

Effect of Online Teaching Instructions on Compliance among Patients Receiving Immunosuppressive Therapy

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Abstract

Patients receiving immunosuppressive therapy face many challenges. Medication compliance (adherence) is an important part of the treatment for those patients' well-being. A high level of compliance to medication regimens can have profound impacts on patients' quality and length of lives, their health outcomes, and overall health care costs. Patients undergoing immunosuppressant therapy were specifically selected to be given online education to protect them from exposure to infection in light of the Corona pandemic. **Aim of the study:** To examine the effect of online teaching instructions on compliance among patients receiving immunosuppressive therapy. **Research design:** Pre-posttest quasi-experimental design was utilized. **Setting:** The study was conducted through online contact (Whats App.). **Sample:** A convenient sample of 30 male and female patients diagnosed with systemic lupus and multiple sclerosis receiving immunosuppressive therapy. **Tools:** Data collection tools included a) Personal and Medical data forms and b) Patient Compliance Rating Scale. **Results:** The study revealed a significant difference between pre and post- instructions. Patients demonstrated a high score level of compliance after applying the online teaching instructions. **Conclusion:** Providing teaching instructions were very important for improving compliance to the therapeutic regimen. The study concluded that the implementation of the online instructional teaching significantly showed an improvement on the level of compliance among the studied group **Recommendations:** Improving adherence to the immunosuppressive therapy regimen is necessary for a better prognosis. Developing an instructional program based on issues related to patients' regimens and personal perceptions is highly recommended.

Keywords: Online instructions- Teaching- Compliance- adherence- Immunosuppressive Therapy.

Introduction

Immunosuppressive therapy is a drug that inhibits or prevents the activity of the immune system. They are used to treat conditions in which the immune system is overactive, such as autoimmune diseases which include: rheumatoid arthritis; multiple sclerosis; systemic lupus, myasthenia gravis; psoriasis;etc. It treats also some other non-autoimmune inflammatory diseases such as long- term allergic asthma control and ankylosing spondylitis. In addition, immunosuppressive therapy may be used to preserve a person from rejecting a bone marrow or organ transplant. Immunosuppressant drugs can be used as tablets, capsules, liquids, or injections (**National Institute of Health and care excellence, 2019 & Romanelli & Mascolo, 2020**).

Immunosuppressive therapy is very powerful and can cause serious side effects; increased risk of infection is the most common side effect. Other common side effects include the following: high blood pressure; kidney and liver problems; dyslipidemia; hyperglycemia; peptic ulcers; moon face; loss of appetite; nausea or

vomiting; increased hair growth; and trembling or shaking of the hands. The drugs can also increase the chance of uncontrolled bleeding (**Jean & Borel, 2019 & Kerckhoffs, Luuk & Rob, 2020**). In addition, several non-steroidal anti-inflammatory drugs, often co-prescribed with immunosuppressant therapy, have also various side effects such as gastrointestinal toxicity and an increased risk of myocardial events. Obviously, immunosuppressive treatment regimens are complex and require ongoing self-management. Therefore, medication compliance (adherence) is an important part of treatment for those patients' well-being. (**Vaismor, Patric & John, 2019 & Clinical guideline for transplant medications, 2019**).

Compliance is the process whereby the patient follows the prescribed and dispensed regimen as intended by the prescriber. It is defined as "the extent to which a person's behavior (in terms of taking medications, following diets, or executing lifestyle changes) coincides with medical or health advice. In fact, compliance with therapy is an indication of a positive behavior in which the patient is

motivated sufficiently to adhere to the prescribed treatment because of a perceived self-benefit and positive outcome. A high level of compliance with medication regimens can have profound impacts on patients' quality and length of life, their health outcomes, and overall healthcare costs (Understanding Factors Influencing Patient Compliance, 2019). In reverse, noncompliance seems to contribute to a lack of effectiveness in treatments and may be a marker for poor clinical outcomes. There are two types of noncompliance: intentional and non-intentional. Intentional noncompliance may be due to several reasons including cost, dosing complexity, duration of treatment, forgetfulness, other priorities, and the decision to omit a dose. On the other hand, in non-intentional compliance, the patient is unaware that he or she is not taking the medication as prescribed. A large number of variables that may contribute to noncompliance include the patient-prescriber relationship, health literacy, patient knowledge, physical difficulties, tobacco or alcohol intake, and forgetfulness (National Institutes of Health, 2020 & Martin, Summer & Williams, 2020).

