Original article

Saudi cultural adaptation of the "compliance questionnaire of Rheumatology" for Rheumatoid arthritis patients on disease modifying anti-rheumatic drugs (DMARDs)

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ABSTRACT

Purpose: This study aims to develop a valid and reliable Arabic version of the Compliance Questionnaire on Rheumatology (CQR-A) and to explore the impact of demographic factors on compliance.
Methods: This is a descriptive cross-sectional study carried out at the outpatient clinics of rheumatology in King Fahad hospital (KFH) in Madinah, Saudi Arabia, from May 2019 to October 2019. Initially, the original version was culturally adapted to an Arabic version by forward translation, backward translation, committee review of both the Arabic and the original versions, and lastly, pre-testing. Then, seventy-two rheumatoid arthritis patients were recruited to evaluate the reliability and validity of the CQR-A. Reliability was assessed by the test–retest method with a two-week interval through the intraclass correlation coefficient (ICC). The criterion validity of the CQR-A was assessed through Pearson correlation of pharmacy refill and CQR-A. The content validity index (CVI) was used to determine content validity. Multiple regression analysis was done to evaluate the effect of demographic factors on compliance.
Results: The CQR-A has adequate reliability and validity. The ICC = 0.757 with a 95% CI ranging from 0.579 to 0.860, $p < 0.001$, Cronbach's alpha coefficient = 0.788. Pearson correlation coefficient was found to be ($r = 0.338$, $p = 0.013$). The individual content validity index (I-CVI) ranged from 0.67 to 1.00, and the average scale content validity index (S-CVI/Ave) = 0.91. Education was the only significant predictor of compliance amongst the demographic factors with R^2 of 0.158.
Conclusion: The Arabic version of the Compliance Questionnaire on Rheumatology (CQR-A) is a reliable and valid clinical tool to assess compliance in Arabic speaking patients.

1. Introduction

Rheumatoid arthritis (RA) is a chronic autoimmune inflammatory disease characterized by symmetrical, occasionally deforming peripheral polyarthritis(Almoallim and Alharbi, 2014). Rheumatoid arthritis has a global prevalence of 0.24%. Despite this relatively low prevalence, it is the forty-second highest cause of global disability (Lozano et al., 2012). The epidemiology of RA in the Middle East and North Africa region (MENA) remains scarce and not fully understood due to insufficient studies on its prevalence and disease characteristics (Cross et al., 2014). Based on limited data from several regional MENA studies, the severity and management of RA disease vary widely all around the Arab region (Dargham et al., 2018; Lutf et al., 2014). The main pharmacological treatments of RA are conventional synthetic disease-modifying anti-rheumatic agents (CsDMARDs) and biological DMARDs. These treatments help reduce inflammation, disease progression, and disability, as well as control pain, which has a positive impact on patients' quality of life (Verstappen et al., 2005).

Over the past two decades, compliance has been the focus of significant research and clinical interest. Treatment compliance is the degree of accuracy and consistency to which patients conform to healthcare providers' recommendations regarding their

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treatment (Osterberg and Blaschke, 2005). Compliance with treatment is particularly important because it has been directly correlated to better outcomes and fewer complications (Cinar et al., 2016). Non-compliance leads to increased health expenditure due to the unnecessary escalation of treatment and hospital stays (Osterberg and Blaschke, 2005).

Previous studies have reported a variable rate of non-compliance to RA therapy, which is influenced by the study design and measurement method. There are two methods of subjective compliance measurement: self-reported and physician compliance estimates. Objective compliance measures are generally classified into direct and indirect methods. Questionnaires are the most widely used indirect method of measuring compliance. It has the advantage of being cheap, and it could be validated; however, it is not feasible (van den Bemt et al., 2012). There are three adherence questionnaires: Morisky questionnaire, the Medication Adherence Report Scale (MARS), and the Compliance Questionnaire on Rheumatology (CQR), all of which have been validated against the Medication Event Monitoring System (MEMS) (de Klerk et al., 2003). The 19-item CQR is the only questionnaire specific to rheumatology.

