

BMJ Open Correlation between disease activity and patient-reported health-related quality of life in rheumatoid arthritis: a cross-sectional study

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ABSTRACT

Objective We aimed to provide a comprehensive assessment of health-related quality of life (HRQoL) in patients with rheumatoid arthritis (RA) of different activities and to evaluate the correlation between clinical activity measures and HRQoL instruments. This research also analysed the extent to which different aspects of HRQoL (physical, psychological and social) were affected.

Design Cross-sectional, observational, non-interventional study.

Setting The study was conducted at the Department of Rheumatology and Immunology, Qilu Hospital, Shandong University.

Methods From December 2019 to October 2020, a total of 340 RA patients participated in the survey using convenient sampling. Three generic instruments, EQ-5D-5L, SF-12 and the AQL-4D, as well as an RA-specific instrument, the Stanford Health Assessment Questionnaire Disability Index (HAQ-DI), were administered to assess patients' HRQoL. The Disease Activity Score 28-Erythrocyte Sedimentation Rate (DAS28-ESR) was used by doctors to measure patients' clinical activity. Multivariable linear regression was used to compare patients' HRQoL across different levels of activity. Spearman's correlation was used to assess the correlation between doctor-reported clinical activity and HRQoL.

Results A total of 314 patients with RA participated in this study. The mean score of HAQ-DI was 0.87 (SD: 0.91). Using patients in the clinical remission group as a reference, patients in the moderate and high disease activity groups showed significantly reduced health state utility values and HRQoL scores (all $p < 0.05$). On the contrary, there was an increase in HAQ-DI scores, indicating more impairment ($p < 0.05$). All instruments included in the study tended to differentiate disease activity based on multiple criteria, with scores showing a moderate to strong correlation with RA activity ($|r_s| = 0.50$ to 0.65). Among them, the disease-specific instrument had the highest correlation.

Conclusions RA can have considerable impairment on patients' HRQoL, both in terms of physical and psychosocial functioning. Given the strong correlation between clinical activity and HRQoL scores, and the fact that HRQoL can be an important clinical supplement. The EQ-5D-5L is probably the most appropriate generic

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ We conducted face-to-face survey and patient's disease activity (clinical information) was reported by doctors rather than relying on patient's responses, thus avoiding inclusion bias and 'recall bias'.
- ⇒ The study explored the correlation between disease activity and health-related quality of life and the major affected dimensions were analysed.
- ⇒ The data collection was conducted in one hospital therefore may not be representative of the rheumatoid arthritis patient population in China.
- ⇒ Although all patients' disease activity was filled out by doctors to ensure accuracy, some of the factors that may influence disease activity (eg, smoking status, body mass index and comorbidities) were also not collected.

measurement instrument for measuring HRQoL in RA patients.

INTRODUCTION

Rheumatoid arthritis (RA) is one of the most prevalent chronic inflammatory autoimmune disorder that is characterised by pain, stiffness, swelling and pressure in synovial joints.¹ Epidemiological surveys show that the global prevalence of RA is 0.5%–1%, and the prevalence in mainland China is 0.42%, with a total of over 5 million people affected.^{2–3} RA can cause highly visible joint deformities and painful lesions that debilitate patients and interfere with their performance of daily activities, mental health and social functioning.^{2–6} The substantial burden imposed by RA encompasses not only the clinical manifestations but also the challenges associated with prognosis, the toxicities of therapeutic interventions and the significant economic impact.⁷

Health-related quality of life (HRQoL) refers to an individual's physical, psychological and social function, which represents the

patient's overall perception of the impact of an illness and its treatment.⁸ HRQoL data can be used in clinical routines to support decision-making and patient-centred care and is an important supporting clinical data.⁹ Given the paucity of curative treatments, HRQoL emerges as a critical outcome measure for patients with RA. A variety of generic and disease-specific instruments with proven validity and reliability have been employed to assess HRQoL in patients with RA, such as the Five-Level EuroQol Five-Dimensional Questionnaire (EQ-5D-5L), the Short Form 12-item Health Survey (SF-12), the Assessment of Quality of Life (AQoL) and the Stanford Health Assessment Questionnaire Disability Index (HAQ-DI).^{10–12}