In addition, multiple factors could affect medication-taking behavior including patient characteristics, treatment history, and patients' perception of their health and support programs. The importance of these factors may differ among patients according to their individual situation. Obviously, misunderstanding is an important barrier to consider, if a patient does not have a comprehensive understanding of the need for the medicine, the expected adverse effects or how long it will take to see results, can quickly derail their desire and attentiveness to their prescribed therapies. Patient education significantly improves compliance, the main purpose of patient education is to change behavior caused by a lack of information in a positive direction. Therefore, providing patients with education about their disease and treatment plan increases medication compliance (Vaismor, Patric & John, 2019).

Nurses play a crucial role in providing comprehensive care and educating patients (Martin & Williams, 2020). Important elements of patient education are skill building and responsibility. Patients need to know when, how, and why they need to make a lifestyle change (Dawn & Ruth, 2020). Furthermore, simplification of the drug therapy, patient education regarding both the illness and the

medication, continued patient reminders of the therapy's value, as well as benchmarks set to evaluate the success or failure of the therapy, have all had a positive effect on compliance. Implementation of such educational programs can be effective in improving outcomes for patients and reducing costs both at the patient and systemic level (Jing, Edward & Min, 2018 & Fereidouni, Sarvestani, & Hariri, 2019).

Online patients' education, is the education of patients who may not always be physically present at a hospital. Online educational programs can be given through the World Wide Web or other network technologies. It allows long-distance patient and clinician contact, care, advice, reminders, education, intervention, monitoring, and remote admissions. When rural settings, a lack of transport, a lack of mobility, decreased funding, or a lack of staff restricts access to care, Online education is very important to improve patients' compliance with medication and care provided (Guideline to distant education, 2019). Additionally, interventions such as electronic monitoring, feedback, and cognitive education have shown benefits in improving compliance (Romanelli & Mascolo, 2020). Actually, Patients undergoing immunosuppressant therapy were specifically selected to be given online education to protect them from exposure to infection in light of the Corona pandemic.

Significance of the study

The national claims database market scan estimated that; the prevalence of patients receiving immunosuppressive drugs was about 115 million per year from 2017 to 2019. According to the world health organization (WHO, 2020), the number of patients taking immunosuppressive drugs for the management of autoimmune inflammatory conditions is increasing, and patients receiving immunosuppressants are vulnerable to common and uncommon infections. CDC (2021) added that adherence among patients with chronic diseases averages only 50% in developed countries. Richardson and Vinicius, 2019 in their study reported that client receiving immunosuppressive therapy faces many challenges.

According to Beaugerie, & Kirchgessner, (2019) & Emanuele, Nicastro, Vecchio & Liguoro, (2020), online education is effective in

increasing knowledge and improving patient compliance. Gorge & Mark, (2019) added that; online patients' education improves patients' safety among patients post organ transplantation. Scant studies were conducted about online education for those kinds of patients in the current study region. Therefore, the findings of the current study could provide nurses, nurse educators, and healthcare providers an evidence-based information on the effect of online education or the use the technology on education for patients' compliance. Furthermore, the current study results might have a positive reflection on patients' general health status, through improving patients' quality of life at home by reducing the physical and psychological complications. Additionally, data derived from this study may provide a nucleus for further qualitative and quantitative studies in this area. Thus the aim of the current study is to examine the effect of online teaching instructions on compliance among patients receiving immunosuppressive therapy.

Aim of the study:

The aim of the current study was to examine the effect of online teaching instructions on compliance among patients receiving immunosuppressive therapies.

Research hypothesis

To achieve the aim of this research, the following hypothesis is postulated to be tested:

H1: Patients receiving immunosuppressive therapy will have higher mean scores of compliance after receiving online teaching instructions than the mean scores of compliance before.

Research design:

Pre- post-test quasi-experimental design was utilized to fulfill the aim of the current study, in which the same assessment measures are given to participants both before and after they have received treatment or been exposed to a condition, with such measures used to determine if there are any changes that could be attributed to the treatment or condition (APA dictionary of psychology, 2022).