There is currently no Arabic version of the CQR, even though there is no tool used in the MENA region to evaluate the compliance of patients to RA therapy. Hence, this study aims to provide an effective, valid, and reliable method for assessing compliance in Arabic-speaking RA patients and investigate the effect of the patient's demographics on compliance.

2. Methods

2.1. Study setting and population

This descriptive, cross-sectional study was carried out in rheumatology outpatient clinics at King Fahad Hospital (KFH) in Madinah, Saudi Arabia, from May to October 2019. Seventy-two RA patients were recruited; 19 of them did not complete the full questionnaire. Therefore, only 53 patients were included in the data analysis.

The inclusion criteria were as follows: (1) fulfills RA 2010 diagnostic criteria of the American College of Rheumatology (Aletaha et al., 2010), (2) is aged > 18 years old, (3) comprehends Arabic language (reads and writes), (4) has physical and cognitive abilities to communicate, (5) is diagnosed of RA for at least 6 months, (6) is on disease-modifying anti-rheumatic drugs, and (7) consents to participate in the study. The exclusion criteria were: (1) has a psychiatric disorder or cognitive disease, (2) does not comprehend Arabic, (3) has comorbid terminal illness, and (4) refuses to take part in the study.

2.2. Patient characteristics

Data on patient variables, including baseline demographics, duration of disease, comorbidities, and medication history, were collected.

2.3. Translation of the CQR

The 19-item CQR was first published in the English language to assess rheumatology patients' medication compliance (de Klerk et al., 1999). The patients choose the degree to which they agree or disagree with each statement on a Likert scale of 1 to 4, (1 = totally agree, 2 = agree, 3 = disagree, and 4 = totally disagree). Items 4, 8, 9, 11, 12, and 19 are negative statements denoting a reverse Likert scale of 1 being strongly disagreed, and 4 strongly agree.

The total score of the CQR is calculated by the sum of all items score, subtracting 19, and then dividing by 0.75. The higher the CQR score, the better the compliance and vice versa (Beaton et al., 2000; de Klerk et al., 1999). The initial step of the cultural adaptation of the questionnaire was a forward translation from English to Arabic. Two native Arabic-speaking independent qualified translators translated the questionnaire into Arabic. One understood the purpose of the questionnaire fully, while the other was oblivious. The final version of the forward translation was modified by comparing both translations with the original questionnaire and discussing them with the translators to resolve any discrepancies. The next step was back translation of the Arabic version of Compliance questionnaire of rheumatology (CQR-A) by two qualified independent translators who were unaware of the translation's purpose. A committee consisting of three bilingual, multidisciplinary experts (a bilingual consultant rheumatology, a bilingual laboratory specialist, and a bilingual certified translator) reviewed the forward, backward, and original questionnaire and developed a pre-final Arabic version (Appendix 1). Lastly, the questionnaire was tested to ensure that the language used was easy to comprehend and was void of translation errors. For this purpose, five patients from the rheumatology outpatient clinics who fulfilled the inclusion criteria were interviewed (Beaton et al., 2000; Guillemin et al., 1993). Based on the pre-test, four questions (4, 11, 14, 16) were modified by adding examples to each statement as they contained phrases not commonly used in the local culture. The examples added to each statement were as follows: Statement 4 "If I can help myself with alternative therapies, I prefer that to what my rheumatologist prescribes" modified to "If I can help myself to take alternative medications such as alternative or traditional medications, I prefer it over what my rheumatologist prescribes for me"; Statement 11 "I do not expect miracles from my anti-rheumatic medicines" modified to "I do not expect miracles like (total or rapid recovery) from my anti-rheumatic medicines"; Statement 14 "If I do not take my anti-rheumatic medicines, my body warns me" modified to "If I do not take my anti-rheumatic medicines, my body warns me like (joint pain, stiffness, limited joint mobility)"; and Statement 16 "I use a dose organizer for my medications" modified to "I use a certain method to remind myself to take my medications, for example, dose organizer, calendar, alarm clock." Final Arabic version of CQR is shown in Fig. 1.

