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# Factors Influencing Medication Adherence Among Female Patients with Systemic Lupus Erythematosus in Iraq

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**Abstract:** ***This study explores factors affecting medication adherence in Iraqi female patients with systemic lupus erythematosus (SLE). Using a cross - sectional design, 101 patients completed surveys including the Arabic version of the Morisky Medication Adherence Scale (MMAS - 8). Findings revealed an adherence rate of 47.52%, with younger age (≤30 years), low socioeconomic status, illiteracy, short disease duration, and side effects identified as significant predictors of non - adherence. These results highlight critical areas for intervention to improve adherence and patient outcomes.***

**Keywords:** Systemic lupus Erythematosus, Medication adherence, Risk factors, Iraqi patients, Morisky scale

## 1. Introduction

### Definition

Systemic lupus erythematosus (SLE) is the prototypic multi system autoimmune disorder with a broad spectrum of clinical presentations encompassing almost all organs and tissues. The extreme heterogeneity of the disease has led some investigators to propose that SLE represents a syndrome rather than a single disease (1)

### Epidemiology

Lupus is a worldwide disease with a striking predilection for women of childbearing age. In women between the age of 15 and 44 years, the female to male ratio is up to 13: 1 but it is only 2: 1 in children and in the elderly [2]. While it presents across ethnicities, it is more prevalent in non - Caucasians. However, the prevalence in Europe and United States is higher in people of African descent, while SLE is infrequent in Africa [3]. [The prevalence of SLE varies from country to country and from race to race [4] The prevalence of SLE in Iraq was one case per 1, 987 of the population. In the female population it was one per 1, 127 and for women aged between 10 and 49 years it was one per 616] (5).

### Clinical Features

[It is characterized by widespread organ involvement, a variety of clinical manifestations and a tendency to exacerbation and remission. There are marked immunological abnormalities notably the presence of a wide variety of antinuclear anti - bodies, fever, malar rash, oral ulcers, alopecia and arthritis are the classical features of SLE. Any organ system can be involved; Mucocutaneous, Haematological, Musculoskeletal, Cardiovascular, Respiratory, Renal, Neuro - psychiatric, Abdominal, Reticuloendothelial Gastrointestinal and Ocular manifestations could occur during the course of the disease]. (6)

### Management

When managing SLE patients, three points are particularly important:

1) Controlling the patient's symptoms to prevent immediate consequences and to improve quality of life
2) Minimizing damage due to disease activity
3) Preventing long - term morbidity and mortality.

Multiple drugs are used for treatment of SLE patients depending on disease activity and organ involvement (7), this includes broad immunosuppressants and immunomodulatory agents (8). Antimalarials are recommended for all patients, which are considered safe during pregnancy (8, 9). Glucocorticoids are used at varying doses according to patient need (10), while biological therapy has been used during the last two decades (11).

### Adherence to therapy

Adherence has been defined as being the extent to which patients take medications as prescribed by their health care providers. A patient is considered adherent if they take 80% of their prescribed medicine (s). If patients take less than 80% of their prescribed medication (s) they are considered non - adherent. Medication adherence occurs when a patient takes their medications according to the prescribed dosage, time, frequency and direction (12) Adherence rates are typically lower among patients with chronic conditions, as compared to those with acute conditions, the persistence among patients with chronic conditions decreasing drastically after the first 6 months of therapy (13).

In general, failure to adhere to regular treatment results in poor disease control, increasing morbidity and mortality and decreasing quality of life. Non - adherence also results in a significant economic burden (14).

Non - adherence to treatment is multifactorial for most patients and varies according to the unintentional or

intentional pattern of non - adherence. The World Health Organization (WHO) has identified health - care systems, provider relationships, disease treatment, patient characteristics and socioeconomic characteristics to be factors affecting adherence [15]. Pill or prescription burden, also referred to as polypharmacy, appears to be an important predictor of non - adherence. In addition, the dosing regimen (times per day/week) play a role, with 'once a day' being associated with the highest level of adherence [14]. Furthermore, low socioeconomic and educational status, depression and other psychosocial characteristics have also been associated with poor adherence; whereas social support has been shown to improve it [16].