Methods

Setting:

The current study was conducted through online WhatsApp contact for patients with multiple sclerosis and patients with systemic lupus).

Sample:

A convenient sample of 30 male and female patients receiving immunosuppressive drugs who are willing to participate through a period of 6 consecutive months constituted the current study sample. Inclusion criteria were as follows: adult male and female; adult age ranged between 18 to 55 years; able to communicate online; and diagnosed as systemic lupus and multiple sclerosis (those were the most available sample on hand who currently has internet Facebook group access)

Tools of Data Collection

Data pertinent to the current study was collected using the following two tools:

Personal and Medical Data Form: developed by the researchers and consisted of questions regarding gender, age, place of residence, marital status, level of education, occupation, medical diagnosis, type of immunosuppressive drug, frequency of drug, and presence of comorbid diseases for patients, and b) Patient Compliance Rating Scale: which was developed also by the researchers based on thorough literature review, it contained 24 items that assess patients' compliance related to medications (11 items), healthy lifestyle (7 items), and infection control measures (6 items). Each item has 2 responses either yes or no, (Yes) mean that; the patient had low level of compliance and was given (0 score) while (No) means that; the patient had a high level of compliance and was given (1 score). The total score is divided to two categories as follows, 60% or more (14 – 23 score) it mean that; the patients had satisfactory level of compliance while 60% or less (less than 14 score) it mean that; the patients had unsatisfactory level of compliance .

Validity and Reliability

The face and content validity of the study tools was tested by a panel of five experts three of them are faculty members in Medical- Surgical Nursing field and two physicians specialized in immunity and immunotherapy. The experts were asked to examine the tools for content coverage, clarity, wording, length, format, and overall appearance. Minor modifications were done. The reliability of the study tools was established statistically using Cronbach's alpha to examine the internal consistency. It was 0.91.

Ethical consideration:

Approval was obtained from the Ethical Research Committee at the Faculty of Nursing, Cairo University to conduct the study with

approval code No. (RHDIRB2019041701). The purpose and nature of the study as well as the importance of the study was explained to the patients who met the inclusion criteria through online contact. Joining the online Whats App group was considered an agreement from the patient to participate in the study. Also, anonymity and confidentiality were assured through coding the data. Patients were assured that participation in this study is voluntary and they have the right to withdraw from the study at any time without penalty.

Procedure

Once official permission was granted to proceed with the study, the researchers proceed with the data collection. Data was collected through four phases as follows: a) In the first phase, the researchers first joined the Facebook groups belonging to the systemic lupus patients and the multiple sclerosis patients, then the researcher sent a post to both groups introducing selves, identity, and occupation. Also, the researcher explained the purpose and the nature of the study, then the researchers invited the patients in the two groups who are willing to share in the study and who meet the study inclusion criteria to join WhatsApp group that was established before and its link was mentioned in the post. Once patient joined the WhatsApp group, it was considered an agreement to participate in the study. b) In the second phase, the researcher started to contact the participants through the opened WhatsApp groups. Once the participants in WhatsApp group reach 30 patients with systemic lupus and multiple sclerosis, the researchers started by welcoming them, introducing self again, and explaining the purpose and the nature of the study once again. In this phase, the researchers collected the pre-test using study tools (a & b) by sending a Google form link to be filled by the participants. For participants who were not familiar with Google form, the researchers collected the data individually by telephone call, c) In the third phase, once completion of the pretest information, the researcher began the instructions sessions for two weeks (3 sessions each week each session from 45 to 60 minutes), the first week sessions included giving information related to the disease (nature, signs & symptoms, risk factors, and management) those sessions were given just as introduction and for ice break between researchers and patients. Information was given

by sending related posters followed by the researcher's voice recording explanation. While in the second week, the researcher explained in depth the medication regimen and the health instructions related to medication, diet, and the lifestyle changes using power point slides, posters, and voice recordings. During these two weeks the participants were given the opportunity to ask the related questions and the researcher was responding to all inquiries to ensure proper understanding, d) Finally, the fourth phase, in this phase the researcher collected the post-test related information using a study tool (II) form the same way as the pre-test.

Results

Statistical findings of the current study were presented in the following two sections: The first section is devoted to the description of the structured interview questionnaire which includes two aspects: (a) Personal characteristics data (Tab. 1); and (b) Medical data (Table 2). The second section presents patient compliance questionnaire.

