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Reliability and Validity of the Korean Version of the Gout Impact Scale

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ABSTRACT

Background: The Gout Impact Scale (GIS), part of the Gout Assessment Questionnaire 2.0, measures gout-specific health-related quality of life (HRQOL). This study aimed to translate the GIS into Korean and validate the Korean version (K-GIS) using generic HRQOL measures.
Methods: The GIS was translated into Korean and back-translated into English. We asked patients aged 18 years or older who met the 2015 gout classification criteria to fill out the questionnaires (from January 2022 to June 2022); the K-GIS (5 scales [0–100 scores each]), along with the Korean version of Health Assessment Questionnaire (HAQ) and EuroQol-5 dimension (EQ-5D). We investigated the internal consistency, construct validity, and discriminative validity for gout characteristics of K-GIS. The K-GIS form was administrated to patients 4 weeks later to assess the test-retest reliability using the intraclass correlation coefficient (ICC).
Results: One hundred patients completed the questionnaire. The mean ± standard deviation age of the patients was 53.0 ± 15.1 years, and 99.0% of the patients were men. All scales had high degree of internal consistency (Cronbach's $\alpha = 0.59$ to 0.96) and test-retest reliability ($n = 18$, ICC = 0.83 to 0.94, all $P < 0.001$), except for unmet gout treatment needs. Weak-to-moderate correlations were observed between the K-GIS scales and HAQ or EQ-5D ($r = 0.21$ to 0.46). The K-GIS scores were significantly higher in the presence of bone erosion, absence of urate-lowering therapy, serum urate levels > 6 mg/dL, frequent gout flares in the past year, and fewer comorbidities. In contrast, neither the HAQ nor the EQ-5D could discern these subsets of patients.
Conclusion: The K-GIS is a reliable and valid HRQOL measure for patients with gout. Higher K-GIS scores were associated with clinical characteristics leading to unfavorable outcomes, which were not demonstrated by the HAQ and EQ-5D.

Keywords: Gout; Gout Impact Scale; Health-Related Quality of Life; Patient-Reported Outcome

Disclosure
The authors have no potential conflicts of interest to disclose.

Author Contributions
Conceptualization: Kim MJ, Shin K. Data curation: Kim MJ, Kim JY, Lee JJ, Moon KW. Formal analysis: Kim MJ. Funding acquisition: Shin K. Wr–ting - original draft: Kim MJ. Wr–ting - review & editing: Kim JY, Lee JJ, Moon KW, Shin K.

INTRODUCTION

Gout is one of the most common inflammatory arthritis worldwide and is associated with impaired function and health-related quality of life (HRQOL).[1] Long-term urate-lowering therapy (ULT) reduces gout flares, resolves tophi and improves HRQOL.[2,3] However, despite this well-established gout treatment, adherence to ULT is often poor, resulting in failure to achieve optimal outcomes.[4] To date, multiple strategies have been suggested to improve ULT adherence, and patient education and monitoring of patient-reported outcomes, as well as gout flares and tophi, are advisable for clinical management of gout. Considering the growing emphasis on patient-reported outcomes in gout, the Outcome Measures in Rheumatology Clinical Trials (OMERACT) group recommended reporting activity limitations, HRQOL, pain, and patient global assessment of disease activity in long-term gout studies.[5]

The Health Assessment Questionnaire (HAQ), disability index of HAQ (HAQ-DI), and Short-form Survey 36 (SF-36) have been widely used as generic measures to evaluate activity limitations and HRQOL, respectively.[5,6] These generic measurements have the advantage of providing information comparable to data for other chronic conditions. Nevertheless, disease-specific instruments may be the preferred option to assess changes in health status due to the disease itself, particularly in patients with less severe disease.[7] In patients with gout, gout-specific factors, including frequent gout flares, number of joints affected during gout flares, and the presence of tophi, compromise HRQOL.[8-12] Therefore, in 2006, a disease-specific HRQOL measure, the Gout Assessment Questionnaire (GAQ) 1.0, was developed.[13] Since then, the GAQ2.0 and its subscale, the Gout Impact Scale (GIS), have been revised based on feedback from patients and healthcare providers obtained through patient focus groups.[14] The GAQ2.0 has been utilized in a number of nations and has been translated into several languages.[15-17] However, the OMERACT group has not yet endorsed the GAQ2.0 as a validated HRQOL measure, in contrast to generic measures,[5] and GAQ2.0 needs further validation data in different and multicultural populations. Therefore, we aimed to develop a Korean version of the GIS by performing a formal translation and determining its internal consistency and reliability in Korean patients with gout.