In contrast to intentional non - adherence, unintentional non - adherence is thought to be the result of a passive process that is less strongly associated with individuals, beliefs and perceptions. Unintentional non - adherence can be related to issues with the health system e. g. financial costs, pharmacy processes, opening hours, accessibility and language barriers. Patients from disadvantaged populations are at a higher risk of non - adherence due to the barriers imposed by the system itself [17].

**Aims of the Study**

This study aims to identify determinants of medication adherence among Iraqi female patients with systemic lupus erythematosus.

## 2. Patients and Methods

### 2.1 Study design

This cross - sectional study was conducted amongst SLE patients at the Rheumatology Unit of Baghdad Teaching Hospital during from 1st April 2020 to 1st April 2021.

### 2.2 Sample selection

A total of 101 consecutive female patients diagnosed with SLE according to the 1997 American College of Rheumatology classification criteria ([18]) were studied.

### 2.3 Inclusion Criteria

- Female Patients (female to male SLE ratio is 13: 1) undergoing treatment with glucocorticoids, hydroxychloroquine and/or immunosuppressants at the time of enrollment.
- disease duration >3 months.
- Have adequate cognitive status as determined by communicating with the patients

### 2.4 Exclusion Criteria

- Presence of other Autoimmune Inflammatory Disease
- Disease Duration (After Diagnosis) less than 2 months
- Patients with cognitive impairment
- Pregnancy
- Malignant diseases

### 2.5 Ethical Consideration:

Informed consent was obtained from each participant included in this study according to the declaration of Helsinki. Ethical approval was obtained from the Ethics Committee at the Medical Department, College of Medicine, University of Baghdad.

### 2.6 Data collection and entry

Patient data were entered using a paper clinical research form (CRF) through an interview questionnaire.

All participants completed three paper questionnaires: socio - demographic, clinical and treatment characteristics survey including the Arabic version of the eight - item Morisky Medication Adherence Scale (MMAS - 8) [19] which ranged from 0 - 8 (a score below 6 indicates low adherence, a score of 6 & 7 indicates medium adherence and a score of 8 indicates high adherence).

The following data was collected through the questionnaire and clinical examination: Patients age (years), sex, disease duration, smoking status, height (cm), weight (kg), body mass index (BMI, calculated according to the equation BMI = weight/height$^2$). **Disease activity** [20] was reported according to SLE SLEDAI - 2k score: no flare present ≤3, mild/moderate flare 3 – 12, severe flare >12), patients residency, level of education, marital status, fertility status, employment status, duration of SLE, chronic comorbidity and type of SLE medications, satisfaction with treatment, frequency of dosing (if more than once daily), comprehension of medical instructions and presence of side effects.

**Statistical analysis**

Descriptive statistics were used to summarize the characteristics of participants. Factors associated with medication non - adherence were explored using logistic regression analysis and are shown as odds ratios (ORs) with 95% confidence interval (CI). All statistical analyses were performed using IBM SPSS version 21, and a P - value less than 0.05 was considered statistically significant.

## 3. Results

**Demographic Characteristics of 101 SLE Female Patients Studied**

All together 101 female SLE patients were studied. Their mean age was 30.20 ± 5.46 years (range 18 - 41 years). Most patients (92.08%) were married. Only a small percentage (3.32%) were ex/current smokers. The mean BMI of patients was 25.47± 2.44 kg/m2. More than two - thirds (71.29%) of the patients were fertile. The vast majority (91.09%) had attained at least primary education. The socio - economic status of 58.42% of the included women were considered high, while 41.58% of the women were considered of low socio - economic status. Most women (61.39%) were urban residents, and 62.38% of them were employed as presented in table (1).

**Table 1:** Patients' characteristics and demographic data for 101 SLE female patients

| Variables | Values |
|---|---|
| **Age, years** | |
| Mean±SD | 30.20± 5.46 |
| Range | 18 - 41 |
| **Marital status** | |
| Married | 93 (92.08%) |
| Single | 8 (7.92%) |
| **Smoking** | |
| Never | 98 (97.03%) |
| Ex/current | 3 (2.97%) |
| **Body mass index, kg/m$^2$** | |
| Mean±SD | 25.47± 2.44 |
| Range | 21.0 - 32.0 |
| **Fertility** | |
| Fertile | 72 (71.29%) |
| Infertile | 29 (28.71%) |
| **Education** | |
| Yes | 92 (91.09%) |
| No | 9 (8.91%) |
| **Socioeconomic status** | |
| Low | 42 (41.58%) |
| High | 59 (58.42%) |
| **Residence** | |
| Rural | 39 (38.61%) |
| Urban | 62 (61.39%) |
| **Employment** | |
| Yes | 63 (62.38%) |
| No | 38 (37.62%) |

