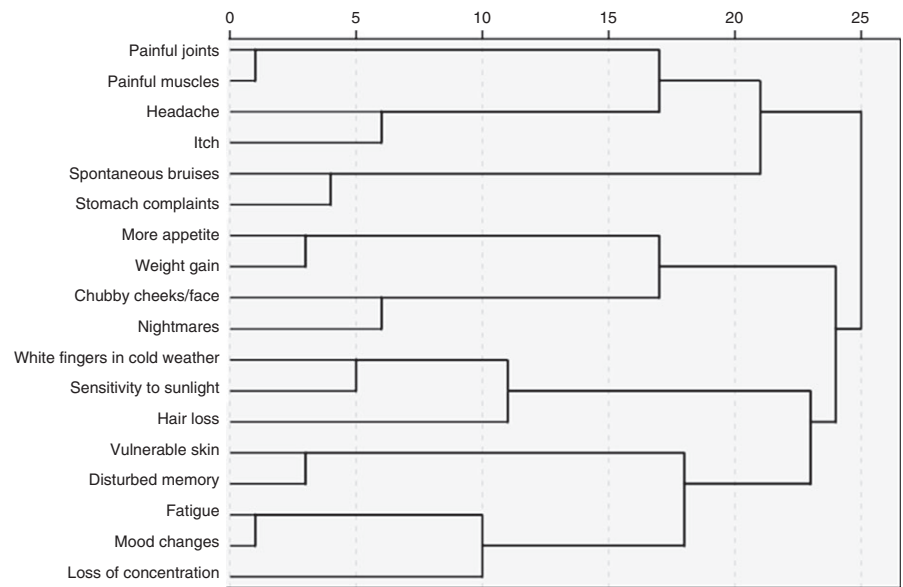


FIGURE 1 Cluster tree of symptoms for patients in SLEc

TABLE 4 The association of each symptom cluster with sleep quality and depression in patients with SLEc

	Cluster #1		Cluster #2		Cluster #3		Cluster #4		Cluster #5	
	Mean (SD)	t (p)	Mean (SD)	t (p)	Mean (SD)	t (p)	Mean (SD)	t (p)	Mean (SD)	t (p)
Sleep		-4.01*		-2.18*		-1.86		-3.10*		-4.87*
Good	2.34 (2.55)		1.17 (1.72)		3.03 (3.08)		2.57 (2.28)		3.00 (3.02)	
Poor	5.18 (3.54)		2.10 (1.93)		4.58 (4.00)		4.55 (3.11)		7.45 (4.79)	
Depression		-1.63		-0.70		-2.14		-0.26		-2.15*
Non-depressed	3.71 (3.09)		1.66 (1.73)		3.47 (2.79)		3.50 (2.66)		4.61 (3.80)	
Depressed	5.50 (3.97)		2.08 (2.19)		6.58 (4.80)		3.75 (3.70)		7.33 (3.98)	

Note. Cluster #1:pain and itching; Cluster #2: bruises and Stomach complaints; Cluster #3: weight gain; Cluster #4: body image and circulatory problems; Cluster #5: fatigue.

*p< .005.

The second limitation is that while the study provides new results about symptom clustering in patients with SLEc, the results should be viewed with caution because over half of the symptoms had a prevalence of less than 30% and were deleted in the cluster procedure. The exclusion of symptoms with a lower prevalence, such as blurred vision (28%), may lead to an underestimation of the number and complexity of clustering symptoms because of a lack of a certain cut-off point to define how low the prevalence should be to be deleted from cluster analysis (Sharma, 1996).

It is not surprising that the symptoms of fatigue, mood changes, loss of concentration, disturbed memory and vulnerable skin were grouped together as a cluster (symptoms related to fatigue). As a subjective experience, fatigue may manifest as somatic, emotional and cognitive symptoms (Stein, Martin, Hann, & Jacobsen, 1998); thus, the manifestation of symptoms of mood changes, loss of concentration and disturbed memory are usually viewed as the main characteristics for measuring fatigue. Therefore, the study also verified that the symptoms of fatigue, mood changes, loss of concentration and disturbed memory were joined together as a cluster.

However, the symptom of vulnerable skin was also merged with the same cluster. As mentioned earlier, children and adolescents with SLE may require moderate to high doses of corticosteroid and immunosuppressant drugs to control disease activity (Huang et al., 2010). One of the main causes of vulnerable skin is corticosteroid treatment, which can also significantly and adversely affect sleep and fatigue (Hinds et al., 2007; Valencia-Flores et al., 2010). Thus, we believe that corticosteroid treatment partly explains why the symptom of vulnerable skin is joined to the cluster of symptoms related to fatigue.