2.4. Reliability

The test–retest method with a two-week interval was used to determine the reliability of the CQR-A. After two weeks, the participants were given the choice of completing the second questionnaire either over a phone call or through an electronic form sent to their mobile phones.

2.5. Validity

The criterion validity of the CQR-A was evaluated using pharmacy refill data. The protocol for dispensing medications in King Fahad Hospital was as follows: the doctor entered the prescription for regular medications in the hospital electronic system for at least 3 to 6 months. The patient, however, can only dispense the number of medications required for one month. Therefore, the patient needed to visit the hospital pharmacy monthly to refill the medication. To calculate the pharmacy refill percentages for each patient, we used the following formula ([total number of tablets dispensed/ total number of tablets prescribed] X 100). The medications included in this formula were analgesia, NSAIDs, corticosteroids, synthetic and biologic DMARDs.

19- items CQR original version	19- items translated Arabic version CQR
1. If the rheumatologist tells me to take the medicines, I do so.	١. إذا أخبرني طَبيبُ الرُّوماتزم بتناول الأدوية، أفعل ذلك.
2. I take my anti-rheumatic medicines because I then have fewer problems	٢. أتناول أدويتي المضادة للروماتيزم لأن الالتزام بذلك سيُقَلِّل من حدوث المشاكل
3. I definitely don't dare to miss my anti-rheumatic medications	٣. أنا بالتأكيد لا أجرؤ على تفويت الأدوية المضادة للالتهابات الروماتيزمية
4. If I can help myself to take alternative medications such as alternative or traditional medications, I prefer it over what my rheumatologist prescribes for me	٤. إذا كان بإمكاني مساعدة نفسي في تناول علاجات بديلة على سبيل المثال الطب البديل او الشعبي)، فأنا أفضل ذلك على ما يصفه لي طبيب الروماتيزم
5. My medicines are always stored in the same place and that's why I don't forget them	٥. أضعُ أدويتي دائمًا في نفس المكان ولهذا لا أنساها
6. I take my medicines because I have complete confidence in my rheumatologist	٦. أتناول أدويتي لأن لدي ثقة كاملة في طبيب الروماتيزم
7. The most important reason to take my anti-rheumatic medicines is that I can still do what I want to do	٧. السبب الأهم الذي يدفعني لتناول الأدوية المضادة للالتهابات الروماتيزمية هو استمراري بفعل ما أريد
8. I don't like to take medicine. If I can do without them, I will	٨. أنا لا أحب تناول الدواء، وإذا استطعت الاستغناء عنها، فسأفعل ذلك.
9. When I am on vacation, it sometimes happens that I don't take my medicines	٩. عندما أكون في إجازة، فإنني لا أتناول أدويتي أحيانًا
10. I take my anti-rheumatic drugs, for otherwise what is the point of consulting a rheumatologist?	١٠. أتناول أدويتي المضادة للروماتيزم، وإلا فما فائدة مراجعة طبيب الروماتيزم؟
11. I do not expect miracles like (total or rapid recovery) from my anti-rheumatic medicines	١١. أنا لا أتوقع المعجزات من الأدوية المضادة للإلتهابات الروماتيزمية (مثل شفاء تام أو سريع)
12. If you can't stand the medicines you might say: "throw it away, no matter what"	١٢. إذا كنت لا تحتمل تناول الأدوية، فقد تقول: "ارميها، بصرف النظر عن النتائج المحتملة لهذا التصرف".
13. If I don't take my anti-rheumatic medicines regularly, the inflammation returns	١٣. إذا لم أتناول الأدوية المضادة للالتهابات الروماتيزمية بانتظام، سيعود الالتهاب
14. If I do not take my anti-rheumatic medicines, my body warns me like (joint pain, stiffness, limited joint mobility)	١٤. إذا لم أتناول أدوية مضادة للروماتيزم، فإن جسدي يحذرني (ألم مفاصل، تيبس، عدم القدرة على تحريك المفاصل)
15. My health goes above everything else and if I have to take medicines to keep well, I will	١٥. صحتي فوق كل شيء، وإذا كان علي أخذ الأدوية للحفاظ عليها بشكل جيد، سأفعل
16. I use a certain method to remind myself to take my medications, for example, dose organizer, calendar, alarm clock.	١٦. أنا استخدم طريقة معينة لتذكرني بأخذ أدويتي مثال على ذلك: علبة تنظيم جرعات الادوية، التقويم، المنبه.
17. What the doctor tells me, I hang on to	١٧. ما يخبرني به الطبيب، التزم به
18. If I don't take my anti-rheumatic medicines, I have more complaints	١٨. إذا توقفت عن تناول الأدوية المضادة للروماتيزم، فمن المتوقع أن أتعرض إلى مشاكل أكثر،
19. It happens every now and then, I go out for the weekend and then I don't take my medicines	١٩. يحدث أحيانا، أن أخرج في عطلة نهاية الأسبوع، ثم لا آخذ أدويتي