**Clinical and Therapeutic Characteristics of 101 SLE Female Patients**

The mean disease duration was 3.38 ± 1.85 years (range 1 - 10 years). Steroids were used by all patients, while DMARDs and immune - suppressants were used by 72.28% and 42.57% of the patients, respectively. None of the patients used single drug, while 57.43% and 42.57% of the patients were using double and triple drugs, respectively. Side effects of these drugs were reported in 59.41% of the patients. However, 85.15% of the patients were satisfied with their treatment.

Comorbidity and systemic involvement of SLE was reported in 14.85% and 43.56% of the patients, respectively. SLE was inactive in 29.70%, mildly active in 27.72%, moderately active in 30.69% and severely active in 11.88% of the patients as shown in table (2).

**Table 2:** Clinical and therapeutic characteristics of 101 SLE female patients

| Variables | Values |
|---|---|
| **Disease duration, years** | |
| Mean±SD | 3.38± 1.85 |
| Range | 1.0 - 10 |
| **Medications** | |
| Steroid | 101 (100%) |
| DMARDs | 73 (72.28%) |
| Immunosuppressant | 61 (60.4%) |
| **Number of drugs** | |
| Single | 0 (0%) |
| Double | 58 (57.43%) |
| Triple | 43 (42.57%) |
| **Side effects** | |
| No | 41 (40.59%) |
| Yes | 60 (59.41%) |
| **Satisfaction** | |
| Yes | 86 (85.15%) |
| No | 15 (14.85%) |
| **Comorbidity** | |
| No | 86 (85.15%) |
| Yes | 15 (14.85%) |
| **Systemic involvement** | |
| No | 57 (56.44%) |
| Yes | 44 (43.56%) |
| **Disease activity** | |
| Inactive | 30 (29.70%) |
| Mild to moderate | 59 (58.42%) |
| Severe | 12 (11.88%) |

**Adherence Rate**

According to the Morisky scale, 23 women (22.77%) had high adherence to their medication, 25 women (24.75%) had medium adherence, and 53 women (52.48%) had low adherence to their medications as shown in Figure

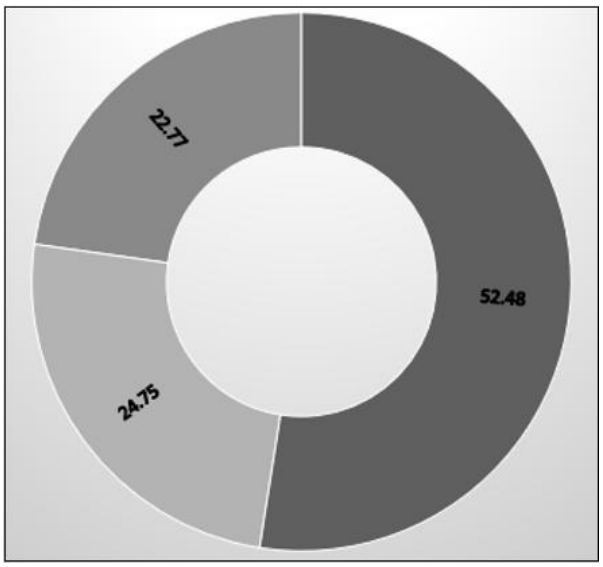


**Figure 1:** Adherence rate for medications among 101 SLE female patients according to Morisky scale
Low Adherence 52.48%, Medium Adherence 24.75%, High Adherence 22.77%

**Association of Patients' Characteristics with Adherence rate**

Most demographic factors displayed a significant association with the adherence. The mean age of the adherent patients was 32.33 ± 4.57 years which was higher than that of non - adherent patients (28.26 ± 5.51years) with a highly significant difference. Non - educated women were more frequent amongst the non - adherent group compared to the adherent group (19.09% versus 2.08%) with a significant difference.

Women with high SES and employed women were more common amongst the adherent group (83.33% and 64.58%) compared to the non - adherent group (35.85% and 13.21%) with highly significant differences. Finally, 83.33% of the adherent patients were urban residents compared to 41.50% from the non - adherent group with a highly significant difference as presented in Table (3).