In recent years, several studies have attempted to explore the correlation between RA disease activity and HRQoL.^{13–15} Previous studies have shown a high consistency of results, with a negative correlation between disease activity and HRQoL.¹⁵ It was also found that insufficient sleep, increasing age and mental health conditions are factors that impact the HRQoL of people with RA.^{14,16} One Canadian study has explored the correlation between generic instruments, disease-specific instruments and disease activity, but clinical information was also obtained through patient self-report, which may have a recall bias that affects the results of the study.¹⁷ Several Chinese studies have focused on functional status and HRQoL influencing factors in RA patients.^{18–20} However, Chinese studies have not paid enough attention to the correlation between disease activity and HRQoL, nor have they compared generic and disease-specific instruments.

Despite the growing recognition of the importance of HRQoL as an outcome measure, further research is needed to determine whether the existing HRQoL instruments effectively reflect and address the most salient issues of this RA patient community. To address these knowledge gaps, we conducted a comprehensive assessment of HRQoL in RA using a wide range of validated generic and RA-specific instruments. The aim of the study was to identify the specific domains of HRQoL that are most vulnerable in patients with RA and to analyse the correlation between measures of clinical activity and patient-reported HRQoL outcomes to provide a reference for disease management and patient HRQoL studies.

METHODS

Study design and sampling method

This was a cross-sectional study conducted from December 2019 to October 2020 in the Department of Rheumatology and Immunology, Qilu Hospital, Shandong University. The convenience sampling method was used for the study.

Participants and data collection

The eligibility criteria for this study included patients who (1) met the 2010 RA classification criteria²¹; (2) were 18 years old or above; (3) had no mental disorders or severe cognitive impairment; and (4) were able to give

consent and willing to participate. Potential participants were excluded if they had other diseases or surgeries that significantly affected their physical function.

Informed consent was obtained from all participants after a detailed explanation of the study. The interviewers, who were nurses (YF, XZ) from the rheumatology department, explained the purpose of the survey and the requirements for completing the questionnaire. This investigation was conducted face-to-face by interviewers using a paper-based questionnaire. To ensure the accuracy of the patients' diagnostic information, the clinical diagnosis and disease-related clinical information were completed by their supervising doctors.

Sample size calculation

The sample size for this study was determined based on equation 1, $Z_{0.05}=1.96$, $\alpha=0.05$, δ represents the allowable error. According to the previous study, the SD (σ) was estimated to be 0.38.²² When $\delta=0.05$, the total sample size required for the study was approximately 290 RA patients, and the actual survey sample size was 340 participants, accounting for a loss rate of 10%.

$$n = \frac{Z_{\alpha}^2 \sigma^2}{\delta^2} \quad (1)$$

Patient and public involvement

Participants were not involved in the design, conduct, reporting or dissemination plans of our research.

Study variables and measurement

Questionnaires were designed for doctors and patients, respectively. The literature and clinical experts in rheumatology were drawn on.^{15,18,23} A pilot questionnaire was developed and presurveyed at the Department of Rheumatology, Qilu Hospital, which included 15 patients with RA and 2 doctors. Then we revised and formed the final questionnaires. The patient's questionnaire contained two main sections. The first section collected sociodemographic information, including gender, age, region, marital status, education level and health insurance. The second section was the measurement of HRQoL, including three generic instruments (Chinese version 1 SF-12, EQ-5D-5L, AQoL-4D) and one RA-specific instrument (HAQ-DI). The doctor questionnaire mainly included the Disease Activity Score 28-Erythrocyte Sedimentation Rate (DAS28-ESR), which was used to measure disease activity in patients with RA. All the instruments used in this study are verified Chinese versions.

Short Form 12-item Health Survey

The SF-12 (Chinese version 1) is a validated 12-item HRQoL instrument that measures disease impact across eight domains: physical functioning, role-physical, bodily pain, general health, energy/vitality, social functioning, role-emotional and mental health.²⁴ The dimensions were aggregated to form the Physical Component Summary (PCS) and Mental Component Summary (MCS). SF-12 has been validated and widely used in the Chinese RA patient population.¹² All summary scores range from 0

to 100, where higher scores indicate better HRQoL. We calculated the scores of the SF-12 according to the algorithm proposed by John E Ware in 1995 that has been widely used in China.²⁵