Table (1) showed that; 73.4% of patients were female and 63% of them were between 28 – less than 38 years. 77% of patients were from urban, 73 % of them were highly educated, and 80% of patients were married. Moreover, 73.4% of them were not working.

Table (2) illustrated that 50% of patients were diagnosed with multiple sclerosis and 50% were diagnosed with systemic lupus. 56.6% experienced disease from 1 to less than 3 years. All the patients were receiving different types of immunosuppressive drugs combined with different types of anti-inflammatory drugs. 43.4% and 33.4% of them were receiving Teriflunomide (Aubagio) 14 mg and Mycophenolate mofetil (Cellcept) 250mg immunosuppressive drugs respectively. And 93.4% of them take those medications one time per day. 70%, 63.3%, 50%, and 46.6% of patients take Steriod (Soli-medrol) 5 mg, NSAIDs (Celebrex), Hydroxychloroquine (Plaquenil) 200 mg, and Melga as other medications respectively. In addition, 56.6% of them had co-morbid diseases, and 30% out of them had diabetes mellitus.

Table (3) showed that in relation to items as sometimes you forget to take medication; you ever stopped taking your medicines: you feel hassled about sticking to your prescribed

medications; sometimes you are not taken your medications on the exact scheduled time and when you forget to take the prescribed medications, you forget to contact your doctor. constituted the highest percentages of non-compliance to medication regimen 93.3%, 60%, 76.3%, 73.3 % & 60%) respectively before conducting the online teaching program compared to (100%, 100%, 40% 86% & 100%) complain level after conducting the online teaching program for the same previous items respectively with the mean of 4.6 ± 2.8 before conducting teaching program compared with the mean of 10.4 ± 0.8 after conducting teaching program and significance level of (0.208)

Table (4) presented that items such as: sometimes you eat nuts; sometimes you eat fast food; sometimes you forget to do the daily exercise; and sometimes you have no enough sleeping time, represented the highest percentage of non-compliance related to healthy lifestyle (100%, 93.4%, 93.4%, & 86.8%) respectively before conducting online teaching program compared with (86.6%, 93.4%, 66.7%

& 80%) of complained level for the same previous items after conducting online teaching program respectively with the mean of (1.2 ± 0.4) before conducting teaching program while the mean after conducting teaching program was 1.9 ± 0.7 and significance level was (0.161).

Table (5) illustrated that item of sometimes you have direct contact with others amounted, you are not commit to wear a mask when leaving home and sometimes you forget to wear a mask when leaving home constituted (100%, 86% & 86%) of patient had non-compliance before conducting teaching program compared with (66.7%, 93.4% & 93.4%) level of complain for the same previous items after conducting the teaching program with the mean of 3.1 ± 1.8 before conducting teaching program while the mean after conducting teaching program was 5.9 ± 0.95 and significance level was 0.321.

Table (6) showed the difference between means and standard deviations of all items of compliance before (9.8 ± 5.8) and after (19.4 ± 3.1) receiving the online instructions with significance level of 0.438.

Table (1): Frequency distribution and percentage of personal characteristics among the studied sample (n = 30).

Item	No.	%
Gender		
- Male	8	26.6
- Female	22	73.4
Age		
- 18 – < 28 years	6	20
- 28 – < 38 years	19	63
- 38 – < 48 years	5	17
Place of residence		
- Rural	7	23
- Urban	23	77
Level of education		
- Highly educated	22	73
- Intermediate education	8	27
Marital status		
- Married	24	80
- Single	6	20
Type of work		
- Employee	3	10
- Student	2	6.6
- Worker	3	10
- Not work	22	73.4

Table (2): Frequency distribution and percentage of medical data among the studied sample (n = 30).