**Table 3:** The association between adherence level and patients' demographic characteristics

| Variables | Low (<6) (n=53) | Med - high (≥6) (n=48) | p – value |
|---|---|---|---|
| **Age, years** | 28.26±5.51 | 32.33±4.57 | **<0.001** |
| **Marital status** | | | |
| **Married** | 51 (96.23%) | 42 (87.5%) | 0.105 |
| **Single** | 2 (3.77%) | 6 (12.5%) | |
| **Smoking** | | | |
| Never | 52 (98.11%) | 46 (95.83%) | 0.5 |
| Ex/current | 1 (1.87%) | 2 (4.17%) | |
| **BMI, kg/m$^2$** | 25.06±2.1 | 25.92±2.73 | 0.077 |
| **Fertility** | | | |
| Fertile | 35 (66.04%) | 37 (77.08%) | 0.22 |
| Infertile | 18 (33.96%) | 11 (22.92%) | |
| **Education** | | | |
| Yes | 45 (84.91%) | 47 (97.92%) | **0.022** |
| No | 8 (19.09%) | 1 (2.08%) | |
| **Socioeconomic status** | | | |
| Low | 34 (64.15%) | 8 (16.67%) | **<0.001** |
| High | 19 (35.85%) | 40 (83.33%) | |
| **Residence** | | | |
| Rural | 31 (58.49%) | 8 (16.67%) | **<0.001** |
| Urban | 22 (41.50%) | 40 (83.33%) | |
| **Employment** | | | |
| Yes | 46 (86.79%) | 17 (35.42%) | **<0.001** |
| No | 7 (13.21%) | 31 (64.58%) | |

**Association of Clinical and Therapeutic Characteristics with Adherence Rate**

The relation between adherence levels and disease characteristics was assessed**.** With the exception of medications and comorbidity, all included clinical and therapeutic characteristics were significantly associated with drug adherence.

The mean disease duration in the adherent group was 3.98 ± 2.03 years which was significantly higher than that of the non - adherent group (2.83 ± 1.49 years). Drug side effects were far more common amongst the non - adherent group versus the adherent one (81.13% versus 35.42%), with a highly significant difference. In contrast, systemic involvement of SLE and patient's satisfaction was far more common amongst the adherent group (56.25% and 100%, respectively) compared to the non - adherent group (32.08% and 71.70%, respectively) with highly significant differences. SLE was inactive in 47.17% of patients in the non - adherent group versus 10.42% of patients in the adherent group with a significant difference between them as shown in table (4).

**Table 4:** The relation between adherence level and disease clinical as well as therapeutic characteristics

| Variables | Non – adherent (n=53) | Adherent (n=48) | p - value |
|---|---|---|---|
| **Disease duration, years** | 2.83±1.49 | 3.98±2.03 | **0.001** |
| **Steroids** | | | |
| Present | 53 (100%) | 48 (100%) | 1 |
| Absent | 0 (0%) | 0 (0%) | |
| **DMARDs** | | | |
| Present | 39 (73.58%) | 34 (70.83%) | 0.785 |
| Absent | 14 (26.42%) | 13 (27.08%) | |
| **Immunosuppressant** | | | |
| Present | 28 (52.83%) | 33 (68.75%) | 0.102 |
| Absent | 25 (47.17%) | 15 (31.25%) | |
| **Number of drugs** | | | |
| Single | 0 (0%) | 0 (0%) | 0.301 |
| Double | 33 (62.26%) | 25 (52.08%) | |
| Triple | 20 (37.74%) | 23 (49.92%) | |
| **Comorbidity** | | | |
| Yes | 8 (19.09%) | 7 (14.58%) | 0.943 |
| No | 45 (84.91%) | 41 (85.42%) | |
| **Side effects** | | | |
| Yes | 43 (81.13%) | 17 (35.42%) | **<0.001** |
| No | 10 (18.87%) | 31 (64.58%) | |
| **Systemic involvement** | | | |
| Yes | 17 (32.08%) | 27 (56.25%) | **0.014** |
| No | 36 (97.92%) | 21 (43.75%) | |
| **Satisfaction** | | | |
| Yes | 38 (71.70%) | 48 (100%) | **<0.001** |
| No | 15 (28.30%) | 0 (0%) | |
| **Disease activity** | | | |
| Inactive | 25 (47.17%) | 5 (10.42%) | **0.001** |
| Mild to moderate | 24 (45.28%) | 35 (72.92%) | |
| Severe | 4 (7.55%) | 8 (16.67%) | |