METHODS

Translation and cultural adaptation

The translation process of the GIS involved five steps, following the guideline for cross-cultural adaptation of self-reported measures.[18] First, two Korean rheumatologists (KMJ, SK), who are fluent in English translated the English version of GIS into Korean (K-GIS). Three nurses reviewed the K-GIS and ensured the cultural relevance of the concepts used in a Korean healthcare setting, which resulted in some sematic and conceptual changes, and a preliminary initial K-GIS. Then, a native English speaker and a Korean rheumatologist (JJL), who are fluent in both English and Korean and were blinded to the original English version, back-translated the preliminary initial K-GIS into English. The back-translated version was compared to the original version, and only minor inconsistencies were discovered, leading to some minor revisions. Lastly, the K-GIS was pilot-tested by three rheumatologists to ensure both sematic and content equivalence. They provided feedback on unclear items, which led to minor changes and resulted in the final translated K-GIS.

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The GIS questionnaire IdeI 24 items related to five distinct subscales: 1) gout concern overall (questions [Q]1 a–d), 2) gout medication side effect (Q1 e, k), 3) unmet gout treatment needs (Q1 i, l, m), 4) well-being during attack (Q2 a–d, Q3 a–g), and 5) gout concern during attack (Q1 f–h, j). These individual items are detailed in the **Supplementary Table 1**. All GIS response options were on a 5-point Likert scale (e.g., strongly agree to strongly disagree; all of the time to none of the time). The GIS response options 1–5 were converted to a scale of 100–0 (1 = 100, 2 = 75, 3 = 50, 4 = 25, 5 = 0) for Q1 a–h, j–l and Q2 a–d, and a scale of 0–100 (1 = 0, 2 = 25, 3 = 50, 4 = 75, 5 = 100) for Q1 i, m, and Q3 a–g. The five GIS subscale scores were calculated as the average score of the questions included in each GIS subscale. The total GIS score was calculated using the average score of the all 24 questions. Subscale scores were calculated only for subscales in which at least half of the items were completed. Higher scores on each subscale indicated a more severe condition or a greater impact of gout.[19,20]

Participants

Between January 1 and June 30, 2022, the study was conducted at the single Rheumatology Clinic of the Seoul Metropolitan Government-Seoul National University Boramae Medical Center. We recruited patients with gout who were 18 years of age or older and met the 2015 classification criteria for gout.[21]

Outcomes

All patients completed the K-GIS questionnaire and a series of questions regarding gout, comorbidities and demographics during a regularly scheduled visit. Gout-specific clinical data (date of diagnosis of gout, presence of tophi/bone erosion on radiography, gout-related medications, number of acute flares in the past year, and serum urate [SU] level) was also collected by reviewing electronic medical record and physical examination.

As generic HRQOL measures, the patients completed the HAQ-DI and EuroQol-5 dimension (EQ-5D), which had been cross-culturally validated for the Korean population.[22,23] The HAQ-DI comprises 20 items in eight categories of functional activities: dressing, rising, eating, walking, hygiene, reach, grip and usual activities. Each item has a four-level difficulty scale ranging from 0 to 3. Each category score was determined using the highest item score for each category. The eight category scores were averaged to obtain an overall HAQ-DI score on a scale of zero (no disability) to three (completely disabled).[24] The EQ-5D contained five domains: mobility, self-care, usual activity, pain/discomfort, and anxiety/depression. Each EQ-5D three-level version (EQ-5D-3L) domain has a single item with three levels of response: no problem, some problem, and extreme problem.[23] EQ-5D utility scores were calculated using the EQ-5D value set derived from South Korean population-based preferences weights for EQ-5D health conditions.[25] Pain and patient global assessment on a 0–10 cm visual analog scale (VAS) were also completed.

Statistical analysis

Descriptive statistics were used to describe all the variables. Categorical variables were described as numbers and percentages. For continuous variables, means and standard deviations (SDs) were determined. We investigated whether different sets of question items for each GIS scale produced the similar outcomes using the Cronbach's α coefficient as a measure of internal consistency. In addition, to assess the reliability of each GIS subscales depending on the number of items, we applied the Spearman-Brown prophecy formula to adjust for each GIS subscale to 10 items (adjusted Cronbach's α), except for the well-being during attack subscale, which already consists of 11 items. This was because the internal