Fig. 1. The compliance questionnaire of rheumatology Arabic version (CQR-A).

The content validity of the CQR-A was evaluated by the content validity index (CVI) (LYNN, 1986).

For this rationale, six experts in rheumatology were selected to rate each item's appropriateness to the construct of interest, that is, compliance on a scale of 1 to 4—not appropriate, somewhat appropriate, quite appropriate, and highly appropriate, respectively. The experts were chosen according to the following criteria: consultant of rheumatology, a native Arabic speaker, and have had practice with Arabic-speaking patients (Davis, 1992; Grant and Davis, 1997). The individual validity index (I-CVI) was determined by adding up the number of rheumatologists who gave a score of either 3 or 4 divided by the total number of rheumatologists. The universal agreement of the scale content validity index (S-CVI/UA) was calculated by dividing the sum of (I-CVIs) equal to 3 or 4 divided by the total number of items. The average agreement of the scale content validity index (S-CVI/Ave) was assessed by calculating the average of the I-CVIs (Polit and Beck, 2006).

3. Statistical analysis

All analyses were performed using IBM SPSS Macintosh statistics Version 23.0 (Armonk, NY: IBM Corp). Frequency analyses were carried out for demographic factors. Multiple regression analysis was conducted on demographic variables. The test used to assess the CQR-A's test–retest reliability was the two-way mixed, single-rater, absolute interclass correlation coefficient (Koo and Li, 2016). The internal consistency of CQR-A was tested by Cronbach's alpha. Pearson's correlation coefficient for CQR-A scores and pharmacy refill tested the validity of CQR-A. The CQR-A content validity was statistically analyzed through the content validity index.

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4. Results

A total of 53 patients who completed the full two-step questionnaire were included in the study. The participants' mean age was 45.81 ± 13.27 years. The majority of patients were females (71.7%), married (86.8%), and living in Madinah (81.1%), with mean disease duration of 5.93 ± 5.38 and 31 (58.8%) had no comorbidities. The participants' clinical and demographic variables are shown in Table 1. The most widely prescribed medications for patients are summarized in Table 2.

4.1. Reliability

There was no difference between the average score of the first measurement of 72.59 (±11.34) and the second measurement of

Table 1
Demographic features of participants (53 patients).

Patients characteristics	N (%)
Age Years (mean ± SD)	45.81 ± 13.27
Gender	
Male	15 (28.3)
Female	38 (71.7)
Residence	
Madinah	43 (81.1)
Outside	10 (18.9)
Marital status	
Single	5 (9.4)
Married	46 (86.8)
Divorced	1 (1.9)
Widowed	1 (1.9)
Education	
High (college or higher)	26 (49.1)
Intermediate (secondary school)	15 (28.3)
Low (less than high school)	12 (22.6)
Occupation	
Yes	16 (30.2)
No	37 (69.8)
Mean duration of illness in years (mean ± SD)	5.93 ± 5.38
Number of comorbidities	
0	31 (58.5)
1	13 (24.5)
Multi-morbidity	9 (16.9)
Types of co-morbidity	
Osteoarthritis	11(20)
Hypertension	8(15)
Diabeted mellitus	7(13)
Ischemic heart disease	1(2)
Osteoporosis	4(7)
Fibromyalgia	1(2)
Side effects of medications	
Mild	14 (24.5)
Severe (discontinuation of drugs)	2 (5.7)
Number of medications	
<5	11 (20.8)
5–10	38 (71.8)
>10	4 (7.6)

Table 2
Frequency of medications used by participants.