**Multivariate Analysis**

A multivariate logistic regression test was used to find out independent risk factors for drug non - adherence. All variables which had a significant association with adherence were entered into the model. For this analysis, continuous variables (age, BMI, disease duration) were categorized into categorical variables. The results are demonstrated in table 5. Each of employment, residence and systemic involvement of SLE had a significant association with adherence rates. In contrast, younger age ≤30 years (OR=0.32, 95%CI=0.12 - 0.86, p=0.027), illiteracy (OR=3.22, 95%CI=1.22- 21.67, p= 0.038), low socioeconomic status (OR=0.36, 95%CI=0.08 - 0.84, p=0.015), more than 3 years' disease duration (OR= 0.28, 95%CI= 0.32 - 0.92, p= 0.019), presence of side effects (OR= 25.8, 95%CI=3.75 - 78.45, p= 0.001), patient's dissatisfaction (OR= 41.2, 95%CI=2.07 - 83.63, p=0.015) and mild to moderate forms of the disease were independent risk factors for non - adherence.

**Table 5:** Multivariate Analysis

| Variables | Non - adherent (n=53) | Adherent (n=48) | p - value | OR (95%CI) |
|---|---|---|---|---|
| **Age, years** | | | | |
| ≤30 | 35 (66.04%) | 15 (31.25%) | **0.027** | **1** |
| >30 | 18 (33.96%) | 33 (68.75%) | | **0.32 (0.12 - 0.86)** |
| **Education** | | | | |
| Yes | 45 (84.91%) | 47 (79.92%) | **0.038** | 1 |
| No | 8 (19.09%) | 1 (2.08%) | | **3.22 (1.22 - 21.67)** |
| **SES** | | | | |
| Low | 34 (64.15%) | 8 (16.67%) | **0.015** | **1** |
| High | 19 (35.85%) | 40 (83.33%) | | **0.36 (0.08 - 0.84)** |

| | | | | |
|---|---|---|---|---|
| **Residence** | | | | |
| Rural | 31 (58.49%) | 8 (16.67%) | 0.105 | 1 |
| Urban | 22 (41.50%) | 40 (83.33%) | | 0.89 (0.82 - 5.87) |
| **Employment** | | | | |
| Yes | 46 (86.79%) | 17 (35.42%) | 0.118 | 1 |
| No | 7 (13.21%) | 31 (64.58%) | | 0.53 (0.76 - 58.81) |
| **Duration, years** | | | | |
| ≤3 | 39 (73.58%) | 23 (47.92%) | **0.019** | **1** |
| >3 | 14 (26.42%) | 25 (52.08%) | | **0.28 (0.32 - 0.92)** |
| **Side effects** | | | | |
| No | 10 (18.87%) | 31 (64.58%) | **0.001** | **1** |
| Yes | 43 (81.13%) | 17 (35.42%) | | **25.8 (3.75 - 78.45)** |
| **Syst. involvement** | | | | |
| No | 36 (97.92%) | 21 (43.75%) | 0.159 | 1 |
| Yes | 17 (32.08%) | 27 (56.25%) | | 0.26 (0.04 - 1.69) |
| **Satisfaction** | | | | |
| Yes | 38 (71.70%) | 48 (100%) | **0.015** | **1** |
| No | 15 (28.30%) | 0 (0%) | | **41.2 (2.07 - 83.63)** |
| **Disease activity** | | | | |
| Inactive | 25 (47.17%) | 5 (10.42%) | **0.008** | 1 |
| Mild to moderate | 24 (45.28%) | 35 (72.92%) | **0.014** | **0.14 (0.3 - 0.67)** |
| Severe | 4 (7.55%) | 8 (16.67%) | 0.104 | 0.72 (0.19 - 2.93) |

## 4. Discussion

This study aimed to determine the prevalence and predictors of medication non - adherence amongst a sample of SLE female patients in Baghdad, Iraq. According to this study, the mean age of the patients was 30.20 ± 5.46 years. This is in accordance with other previous study performed among Iraqi patients. Abbas et al. [21] found the mean age was (32.5 ± 1.1years) with an age range of 23 - 36 years. This confirms a higher incidence of SLE in this age bracket among Iraqi women.