Five-Level EuroQol Five-Dimensional Questionnaire

The EQ-5D descriptive system comprises five dimensions: mobility, self-care, usual activities, pain/discomfort and anxiety/depression; each dimension is rated on five levels (no problems, slight problems, moderate problems, severe problems and extreme problems). We used the Chinese version of the EQ-5D-5L and the China-specific scoring algorithm that has been developed and validated.²⁶ The theoretical health state utility (HSU) score ranges from -0.391 to 1, with the value of 1 indicating full health and a value of 0 representing death. Scores below 0 indicate a health status worse than death.²⁶

Assessment of Quality of Life-4D

The descriptive system for AQoL-4D was developed within the framework of the WHO classification of impairment, disability and handicaps.²⁷ AQoL-4D comprises four health dimensions: independent living, relationships, mental health and senses, each with three items of four levels of severity. The AQoL-4D is able to derive simple psychometric scores for HRQoL and provides profile scores describing the different dimensions or items of the system. Scores are derived by summing the order of unweighted responses for each question.²⁸ The scale takes on a range of values from 0 to 100, with higher scores representing better HRQoL.

Health Assessment Questionnaire Disability Index

HAQ-DI was developed to assess difficulty performing day-to-day activities, is widely used in clinical research and in conditions of standard clinical practice by patients with RA. The HAQ consists of 20 items covering 8 categories assessing physical disabilities: dressing and grooming, arising, eating, walking, hygiene, reach, grip and common daily activities.²⁹ Each category consists of two or three items, and each item has four levels (0–3), reflecting no difficulty to severe disability. For each dimension a disability score from 0 to 3 is obtained. The eight category scores are averaged into an overall HAQ-DI score on a scale from 0 (no disability) to 3 (completely disabled). The overall HAQ-DI score is the average of eight categories, within 0–3.³⁰ Functional disability was defined as HAQ-DI score ≥ 1 .³⁰

Disease Activity Score 28-Erythrocyte Sedimentation Rate

The Disease Activity Score (DAS28) was based on a simplified version of the DAS44, which is currently the most widely used index.³¹ The values of DAS28 range from 0.49 to 9.07 with a normal distribution. The DAS28 assessment included the number of swollen joints in 28 joints

(SJC28), the number of tender joints in the same 28 joints (TJC28), erythrocyte sedimentation rate (ESR) and general health (VAS 0–100). DAS28 is calculated using equation 2.

$$DAS28 = 0.56 \times \sqrt{(TJC28)} + 0.28 \times \sqrt{(SJC28)} + 0.70 \times \ln(ESR) + 0.014 \times (general\ health) \quad (2)$$

Meanwhile, disease activity in RA can be divided into four groups according to the score cut-off of DAS28: clinical remission <2.6 , low level 2.6–3.2, moderate level 3.2–5.1 and high level >5.1 .

STATISTICAL ANALYSIS

Descriptive statistics were employed to summarise the sociodemographic characteristics and clinical activity of the participants. Categorical variables use frequencies and percentages, while continuous variables use means and SD. Normality of HRQoL scores was tested using the Kolmogorov-Smirnov method. Differences in participant characteristics and HRQoL scores between groups were compared using χ^2 tests for categorical variables and non-parametric tests (Kruskal-Wallis test) for continuous variables. Multivariable linear regressions compared the HRQoL scores of patients in clinical remission (reference group) to those of patients with low, moderate and high disease activity levels, adjusting for sociodemographic factors (eg, age, gender, residence, education, marital status, health insurance, income, occupation). The Spearman's rank correlation coefficient (r_s) was used to assess the correlation between clinical activity and HRQoL instruments, as well as between generic and specialised instruments. The magnitude of the correlation coefficient is being interpreted as representing the strength of the association: as very weak ($|r_s| < 0.20$), weak ($0.20 \leq |r_s| < 0.40$), moderate ($0.40 \leq |r_s| < 0.60$), strong ($0.60 \leq |r_s| < 0.80$) and very strong ($0.80 \leq |r_s| < 1.00$) relationships. Stata V.15.1 was used for statistical analyses. P value of less than 0.05 was considered statistically significant for all analyses.