Item	No.	%
Medical diagnosis		
- Systemic lube	15	50
- Multiple sclerosis	15	50
The first time the symptoms of disease were discovered		
- Less than 1 year	5	16.6
- 1 - < 3 years	17	56.6
- 3 - < 5 years	7	23.4
- 5 years and more	1	3.4
Name of the immunosuppressive drug(s)		
- Sandiimmun (Neoral) 25 mg	5	16.6
- Azathioprine (Imuran) 50 mg	2	6.6
- Mycophenolatemofetil (Cellcept) 250mg	10	33.4
- Teriflunmide (Aubagio) 14 mg	13	43.4
Frequency of the prescribed immunosuppressive drugs		
- 1 time/ day	28	93.4
- 2 times/day	2	6.6
Name of the other prescribed drugs:		
- Interferon beta 1 a (Avonex) 30mg	12	40
- Hydroxychloroquine (Plaquenil) 200 mg	15	50
- Steriod (Soli-medrol) 5 mg	21	70
- Gabapentin (Gaptin)300 mg	10	33.3
- NSAIDs (Celebrex)	19	63.3
- Melga	14	46.6
- Ossofortin D3 5000 unit	11	36.6
- Centrum 5mg	4	13.3
Presence of co morbid diseases		
- Yes	17	56.6
- No	13	43.4
Type of co morbid diseases		
- Diabetes mellitus	9	30
- Hypertension	3	10
- Epilepsy	1	3.3
- Nephritis	4	13.3

Table (3): Frequency distribution and percentage of patients 'compliance to medications regimen before and after conducting the online nursing instructions (no 30).

Items Compliance with medications regimen	Before conducting instruction				After conducting instruction				P-value	Sign.		
	Yes		No		Yes		No					
	No.	%	No.	%	No.	%	No.	%				
Sometimes you forget to take your prescribed medicines.	28	93.3	2	6.7	0	0	30	100	0.237	0.208*		
You ever stopped taking your medicines.	18	60	12	40	0	0	30	100				
When you travel or leave home you forget to take your medication.	8	26.6	22	73.4	0	0	30	100				
You did not take your prescribed medicines yesterday.	2	6.7	28	93.3	30	100	0	0				
Some time you stop your medications when you feel your health is under control.	16	53.3	14	46.7	0	0	30	100				
You did not take your medications over the past 2 weeks.	8	26.6	22	73.4	0	0	30	100				
You feel hassled about sticking to your prescribed medications.	23	76.6	7	23.4	18	60	12	40				
You take your medication only when you feel sick.	16	53.3	14	46.7	0	0	30	100				
Sometimes you are not taken your medications on the exact scheduled time.	22	73.3	8	26.7	4	13.3	26	86.7				
When you forget to take the prescribed medications, you forget to contact your doctor.	18	60	12	40	0	0	30	100				
You ever double the dose of medications by mistake.	16	53.4	14	46.6	0	0	30	100				
		X± SD				X± SD						
		4.6± 2.8				10.4 ± 0.8						

*p < .05

Table (4): Frequency distribution and percentage of patients' compliance to healthy life style before and after conducting the online nursing instructions (no 30).

Items	Before conducting instruction				After conducting instruction				P-value	Sign.
	Yes		No		Yes		No			
	No.	%	No.	%	No.	%	No.	%		
Sometimes you eat fast food.	28	93.4	2	6.6	4	13.4	26	86.6		
Sometimes you drink beverages.	26	86.6	4	13.4	2	6.6	28	93.4		
Sometimes you eat nuts.	30	100	0	0	10	33.3	20	66.7		
Sometimes you forget to do the daily exercise.	28	93.4	2	6.6	6	20	24	80		
Sometimes you forget to contact your doctor when you have complications.	22	73.3	8	26.7	3	10	27	90		
Sometimes you have no enough sleeping time.	26	86.6	4	13.4	22	73.3	8	26.7		
	X± SD				X± SD				0.57	0.32*
	2.2± 1.3				3.8± 1.6					

p* < .05Table (5):** Frequency distribution and percentage of patients' compliance to infection control before and after conducting the online nursing instructions (no 30).

Items	Before conducting instruction				After conducting instruction				P-value	Sign.
	Yes		No		Yes		No			
	No.	%	No.	%	No.	%	No.	%		
Sometimes you are not follow the general hygienic measures.	6	20	24	80	1	3.3	29	96.7		
Sometimes you are not able to maintain a clean environment around you.	18	60	12	40	14	46.7	16	53.3		
Sometimes you are stay long time in a crowded place.	8	26.6	22	73.4	2	6.6	28	93.4		
Sometimes you have direct contact with others.	30	100	0	0	10	33.3	20	66.7		
Sometimes you are deal with animals and birds.	12	40	18	60	2	6.6	28	93.4		
You are not commit to wear mask when leaving home.	26	86.6	4	13.4	2	6.6	28	93.4		
Sometimes you forget to wear mask when leaving home.	26	86.6	4	13.4	2	6.6	28	93.4		
	X± SD				X± SD				0.98	0.321*
	3.1± 1.8				5.9 ± 0.95					

p* < .05Table (6):** Mean and Standard deviation among all items of compliance before and after conducting the online nursing instructions (no 30).