In the present study, using Morisky scale, the adherence rate was 47.52%, which implies that more than 50% of the patients were non - adherent to their medications. In accordance with this result is a review including 11 studies with the number of patients ranging from 32 to 246, respectively. In this review, Mehat et al. [22] assessed non - adherence among SLE patients and reported the overall percentage of non - adherent patients ranged from 43% - 75%, with the majority of included studies reporting that over half of SLE patients are non - adherent to treatment. A much lower percentage of adherence (31.7%) was reported in Brazil ([23]) (using Morisky scale). In a single - center cross - sectional study amongst Egyptian patients [24] with SLE, adherence to medication was measured via The Compliance Questionnaire for Rheumatology - 19 and found to be 38%. Thus, besides the different demographic and therapeutic factors, the tool used for determination of adherence has a very important role.

According to multivariate analysis, each of younger age ≤30 years (OR=0.32, 95%CI=0.12 - 0.86, p=0.027), illiteracy (OR=3.22, 95%CI=1.22 - 21.67, p= 0.038), low socioeconomic status (OR=0.36, 95%CI=0.08 - 0.84, p=0.015), more than 3 years' disease duration (OR= 0.28, 95%CI= 0.32 - 0.92, p= 0.019), presence of side effects (OR= 25.8, 95%CI=3.75 - 78.45, p= 0.001), patient's dissatisfaction (OR= 41.2, 95%CI=2.07 - 83.63, p=0.015) and mild to moderate forms of the disease activity were independent risk factors for non - adherence. This implies that patients > 30 years old have about 3 - fold (1/0.32) more adherence than those ≤ 30 years old. This agrees with many previous studies. In a German study including 579 patients with SLE, Chehab et al. [25] reported that older ages were significantly associated with medication adherence (OR=1.06; 95% CI=1.03– 1.08). In another study, Daleboudt et al. [26] enrolled SLE patients to determine the factors associated with non - adherence to medication. The study disclosed that younger age was a strong predictor for non - adherence. However, the authors did not calculate the odds of this factor. In a Saudi study, younger patients were associated with higher non - adherence rates versus patients of older age (OR= 2.62; 1.02–6.71) [27]

Different factors are likely to contribute to this association. Higher morbidity caused by accumulated damage or comorbidities linked to age and long - standing disease will lead to change of illness awareness and might influence treatment acceptance. Furthermore, general life experience in older patients may be the essential factor. Additionally, the burden of occupational, familial and social commitments are more likely to affect disease and treatment acceptance negatively at younger age, with eventual intentional or unintentional non - adherence.

The other factor which was independently associated with drug non - adherence in the present study was illiteracy (OR=3.22, 95%CI=1.22 - 21.67, p= 0.038). This is consistent with an adherence study conducted in the USA by Garcia - Gonzalez et al. ([28]) which revealed significant correlation between compliance questionnaire rheumatology (CQR) score and education level. Oliveira - Santos et al. [23] showed that patients with incomplete secondary education showed twice the odds of not understanding the medical prescription (OR=2.18, 95% CI=1.20–3.96, p<0.05) when compared to those with complete Secondary or University education. These results may be attributed to the fact that patients with lower levels of education often have less knowledge of medication and poor comprehension of the consequences of non - adherence. Thus, improving the medication knowledge of patients (especially those with

lower education levels), may help to improve the adherence in SLE patients.

The other factor which was independently associated with adherence in the present study was SES. Patients with high SES will be 2.78 - fold more adherent than those with low SES. Chambers et al. [29] called attention to low SES in Jamaica, with the authors considering it an important factor impacting adherence. Garcia Popa - Lisseanu et al. [30] also highlight low income as a barrier to adherence among patients in North America. In the Egyptian study, the low SES increased the odd of non - adherence by 2.6 - times (OR 2.6, 95 % CI 1.6–4.3, P < 0.04) [29]. Almost similar results were obtained by Garcia - Gonzalez amongst American patients. [28]

Some reports indicated that the extent of medication non - adherence in low and middle - income countries is greater than in developed countries because of a lack of health resources and unequal access to health care. The healthcare system in Iraq provides free services to all Iraqi citizens, and most cost is covered by the government. This characteristic eliminates the impact of patients' income on adherence. However, a lot of patients did not feel helped by the government because the medications were frequently not available at the points of delivery, and therefore the patients had to buy them. Sometimes the medication cost is not available, which is considered an important factor that prevented these patients from adhering to the treatment.