Quality control

First, we minimise response bias by ensuring anonymity and confidentiality. The HRQoL instrument used in our study has been validated for content and structure. Then, we provided participants with clear instructions on how to complete the questionnaire and trained interviewers to standardise the process. Third, Clinical indicators (eg, erythrocyte sedimentation rate) were queried through the hospital information system to minimise recall bias. Fourth, we collected data on some of the potentially confounding variables (eg, age, sex, residence, education, marital status, health insurance, income, occupation) and adjusted for them in multivariate linear regressions. Finally, we examined the collected data and excluded questionnaires with missing values.

Table 1 Characteristics of patients with rheumatoid arthritis (n=314)

Characteristics	Total (n=314)	Clinical remission (n=27)	Low level (n=15)	Moderate level (n=99)	High level (n=173)	P value
Gender						0.732
Male	78 (25.00)	6 (22.22)	5 (33.33)	27 (27.55)	40 (23.26)	
Female	234 (75.00)	21 (77.78)	10 (66.67)	71 (72.45)	132 (76.74)	
Age (mean (SD))(years)	52.50±14.73	42.67±11.60	47.33±17.09	52.24±15.85	54.64±13.63	0.003
18–39	73 (23.25)	12 (44.44)	6 (40.00)	26 (26.27)	29 (16.76)	
40–59	137 (43.63)	14 (51.85)	5 (33.33)	40 (40.40)	78 (45.09)	
≥60	104 (33.12)	1 (3.70)	4 (26.67)	33 (33.33)	66 (38.15)	
Residence						0.018
City	135 (42.99)	16 (59.26)	8 (53.33)	50 (50.51)	61 (35.26)	
Rural	179 (57.01)	11 (40.74)	7 (46.67)	49 (49.49)	112 (64.74)	
Marital status						0.683
Single*	39 (12.42)	4 (14.81)	2 (13.33)	9 (9.09)	24 (13.87)	
Married	275 (87.58)	23 (85.19)	13 (86.67)	90 (90.91)	149 (86.13)	
Education						0.059
Primary school or below	100 (31.85)	4 (14.81)	4 (26.67)	32 (32.32)	60 (34.68)	
Junior high school	78 (24.84)	6 (22.22)	3 (20.00)	22 (22.22)	47 (27.17)	
Senior high school	71 (22.61)	7 (25.93)	1 (6.67)	24 (24.24)	39 (22.54)	
Junior college or above	65 (20.70)	10 (37.04)	7 (46.67)	21 (21.21)	27 (15.61)	
Occupation						0.014
Staff	110 (35.03)	12 (44.44)	7 (46.67)	41 (41.41)	50 (28.90)	
Self-employed/freelancer	44 (14.01)	9 (33.33)	2 (13.33)	10 (10.10)	23 (13.29)	
Farmer/migrant worker	110 (35.03)	4 (14.81)	5 (33.33)	30 (30.30)	71 (41.04)	
Unemployed	50 (15.92)	2 (7.41)	1 (6.67)	18 (18.18)	29 (16.76)	
Annual family income [†]						0.001
<3	164 (52.23)	7 (25.93)	9 (60.00)	56 (56.57)	92 (53.18)	
3–8	104 (33.12)	19 (70.37)	3 (20.00)	24 (24.24)	58 (33.53)	
>8	46 (14.65)	1 (3.70)	3 (20.00)	19 (19.19)	23 (13.29)	
Health insurance						0.825
RBMI [‡]	168 (53.50)	14 (51.85)	7 (46.67)	51 (51.52)	96 (55.49)	
UEBMI [§]	95 (30.25)	10 (37.04)	6 (40.00)	34 (34.34)	45 (26.01)	
Other insurance [¶]	16 (5.10)	1 (3.70)	1 (6.67)	3 (3.03)	11 (6.36)	
Self-pay	35 (11.15)	2 (7.41)	1 (6.67)	11 (11.11)	21 (12.14)	
Health Assessment Questionnaire Disability Index						0.000
Scores <1	196 (62.42)	27 (100.00)	14 (93.33)	72 (72.73)	83 (47.98)	
Scores ≥1	118 (37.58)	0 (0.00)	1 (6.67)	27 (27.27)	90 (52.02)	

*Single: unmarried and divorced.

[†]Annual family income: unit: 10 000 yuan (RMB).[‡]RBMI: Resident Basic Medical Insurance.[§]UEBMI: Urban Employee Basic Medical Insurance.[¶]Commercial insurance and official health insurance.