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consistency appears to be rather low due to the small number of items.[26] The Cronbach's α values greater than 0.70 were considered to indicate acceptable reliability. A test-retest reliability analysis was performed in patients with stable gout who completed both the baseline and 4-week K-GIS questionnaires. For test-retest reliability, a single-rating, absolute-agreement, two-way mixed-effects model was used to calculate the intraclass correlation coefficient (ICC) estimates and their 95% confidence intervals (CIs) between repeated assessments. The ICC values below 0.50 indicated poor reliability, values between 0.50 and 0.75 indicated moderate reliability, values between 0.75 and 0.90 indicated good reliability, and values above 0.90 indicated excellent reliability.[27] The Pearson's correlation coefficients were used to measure the strength of association between GIS subscales and the generic HRQOL measures. Correlation coefficients less than 0.30 were considered to have low correlation, 0.30 to 0.49 to have moderate correlation, and greater than 0.50 to have high correlation.[28] A two-tailed Student's *t*-test was performed to investigate differences in GIS subscales and generic HRQOL measures between subgroups stratified by gout-specific characteristics. A two-sided *P* value less than 0.05 was considered to indicate statistical significance. All statistical analyses were performed using SPSS Statistics (version 26.0; IBM Corp., Armonk, NY, USA).

Ethics statement

The present study protocol was reviewed and approved by the Institutional Review Board of the Seoul Metropolitan Government-Seoul National University Boramae Medical Center (approval No. 10-2021-127). This study was conducted in accordance with Good Clinical Practice and the principles of the Declaration of Helsinki. Written informed consent was obtained from all the participants at the time of enrollment.

RESULTS

Patient characteristics

This study included 100 patients, whose characteristics are presented in **Table 1**. The mean ± SD age was 53.03 ± 15.12 years and 99% patients were male. The mean ± SD disease duration was 7.27 ± 7.00 years. Half of the patients held a bachelor's degree or higher, and 71% had a job. The majority of patients (92%) were receiving ULT with the mean ± SD SU level of 5.47 ± 1.63 mg/dL. Approximately 15% of the patients had tophi; additionally, 58% reported having no flares in the past 12 months; however, 19% had experienced three or more flares during that time. The most common comorbidities were hypertension (59%), dyslipidemia (30%), and chronic kidney disease (29%).

The mean ± SD scores for each GIS subscale (0–100) were as follows: 52.25 ± 28.81 for gout concern overall; 40.63 ± 21.64 for gout medication side effects; 27.54 ± 17.49 for unmet gout treatment needs; 54.64 ± 28.67 for well-being during attack; and 50.44 ± 24.23 for gout concern during attack. GIS exhibited ceiling effects ranging from 4.0% to 9.0% and floor effects ranging from 0.0% to 5.0%. The mean ± SD overall HAQ-DI score (0–3) was 0.11 ± 0.35, and the EQ-5D-3L utility score was 0.90 ± 0.20 (**Table 2**). The mean ± SD VAS pain and VAS patient global assessment were 0.66 ± 1.37 and 1.64 ± 2.67, respectively.

Internal consistency

The Cronbach's α coefficients ranged from 0.77 to 0.96 for each GIS subscale, with the exception of those measuring gout medication side effects (0.59) and unmet gout treatment

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Table 1. Baseline characteristics of patients

Variables	Patients (N = 100)
Age, yr	53.03 ± 15.12
Male	99 (99)
Height, cm	171.29 ± 6.52
Weight, kg	77.68 ± 12.85
Body mass index, kg/m^2	26.38 ± 3.41
Education	
Low	50 (50)
High[a]	50 (50)
Current working	71 (71)
Smoking	
Current	24 (24)
Ever	40 (40)
Never	36 (36)
Current alcohol	68 (68)
Comorbidities	
Hypertension	59 (59)
Diabetes	16 (16)
Dyslipidemia	30 (30)
Cardiovascular disease	18 (18)
Liver disease	10 (10)
Chronic kidney disease	29 (29)
Kidney transplantation	1 (1)
Malignancy	10 (10)
Concomitant medications	
Diuretics	8 (8)
Losartan	9 (9)
Aspirin	9 (9)
Disease duration, yr	7.27 ± 7.00
Presence of tophi	15/99 (15.15)
Presence of erosion on X-ray	26/81 (32.10)
Present acute gout flare	5 (5)
Frequency of acute flare during the past year	
0	59 (59)
1–2	21 (21)
3–5	13 (13)
6–10	2 (2)
> 10	4 (4)
Urate-lowering therapy	92 (92)
Allopurinol	10 (10)
Febuxostat	72 (72)
Benzbromarone	4 (4)
Febuxostat + Benzbromarone	6 (6)
Duration of urate-lowering therapy, yr	2.59 ± 2.14
Anti-inflammatory prophylaxis	35 (35)
Serum urate, mg/dL	5.47 ± 1.63
Serum creatinine, mg/dL	1.16 ± 0.51
eGFR, mL/min/1.73 m^2	75.61 ± 23.82

Values are mean ± standard deviation or number (%).
eGFR = estimated glomerular filtration rate.
[a]Bachelor's degree or higher.

needs (0.54). However, after converting each GIS subscale to 10-item length using the Spearman–Brown prophecy formula, the Cronbach's α values for both the subscales of gout medication side effects and unmet gout treatment needs increased beyond 0.80 (**Table 3**).