Medication Type	Name of medication	N (%)
Glucocorticoids	Prednisolone (Oral)	23 (43.4)
Analgesia	Non-Steroidal Anti-Inflammatory Drugs	26 (49.1)
	Paracetamol	44 (83.0)
Conventional Synthetic Disease modifying antirheumatic drugs (CsDMARDs)	Hydroxychloroquine	44 (83.0)
	Methotrexate	32 (60.4)
	Sulfasalazine	11 (20.8)
	Azathioprine	2 (3.80)
	Leflunomide	1 (1.9)
Biologic DMARDs	Adalimumab	3 (5.70)
	Etanercept	2 (3.80)
Other medications	CaCo3	52 (98.1)
	Vitamin D3	51 (96.2)
	Gastroprotective drugs	25 (47.2)
	Folic acid	33 (62.3)

73.49 (±9.52). The average measure of the ICC for the test–retest reliability of CQR-A was adequately statistically significant with positive correlation (ICC = 0.757) with a 95% confidence interval between 0.579 and 0.860, $p < 0.001$, and Cronbach's alpha coefficient = 0.788.

4.2. Validity

A moderate positive correlation was found between pharmacy refill and CQR-A (r = 0.338, p = 0.013). The I-CVI ranged from 0.67 to 1.00. The universal agreement of the content validity index (S-CVI/UA) was found to be 0.68. The average of the I-CVI, that is S-CVI/Ave, was 0.91. Therefore, overall, the instrument's content was considered valid. Further details are shown in Table 3.

4.3. Regression analysis

Multivariable linear regression analysis indicated that education was the only factor that could predict the value of CQR-A among all variables including,(age, gender, residence, marital status, occupation, duration of illness, education, number of comorbidities, and medications, side effects of therapy) Table 4. A significant regression equation (F (1.51) = 9.574, p = 0.003) with an R2 of 0.158 was found. Participants predicted that CQR-A was 62.608 + 4.647 (education), where education is measured at three levels. Further details in Table 5.

5. Discussion

This study introduced the first valid and reliable tool for assessing compliance in Arabic-speaking rheumatology patients by translating and adapting the original CQR to Arabic. In 2003, Klerk et al. developed the original CQR to assess compliance in patients with rheumatoid arthritis, gout, and polymyalgia rheumatica (de Klerk et al., 2003). The instrument has shown adequate sensitivity and specificity in identifying non-compliant patients amid non-responders to medication (de Klerk et al., 1999). Therefore, the CQR has been adapted to many languages, including Korean, Turkish, and Spanish (Cinar et al., 2016; Lee et al., 2011; Salgado et al., 2018).

In this study, we chose RA patients because it is the most prevalent type of inflammatory arthropathy in Saudi Arabia and other MENA regions (Dargham et al., 2018; Jokar and Jokar, 2018; RAJAPAKSE, 1987).This study showed that CQR-A has adequate

Table 3
Ratings of the 19-item Arabic version of the compliance questionnaire on rheumatology by six rheumatologists: items rated 3 or 4 on a 4-points relevance scale.

Items	Rater 1	Rater 2	Rater 3	Rater 4	Rater 5	Rater 6	I-CVI
1	3	3	3	4	4	4	1.00
2	3	3	3	3	4	4	1.00
3	4	4	3	4	4	2	0.83
4	3	1	1	4	4	4	0.67
5	3	4	3	4	3	3	1.00
6	4	3	4	4	4	3	1.00
7	4	4	3	4	4	4	1.00
8	3	4	3	4	4	4	1.00
9	4	3	2	4	4	2	0.67
10	4	4	3	3	4	3	1.00
11	3	2	3	3	4	1	0.67
12	3	2	3	4	4	2	0.67
13	3	3	3	4	4	4	1.00
14	3	4	2	3	4	4	0.83
15	3	4	3	4	4	4	1.00
16	3	4	3	4	4	3	1.00
17	4	4	3	4	4	3	1.00
18	3	3	3	4	4	4	1.00
19	3	4	3	3	4	3	1.00
S-CVI/UA	68%						
S-CVI/Ave	91%						

ICV-I: Individual content validity index, S-CVI/UA: Universal agreement content validity index. S-CVI/Ave: Average scale content validity index.