RESULTS

Characteristics of study participants

A total of 340 patients were interviewed, of whom 314 completed the questionnaire (online supplemental figure S1). Table 1 shows the main sociodemographic and clinical characteristics of patients with different clinical activities. The mean age of the patients was 52.50 (SD: 14.73) years old. Of the patients, 75% were female, more than half were from rural areas and approximately 80% had a senior high school education or less. It was found that

patient's age, residence, occupation and annual family income had a significant effect on the disease activity.

HRQoL of patients with different clinical activity

The mean HSU score of EQ-5D-5L was 0.57 (SD: 0.40) and the total HRQoL score for AQoL-4D was 72.11 (SD: 20.26). The PCS and MCS scores in the SF-12 instrument were 34.07 (SD: 10.22) and 41.33 (SD: 11.66), respectively. The total score of HAQ-DI was 0.87 (SD: 0.91). Among patients in different activity levels, there

Table 2 Multivariable adjusted linear models of change in HRQoL scores associated with clinical activity*

Outcome variable	Moderate level			High level		
	Coefficient	95% CI	P value	Coefficient	95% CI	P value
EQ-5D-5L HSU score†	−0.16	−0.3 to 0.02	0.024	−0.30	−0.43 to 0.17	<0.001
SF-12 PCS‡	−7.09	−10.70 to 3.48	<0.001	−10.52	−14.03 to 7.01	<0.001
SF-12 MCS	−5.23	−8.96 to 1.49	0.006	−9.13	−12.77 to 5.50	<0.001
AQoL-4D total§	−14.13	−20.56 to 7.70	<0.001	−22.14	−28.39 to 15.88	<0.001
Independent living	−17.43	−29.12 to 5.74	0.004	−29.83	−41.20 to 18.46	<0.001
Relationships	−14.84	−23.39 to 6.28	0.001	−20.98	−29.30 to 12.65	<0.001
Mental health	−21.30	−29.75 to 12.86	<0.001	−29.75	−37.96 to 21.54	<0.001
Senses	−2.95	−9.06 to 3.16	0.343	−7.98	−13.93 to 2.04	0.009
HAQ-DI¶	0.36	0.03 to 0.69	0.031	0.74	0.42 to 1.07	<0.001

P values <0.05 were considered significant (in bold).

*The low level group was not statistically significant compared with the clinical remission group and not shown.

†The EQ-5D-5L HSU is scored on −0.39 (worse than death) to 1 (perfect health), with higher scores indicating better HRQoL.

‡The SF-12 (PCS and MCS) has a total and sub-dimensional scale of 0–100, with higher scores indicating worse HRQoL.

§The AQoL-4D has a total and subdimensional scale of 0–100, with higher scores indicating worse HRQoL.

¶The HAQ-DI is scored on 0 (no impairment) to 3 (more severe impairment), with higher scores indicating worse HRQoL.

AQoL, Assessment of Quality of Life; EQ-5D-5L, Five-Level EuroQol Five-Dimensional Questionnaire; HAQ-DI, Health Assessment Questionnaire Disability Index; HRQoL, health-related quality of life; HSU, health status utility; MCS, Mental Component Summary; PCS, Physical Component Summary; SF-12, Short Form 12-item Health Survey.

was a statistically significant difference in scores for all instruments ($p<0.001$). Compared with patients in the clinical remission and low-level groups, those with moderate and severe conditions had significantly lower HRQoL scores (online supplemental table S1), with the most significant HRQoL impairment observed in severe patients. The results of multivariate linear regression were in high agreement with the findings of univariate analysis (table 2). On the contrary, there was an increase in HAQ-DI scores (0.36 to 0.74), which indicated more impairment (table 2).

Patient self-reported health problems in different dimensions

The RA and its symptoms had an impact on all dimensions of the patient's HRQoL. SF-12 scores show that both the mental and physical dimensions are affected by RA (online supplemental table S1). Pain/discomfort and usual activities were most frequently reported as a problem (moderate and above) in the moderate and high activity level groups of patients (online supplemental figure S2). For AQoL-4D, independent living and mental health were the two dimensions that decreased the most as disease activity increased (online supplemental figure S3). The AQoL-4D results showed that more than half of the patients suffered from psychological problems/depression. When the mean differences of HRQoL scores were adjusted for potential confounders, a similar pattern was observed. We also found moderate and high activity level patients showed the largest limitation in dimension of independent living and mental health in AQoL-4D (table 2).