The results of our study showed that the problems of spontaneous bruising and stomach complaints were merged. The result of the study also indicated that the prevalence of painful joints and painful muscles were 45.3% and 23.8% respectively. Non-steroidal anti-inflammatory drugs (NSAIDs), and low to moderate doses of glucocorticoids are usually used to manage the symptom of pain that result from inflammatory arthritis in SLEc patients. Common side effects of NSAIDs and glucocorticoids are gastrointestinal irritation, thinning skin and ease of bruising (Eren, Armağan, & Talmaç, 2006).

It is possible that the cluster of symptoms related to bruises and stomach complaints results from treatment with NSAIDs and glucocorticoids.

Leuchten et al. (2018) investigated early symptoms perceived by 339 SLE patients and indicated that the first reported symptom was "fatigue," perceived by almost 90% of the patients. The study results were also consistent with several previous studies (Jones, Cunningham, Kashikar-Zuck, & Brunner, 2016; Kohut et al., 2013; Palagini et al., 2013), that the most frequent symptom reported by SLE patients is fatigue. Jones et al. (2016) conducted a study to investigate the fatigue, pain and psychological symptoms that have an impact on the quality of life of SLEc patients. They indicated that the quality of life of SLEc patients was highly correlated with greater levels of fatigue. Golder et al. (2018) indicated that although the highest-scoring symptom ranked by patients was fatigue, only about 48% of patients were routinely assessed by physicians. The study highlighted a significant gap in the perception of disease-related health status concerns between SLE patients and healthcare providers. It suggests that the problem of fatigue perceived by patients should be assessed by healthcare professionals and that appropriate fatigue management should be provided to these patients.

It is interesting that our study indicated that the incidence of painful joints and painful muscles was relatively low in SLEc patients, with prevalence rates of 45.3% (sixth place out of 38 symptom) and 44% (eighth place out of 38 symptom), respectively. The clinical features of lupus patients are many due to the patients' disease onset age; for example, SLEc patients had significantly more frequent problems of fever and renal disease and less muscle and joint lesions compared with adult-onset lupus patients (Wu et al., 2017). Only 40% of SLEc patients presented with pain symptoms (Jones et al., 2016). However, the pain of SLE patients may have significant physical and psychological impacts on them. For example, research has found the higher the pain levels, the worse the sleep and fatigue perceived by patients (Palagini et al., 2014). Pain may also result in the problem of depression (Figueiredo-Braga et al., 2018). Therefore, we suggest that clinical practice ought to pay attention to the pain levels perceived by SLEc patients.

Systemic lupus erythematosus patients have poorer sleep quality and greater levels of fatigue, anxiety and depression than healthy people (Moraleda et al., 2017). A significantly correlated relationship between fatigue, sleep problems and depression has been established in SLE patients (Valencia-Flores et al., 2010). Our findings corroborate the above-mentioned studies, indicating that a poor sleeper may perceive a greater symptom burden in all five symptom clusters, with one exception. Although SLEc patients with poor sleep and depression tend to have a higher burden of symptoms related to weight gain, statistically significant differences were not reached. The inequality of the variances between depressed and non-depressed people should be observed in the results due to the small sample size of the depressed group. It is suggested that further study could examine whether sleep and depression may have an impact on symptoms relating to weight gain.

Zakeri et al. (2012), who investigated the prevalence of depression in patients with SLE, noted that the most common depressive symptoms reported by patients were fatigue and weakness. This explains why, in the present study, depression only had an impact on the cluster of symptoms related to fatigue.

5 | CONCLUSION

Five symptom clusters were indicated in patients with SLEc. Our study findings indicate that a poor sleeper may perceive a greater symptom burden in all five symptom clusters, except for cluster #3 (symptoms related to weight gain), and that depression had a significant impact only on cluster #5 (symptom related to fatigue). These findings can be helpful for guidance on clinical symptom assessment and management in patients with SLEc.

It is hoped that this study will improve the quality of nursing care for patients with SLEc by providing useful knowledge and understanding of symptom clusters.

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CONFLICT OF INTEREST

No conflict of interest has been declared by the authors.

AUTHOR CONTRIBUTIONS

All authors have agreed on the final version and meet at least one of the following criteria [recommended by the ICMJE (*<http://www.icmje.org/recommendations/>)]:

- substantial contributions to conception and design, acquisition of data or analysis and interpretation of data;
- drafting the article or revising it critically for important intellectual content.

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