Table 4
Multivariate regression analysis where education is the only significant factor.

Model[a]	Unstandardized Coefficients	Standardized Coefficients	t	Sig.	Collinearity Statistics		
	B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	62.608	3.609		17.350	0.000	
	Education	4.647	1.502	0.398	3.094	0.003	1.000	1.000

[a] Depednent variable: CQR_A. VIF: Variance inflation factor.

Table 5
Effect of demographic Variables on CQR-A.

Variables	Beta In	t	Sig.	Partial Correlation	Collinearity Statistics Tolerance	VIF	Minimum Tolerance
	Age	.018[b]	0.134	0.894	0.019	0.936	1.068	0.936
	Gender	-.005[b]	-0.039	0.969	-0.006	0.956	1.046	0.956
	Residence	.030[b]	0.225	0.823	0.032	0.923	1.084	0.923
	Marital status	.049[b]	0.367	0.716	0.052	0.941	1.062	0.941
	occupation	-.061[b]	-0.418	0.678	-0.059	0.799	1.251	0.799
	Duration of illness	-.013[b]	-0.099	0.922	-0.014	1.000	1.000	1.000
	No. of comorbidities	-.012[b]	-0.085	0.932	-0.012	0.876	1.141	0.876
	Side effects	.014[b]	0.102	0.919	0.014	0.936	1.068	0.936
	Number of Medications	.191[b]	1.505	0.139	0.208	1.000	1.000	1.000

a. Dependent Variable: CQR_A.
b. Predictors in the Model: (Constant), Education.

test–retest reliability (ICC = 0.757) and internal consistency (Cronbach's alpha coefficient = 0.788). In line with our study, most of the previous cultural adaptation studies of the CQR have found satisfactory test–retest reliability and internal accuracy (de Klerk et al., 1999; Lee et al., 2011; Salgado et al., 2018). The CQR-A has demonstrated similar reliability to the original English version of CQR (ICC = 0.73) (de Klerk et al., 1999), as demonstrated for the reliability and internal consistency of Spanish and Korean adaptations of the compliance questionnaires (ICC = 0.76, ICC = 0.71, respectively). Cinar et al. (2016) also showed that the Turkish version of the compliance questionnaire was sufficiently reliable.

Adherence to medications plays a significant role in improving disease outcomes and preventing further disabilities. Many validated measures can be used to identify non-adherent patients.

Self-reporting is the most widely used method for evaluating adherence in research and clinical practice, but its validity and accuracy are questionable (Scheffer, 2000). The 5-item CQR is another method used to assess compliance in RA patients; this reduced version of the 19-item CQR is easy to use and save times but is yet to be validated against other measures of adherence, neither has it been translated and tested in other languages (Hughes et al., 2013). A pharmacy refill is another measure for medication compliance. It is cheap, convenient, and mostly used in clinical trials. Consequently, the validity test of the CQR-A was assessed by correlating it with pharmacy refill. Pearson's correlation of pharmacy refill and CQR-A demonstrated a moderate positive correlation (r = 0.338, p = 0.013), which is in concordance with other studies (de Klerk et al., 1999; Lee et al., 2011).