Correlation of clinical activity with patients' HRQoL

Table 3 shows a moderate to strong correlation between the clinical activity measure and the generic instruments

Table 3 Spearman's rank correlation between clinical activity measures and HRQoL instruments

Instruments	Correlation	P value
EQ-5D-5L HSU score*	−0.61	<0.001
SF-12 PCS†	−0.51	<0.001
SF-12 MCS	−0.50	<0.001
AQoL-4D total‡	−0.63	<0.001
Independent living	−0.58	<0.001
Relationships	−0.51	<0.001
Mental health	−0.62	<0.001
Senses	−0.36	<0.001
HAQ-DI§	0.65	<0.001

P values <0.05 were considered significant (in bold).

*The EQ-5D-5L HSU is scored on −0.39 (worse than death) to 1 (perfect health), with higher scores indicating better HRQoL.

†The SF-12 (PCS and MCS) has a total and subdimensional scale of 0–100, with higher scores indicating worse HRQoL.

‡The AQoL-4D has a total and subdimensional scale of 0–100, with higher scores indicating worse HRQoL.

§The HAQ-DI is scored on 0 (no impairment) to 3 (more severe impairment), with higher scores indicating worse HRQoL.

AQoL, Assessment of Quality of Life; EQ-5D-5L, Five-Level EuroQol Five-Dimensional Questionnaire; HAQ-DI, Health Assessment Questionnaire Disability Index; HRQoL, health-related quality of life; HSU, health status utility; MCS, Mental Component Summary; PCS, Physical Component Summary; SF-12, Short Form 12-item Health Survey.

total score ($r_s = -0.50$ to -0.63), with the highest correlation with the specific instrument ($r_s = 0.65$). 'Sense' had the lowest correlation ($r_s = -0.36$) with clinical activity among the AQoL-4D subdimensions. The EQ-5D-5L HSU score showed strong negative correlations with HAQ-DI score ($r_s = -0.82$). Among the five dimensions of the EQ-5D-5L, the correlations between 'self-care' ($r_s = 0.80$) and 'usual activities' ($r_s = 0.79$) and HAQ-DI scores were relatively high. 'Independent living' is the dimension of the AQoL-4D that has the highest correlation ($r_s = 0.85$) with the HAQ-DI (online supplemental table S2).

DISCUSSION

Our study shows that RA has a profound and pervasive negative impact on patients' HRQoL. More importantly, we explore the correlation between generic HRQoL instruments, specific instrument and clinical activity; this offers a reference for clinical disease management and the selection of HRQoL instruments for patients. Overall, the impact of RA on patients' HRQoL was comprehensive and was more pronounced in patients with high levels of activity. All instruments used had a moderate or higher correlation with clinical disease activity. Disease-specific instruments showed the strongest correlation with the disease activity level. The EQ-5D-5L is probably the most appropriate generic HRQoL instrument.

This study reports that functional impairment is common in Chinese patients with RA. Low HRQoL and limited joint mobility have a significant impact on functional impairment in Chinese patients with RA. Approximately 37.6% RA patients in our study experience functional disability (defined as a HAQ-DI score ≥ 1), which was higher than that reported in other studies.¹⁸ This functional impairment is adequately captured in the generic instruments. For example, the impairment of RA was reflected in the reduction of HSU, with a mean EQ-5D-5L based patient health state utility score of 0.57 (SD: 0.40), which was significantly lower than the health state utility score of the Chinese urban population (0.96, SD: 0.07).³² A review of HSU in Asian patients with RA showed an HSU of 0.58 in the Chinese patient population,¹⁶ which is in high agreement with our findings, indicating a high representativeness of the participants selected for this study. We also found that the HSU of Chinese RA patients was lower than that of developed countries such as Japan (0.68),¹⁶ Canada (0.66),¹⁷ the USA (0.66)³³ and the UK (0.63),³⁴ implying the need to further strengthen the treatment and disease management of Chinese RA patients and improve their HRQoL.