Item	Before instruction — X± SD	After instruction — X± SD	P-value	Sign.
Total patients' compliance score	9.8± 5.8	19.4 ± 3.1	2.47	0.438

**p* < .05

Discussion

A sample of 30 patients (15 patients with multiple sclerosis and 15 patients with systemic lupus) constituted the current study participants. With regards to participants' personal data, the majority of them were female, this is consistent with Ramírez Sepúlveda, et al. 2019 and Judith & Pamela, 2011 mentioned that multiple sclerosis (MS) and Systemic lupus

erythematosus (SLE) are more common in females than males. With regards to age, the study group age ranged between 28-38 years old. This result is in congruence with Reich, Lucchinetti, & Calabresi, (2018) who addressed that MS is usually diagnosed between the ages of 20 and 49 years and is in agreement with Khan, et al. 2022, stated that

Systemic lupus erythematosus classically seen in young to middle-aged.

The majority of the study participants were married from urban areas. Two third of them were highly educated and the rest were having intermediate education level. These socio-demographic findings are matching the study sample of Mahmoud, Hawash, & Abd Elmaksoud, 2022 while exploring factors affecting adherence with medication for patients with systemic lupus erythematosus. Apparently, most of the current study participants were not working. This could be explained in light of the complexity of the disease process and due to the fact that most of them were female and suffering from co-morbid diseases. Co-morbidities may modify the clinical presentation of disease and have implications for treatment choice, adherence, and outcome. More than half of study participants were suffering from co-morbid diseases. These findings are equivalent to Gergianaki, et al. 2021 and Magyari & Sorensen, 2020 which addressed that co-morbidities are common in the MS and SLE populations. Regarding study participants' medical data, almost half of the participants discovered the disease between one to three years after symptoms appear. This finding is incongruent also with Mahmoud, Hawash, & Abd Elmaksoud, 2022 reported that most patients discovered the disease after suffering from the symptoms.

Noncompliance to the immunosuppressive therapy regimen can negatively impact long-term outcomes in patients. Concerning patients' compliance with the Immunosuppressive therapy regimens, The overall findings of the present study revealed a significant statistical difference between the compliance level before and after conducting online instructions among the study sample (P- value = 0.438). The total mean scores of all items (compliance with medication regimens, compliance with healthy lifestyle, and compliance with infection control measures) among the study group showed a low level of compliance $X \pm SD$ (9.8 ± 5.8) before providing online instructions, these results are consistent with Moreso, Torres, Costa, & Serón (2015) who admitted that non-compliance to long-term therapies is a common situation. Results are also match what mentioned by Albuquerque, Pinto, Neto, and Fragoso, 2022 that adherence among those patients suffering from chronic diseases

averages 50% in developed countries. Moreover, the results are in agreement with Mohamed et.al., 2021 who reported that the majority of the studied sample was not adherent to the diabetes therapeutic regimen before giving the educational program.

On the other hand, the current study results showed that the total mean scores of items regarding compliance were higher $X \pm SD$ (19.4 ± 3.1) after conducting online instructions. The results are matching Zhu, Zhou, Zhang, Zhang, & Lin. (2017) who found that adherence intervention through education resulted in significantly increased adherence rates and adherence scores compared with patients who did not receive adherence intervention. The findings support the idea that adherence intervention improves adherence with immunosuppressive therapy. The findings are also incongruence with the study of Taibanguay, Chaiamnuay, Asavatanabodee, & Narongroeknawin, (2019) revealed that patient education significantly improved adherence and added also that provision of a disease information pamphlet with or without directed counseling can equally enhance medication adherence of patients with Rheumatic Arthritis (RA). This is supporting the current study findings that showed an obvious effect of providing instruction online. The success of the program could be attributed to the process of the online education, the interactions followed during the implementation, and the fact that it was tailored to patients' needs.