The presence of treatment side effects was another important factor for non - adherence in the present study. This is one of the most agreed upon factors between different studies. In a Chinese study including 140 SLE patients, Xie et al. [31] disclosed that drug side effects were significantly associated with nonadherence. Oliveira - Santos et al. [23] have shown that 13.8% of SLE patients stopped taking their medicine because it made them feel worse. Chambers et al. [29], Garcia - Gonzales et al. [28] and Garcia Popa - Lisseanu et al. [30] identified adverse reactions as determinant factors in adherence.

Adverse drug reactions occurred in a considerable percentage of patients, and prednisone was reported as the main drug involved. [32] It is important to highlight that patients should receive information on probable adverse effects resulting from their treatment and on ways they should behave when such events occur. Approximately 20% of patients reduced the dose or stopped taking their medication when they noted some adverse reaction (ADR). The possibility of a drug causing adverse events is often omitted by the prescriber, who may be fearful that negative information on the medicine will jeopardize the patient's adherence to treatment or that the patient may even feel such an adverse event due to self - suggestion. Maintaining the medication even in the face of some negative symptoms during its use increased the odds of adherence by 81% among those who continued taking the medication, when compared to those that suspended usage. [28]

In the present study, the short duration of SLE (≤ 3 years) was significantly associated with nonadherence, which implies that longer duration of the disease will increase the adherence rate. This result is not in agreement with an Egyptian study in which disease duration was not a predictor of medication non - adherence. [29] Moreover, an American study showed that longer disease duration was associated with better adherence (OR= 0.8, 95%CI= 0.68 - 0.95, p= 0.01). This discrepancy between the different studies could be attributed to cultural differences among different populations, sample sizes and mean duration of the disease. For example, in the American study, the mean duration of the disease was only around 18 months, while in the present study it was 3.38 years.

The adverse impact of longer disease duration on drug adherence in the present study could be explained by the desperate status that may developed (for patients with longer disease duration), because it is well known that medications are not curative, rather are taken to alleviate the symptoms and reduce the progression of the disease. The most powerful predictor for drug non - adherence in the present study was patients' dissatisfaction with medications. In accordance with this result is a German study which revealed that a patient's satisfaction with their medication was significantly associated with their adherence. [30]. Xie et al. [31] also found that non - adherence was more common among participants who were not satisfied with their treatment.

The last factor which was independently associated with non - adherence in the present study was disease activity. This finding is consistent with previous studies. In the Egyptian study, higher disease activity was associated with medication non - adherence in an univariate analysis. However, in multiple analyses, it was not a predictor for medication non - adherence. [29] In another Egyptian study, the non - adherent group had statistically significant higher Systemic Lupus Erythematosus Disease Activity Index (SLEDAI) (36.92 ±11.93 vs.6.8±1.9) and damage index (DI) score (6.67±2.5 0.21±0.47) (P<0.001) compared to adherent group. [33]

In fact, there is a reciprocal cause - effect relationship between disease activity and drug adherence. When a patient feels no improvement after using a certain medication for a period of time, they usually reduce their adherence to that medication and start seeking alternatives. The reverse is also true i. e. when a patient does not adhere to their medication for any reason, the activity of the disease will increase. Therefore, it is a priority to find the cause of this relationship in order to increase the drug adherence.

## 5. Limitation

1) Due to limited time and financial constraints, the study was conducted at a single center which may have resulted in overestimation or underestimation of the prevalence of medication non - adherence of SLE patients
2) The study is a cross - sectional study which allows only for correlation, but not cause - effect relationship.
3) The self - report measures of non - adherence was the only method employed in this study which is subjective in nature and may have underestimated the status of non - adherence.

## 6. Conclusions

This study highlights significant predictors of medication non - adherence in Iraqi women with SLE, including younger age, illiteracy, low socioeconomic status, and side effects. Addressing these factors through targeted interventions may improve adherence and patient outcomes, particularly in resource - limited settings. At the end, we contributes to understanding barriers to medication adherence in low - resource settings, providing insights for healthcare providers to improve outcomes in SLE management

**Conflict of interest**

The authors declare no conflict of interest

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