Content validity is a useful measure to assess the questionnaire's validity and provides perspective into its applicability and feasibility (DeVon et al., 2007; Haynes et al., 1995; Polit et al., 2007). Many approaches have been proposed for the instrument's content validity in the literature (Mallion et al., 1996). The CVI was used in our study because of its simplicity and ease of understanding. It depends on an agreement based on relevance and consensus rather than consistency and includes details on both items and scale level (Polit et al., 2007). CQR-A had a validity index for individual content (I-CVI) ranging from 0.67 to 1.00. The acceptable minimum of I-CVI was 0.78. The following four questions (Questions 4, 9,11, and 12) were then revised because they ranged below the acceptable range: The other 15 items were valid, with values equal to or>0.83. The average of the I-CVI (S-CVI / Ave) was 0.91, which indicates that the tool has relevant content. Six rheumatology experts were chosen for the questionnaire's appropriateness, which was deemed sufficient for content validation and in agreement with most previous content validity studies (Yamada et al., 2010; Zamanzadeh et al., 2015).

Poor compliance in patients with RA can lead to higher costs, disease progression, further medical attention, or sometimes even surgery. Knowing the influences of poor compliance with treatment in RA patients is an important research area and crucial to implementing appropriate approaches to reduce non-adherence (Vangeli et al., 2015). Education was the only significant predictor of compliance in our study. Each one-point increase in the level of education corresponded to a 4.647% increase in the CQR-A score. Evidence from previous studies has been inconsistent on whether education predicts compliance (APTER et al., 1998; Ghods and Nasrollahzadeh, 2003; Horne and Weinman, 1999; Kaona et al., 2004; Norman et al., 1985; Okuno et al., 2001; Spikmans et al., 2003; Stilley et al., 2004; Wai et al., 2005; Yavuz et al., 2004). A large systematic review of the immune-mediated inflammatory disease has shown no constant correlation between demographics or clinical variables and non-adherence to therapy (Vangeli et al., 2015).

This research highlight the value of knowing patients' attitude towards medical treatments and opinions regarding drugs and reinforce and underscore Griffith and Carr's (2001) claim that understanding RA patients attitude is important to encourage shared clinical decision-making and eventually promote adherence (Griffith and Carr, 2001).

We consider the small sample size of this study to be its main limitation, although a sample of 53 patients is considerably acceptable for cultural adaptation studies (Beaton et al., 2000). We were also limited by some drawbacks of the pharmacy refills used to assess compliance, such as unavailability due to shortage of supply of hydroxychloroquine refilled to patients.

6. Conclusion

The Arabic Rheumatology Compliance Questionnaire has demonstrated adequate reliability and validity. It is a cost-effective, easy-to-use clinical measure to assess compliance in both clinical and research settings. Additional studies are needed to assess the validity and reliability of the CQR-A and the factors affecting compliance with a larger patient population.

Authors contributions
The final manuscript was formulated and revised by all the contributors.

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None.

Appendix 1. The compliance questionnaire rheumatology Arabic version translated

1. If the rheumatologist tells me to take the medicines, I do so	11. I do not expect miracles like (total or rapid recovery) from my anti-rheumatic medicines
2. I take my anti-rheumatic medicines because I then have fewer problems	12. If you can't stand the medicines you might say: "throw it away, no matter what"
3. I definitely don't dare to miss my anti-rheumatic medications	13. If I don't take my anti-rheumatic medicines regularly, the inflammation returns
4. If I can help myself to take alternative medications such as alternative or traditional medications, I prefer it over what my rheumatologist prescribes for me	14. If I do not take my anti-rheumatic medicines, my body warns me like (joint pain, stiffness, limited joint mobility)
5. My medicines are always stored in the same place and that's why I don't forget them	15. My health goes above everything else and if I have to take medicines to keep well, I will
6. I take my medicines because I have complete confidence in my rheumatologist	16. I use a certain method to remind myself to take my medications, for example, dose organizer, calendar, alarm clock.
7. The most important reason to take my anti-rheumatic medicines is that I can still do what I want to do	17. What the doctor tells me, I hang on to
8. I don't like to take medicine. If I can do without them, I will	18. If I don't take my anti-rheumatic medicines, I have more complaints
9. When I am on vacation, it sometimes happens that I don't take my medicines	19. It happens every now and then, I go out for the weekend and then I don't take my medicines
10. I take my anti-rheumatic drugs, for otherwise what is the point of consulting a rheumatologist?	

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