Concerning compliance with medication regimens items, the current findings revealed significant difference in compliance between before $X \pm SD$ (4.6 ± 2.8) and after instruction $X \pm SD$ (10.4 ± 0.8). Findings showed that the most evident non-compliance items among the studied group before conducting online instructions were related to forgetting, feeling of annoyance, and schedule time. In relation to compliance with the healthy lifestyle, the current study showed a significant difference between items before $X \pm SD$ (2.2 ± 1.3) and after instructions $X \pm SD$ (3.8 ± 1.6). It is apparent that patients reported a high percentage of non-compliance in all items related to a healthy lifestyle including diet, exercise, and sleeping patterns before instruction. This could be explained in light of most of the participants from urban areas. In addition, the current study showed

also a significance difference between before and after instructions in relation to compliance with infection control measures. The most visible non-compliance items related to infection control measures as reported by the patients were not committing to wearing a mask when leaving out, forgetting to do the daily exercise, and not having enough sleeping time. These findings could be attributed to the complexity of their disease process. In autoimmune diseases, the patients are generally treated with long-term regimens or even life-long immunosuppressive medications. Adhering to medications can be a challenge for those kinds of patients. This is in agreement with Zhang et al., 2019 & Xie et al., 2018 addressed that several interacting factors can control patients' adherence behavior including disease-related factors, patient-related factors, health professional/health service-related factors, therapy-related factors and social, and economic-related factors.

The current results are supported by McKay, et.al. (2017) addressed that factors associated with missing doses in MS may include a perceived lack of efficacy, adverse drug effects, and simply forgetting to take medication. Depression, anxiety, and cognitive difficulties have also been associated with poor drug adherence in MS. The findings are also in congruence with Kołtuniuk & Rosińczuk. (2018) mentioned that poor treatment adherence is common among patients with multiple sclerosis (MS) and the reasons that are specific for non-adherence include a perceived lack of efficacy, forgetfulness, inconvenience of the regimen, adverse effects/tolerability issues and injection fatigue and/or anxiety. On the other hand, Mahmoud, Hawash, & Abd Elmaksoud, (2022) mentioned that systemic lupus erythematosus is associated with several factors that may make patients at especially high risk for treatment non-compliance, including cognitive and psychological manifestations, frequently complex treatment regimens, fluctuating symptoms, and a disproportionate prevalence of the disease among people of lower socioeconomic status

After online instructions, the study results showed that the most apparent non-compliance items among the studied group were as follows: not enough sleep and not committing to wearing a mask while leaving out. These findings are

matching Davide, et. al. (2022) and Young, et. al. (2018) who mentioned that poor sleep is a frequent symptom among MS and SLE patients. With regards to non-compliance to wearing a mask, the finding is not in agreement with Landi, et. al. (2020) study concluded that MS patients, especially those with socially unfavorable conditions, demonstrated good adherence to social distancing and the use of protection equipment. This could be interpreted in light of most of the current study participants were from urban areas.

Conclusion

Noncompliance is a major medical problem globally. The impact of noncompliance can cause physical and psychological complications for patients receiving immunosuppressive therapy. Improving patients' knowledge through teaching instructions was very important for improving compliance with the therapeutic regimen. Based on the current research findings and the research hypothesis, the study concluded that the implementation of online instructional teaching significantly showed an improvement in the level of compliance among the studied group.

Recommendation

In light of the current study results, the following recommendations are suggested:

- Ongoing education is a must for patients receiving immunosuppressive therapy to ensure compliance with the drug regimen.
- Online teaching is recommended especially for patients receiving immunosuppressive drugs to avoid infection from direct contact.
- Design and implement an educational program for nurses to help them to provide nursing instructions to patients receiving immunosuppressive therapy in order to improve their health-related issues.
- Replication of the study on a larger probability sample selected from different geographical areas is recommended to obtain more generalizable data.
- Further research should be designed with a comparison between intervention groups and a control/usual care group both providing the same therapeutic regimen advice to capture

the effect of the intervention only, without confounding factors

- Further studies should investigate the factors contributing to patients' non-adherence to therapeutic regimens in order to develop interventions to overcome barriers.

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Conflicts of Interest Disclosure

The authors declare that there is no conflict of interest.

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