RA and the symptoms have a significant impact on patients' daily activities and self-care, and patients' mental health issues cannot be ignored. On the one hand, limitation of activity is the dimension most affected in RA patients, which is consistent with the findings of previous studies.^{18 35} RA primarily attacks the joints and may have systemic symptoms in later stages. Symptoms of RA are a major cause of limited mobility. These symptoms include

joint pain, morning stiffness, swelling, difficulty in movement, as well as influenza-like systemic symptoms, such as muscle pain and fatigue, that patients may also experience during flares.³⁶ On the other hand, the mental health of people with RA needs to be given adequate attention. Multiple linear regression results also showed that mental health (a dimension included in AQoL-4D) was one of the dimensions most significantly affected by disease activity. The results of the study were similar to those of studies nationally and internationally, in that RA patients had more severe depression, anxiety, irritability and other adverse emotions. The chronic physical pain, financial burden, side effects from treatment and lack of social support of RA patients are all negative factors that affect mental health.^{15 30} In China, psychological counselling services for patients with RA are necessary, although they are currently uncommon. Previous studies have also demonstrated that patients who received psychological counselling had higher HRQoL than those who did not, highlighting its ability to alleviate low HRQoL in RA patients.^{15 37 38}

Overall, all instruments included in the study differentiated disease activity based on multiple criteria, with scores indicating a moderate/strong correlation ($|r_s| = 0.50$ to 0.65) with RA activity. Generic instruments were slightly less correlated with disease activity than specific instrument. However, the difference was not significant, probably because the main symptoms of RA are also captured by generic instruments (eg, pain, self-care and activities of daily living). Meanwhile, there was a strong correlation between the generic instruments and HAQ-DI, the disease-specific instrument. This was related to the nature of the instruments and their measurement properties. The dimensions measured by the generic instruments are highly consistent with those measured by the HAQ-DI, and the activity measured by the HAQ-DI is encompassed within the dimensions measured by the generic instruments. For example, the eight dimensions measured by the HAQ-DI (dressing, getting up, eating, walking, hygiene, reaching, grasping and common daily activities) overlap with the EQ-5D (daily activities and self-care) and the AQoL-4D (independent living).

Similar to previous findings, there was a negative correlation between disease activity and HRQoL in Chinese RA patients.^{13 14 39 40} Published research has also found a significant effect of RA on work efficiency.³⁹ Existing studies lacked scientific estimates of sample size; those that existed did not make comparisons between multiple instruments. Our study also compared several generic scales in a population of RA patients and found that the EQ-5D-5L is probably the most suitable generic measurement instrument. The EQ-5D-5L was preferred for three key reasons: (1) the EQ-5D-5L HSU scores were highly correlated with disease activity; (2) there were fewer items compared with SF-12 and AQoL-4D, making it easier to administer; and (3) the EQ-5D-5L allows for the calculation of quality-adjusted life years, an important measure in health economics and the decision-making

process. However, the sensitivity of EQ-5D-5L in Chinese RA patients was not examined in this study and needs to be explored in future intervention or cohort studies.

Strengths and limitations

Our study also has some limitations. First, although all patients' disease activity was filled out by doctors to ensure accuracy, some of the factors that may influence disease activity (eg, smoking status, body mass index and comorbidities) were also not collected. Moreover, some potential comorbidities were not captured. Second, the HRQoL scoring algorithm for the AqoL-4D is based on Australian preferences. However, empirical evidence in the literature suggests that the use of country-specific scoring algorithms has little effect on outcomes.⁴¹ Third, the data collection was conducted at one hospital and therefore may not be representative of the Chinese RA patient population. Nevertheless, the hospital has a high prestige and its patient base includes the eastern and central provinces of China. Finally, due to the cross-sectional design, it is not possible to make causal inferences about correlations between variables. The strengths of this study were the realisation of physician-assessed disease activity versus patient self-reported HRQoL, and the assessment of the discriminability of multiple generic instruments across RA activity. It provides a reference for clinical management and HRQoL studies in patients with RA.

CONCLUSION

RA can have a considerable impairment on patients' HRQoL, both in terms of physical and psychosocial functioning. Given the strong correlation between clinical activity and HRQoL scores, and the fact that HRQoL serves as an important clinical supplement, incorporating HRQoL assessment into routine clinical evaluations is crucial for patients. The EQ-5D-5L is probably the most appropriate generic measurement instrument for measuring HRQoL in RA patients.

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