Test-retest reliability

The ICC was assessed in a group of 18 patients (18 [100%] males, mean ± SD age of 50.61 ± 11.76 years, and mean ± SD disease duration of 7.64 ± 6.74 years) who completed the K-GIS

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Table 2. Baseline patient-reported outcome measurements

Questionnaires	Scores
Gout Impact Scale (0–100)	
Gout concern overall	52.25 ± 28.81
Gout medication side effects	40.63 ± 21.64
Unmet gout treatment needs	27.54 ± 17.49
Well-being during attack	54.64 ± 28.67
Gout concern during attack	50.44 ± 24.23
HAQ-DI (0–3)	0.11 ± 0.35
EQ-5D-3L	
Mobility (1–3)	1.09 ± 0.29
Self-care (1–3)	1.06 ± 0.24
Usual activity (1–3)	1.12 ± 0.38
Pain/Discomfort (1–3)	1.23 ± 0.49
Anxiety/Depression (1–3)	1.15 ± 0.36
Utility index score	0.90 ± 0.20
Pain (0–10)	0.66 ± 1.37
Patient global assessment (0–10)	1.64 ± 2.67

Values are mean ± standard deviation.
EQ-5D-3L = EuroQol-5 dimension-3 level, HAQ-DI = Health Assessment Questionnaire-disability index.

Table 3. Internal consistency of the Gout Impact Scale

Gout Impact Scale domain (No. of items)	Cronbach's α	Adjusted α to 10-item scale[a]
Gout concern overall (n = 4)	0.93	0.97
Gout medication side effects (n = 2)	0.59	0.88
Unmet gout treatment needs (n = 3)	0.54	0.80
Well-being during attack (n = 11)	0.96	Not calculated
Gout concern during attack (n = 4)	0.77	0.89

[a]Adjusted to 10-item scale using the Spearman-Brown prophecy formula.

questionnaire twice over a 4-week period and reported stable gout symptoms during that time. Gout overall concern had an ICC value of 0.94, with a CI of 0.85 to 0.98, indicating good-to-excellent reliability. The ICC values for well-being during attack, gout concern during attack, and gout medication side effects were 0.89, 0.86 and 0.83, respectively (**Table 4**). The unmet gout treatment needs had the lowest ICC value (0.75; 95% CI, 0.32–0.91) of all the GIS subscales.

Construct validity

The Pearson correlation coefficients between overall HAQ-DI and each GIS subscale were 0.27 with gout concern overall, 0.26 with gout medication side effects, 0.12 with unmet gout treatment needs, 0.07 with well-being during attack, and 0.15 with gout concern during attack. The corresponding coefficients between the EQ-5D-3L utility index and GIS subscales were 0.25, 0.34, 0.42, 0.13, and 0.20. Other correlations between each HAQ item or EQ-5D-3L item and each GIS subscale are summarized in **Table 5**. Patient global assessment and most of the GIS subscales had significantly positive correlation, with a Pearson correlation coefficient ranging from 0.29 to 0.47 (gout concern overall, gout medication side effects, unmet gout treatment needs, gout concern during attack) (**Table 5**).

Table 4. Test-retest reliability (n = 18) of the Gout Impact Scale

Gout Impact Scale domain	ICC	95% CI	*P* value
Gout concern overall	0.94	0.85, 0.98	< 0.001***
Gout medication side effects	0.83	0.54, 0.94	< 0.001***
Unmet gout treatment needs	0.75	0.32, 0.91	0.004**
Well-being during attack	0.89	0.71, 0.96	< 0.001***
Gout concern during attack	0.86	0.63, 0.95	< 0.001***

ICC = intraclass correlation coefficient, CI = confidence interval.
**$P < 0.01$; ***$P < 0.001$.

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Table 5. Pearson correlation for Gout Impact Scales with HAQ and EQ-5D-3L

Variables	Gout concern overall	Gout medication side effects	Unmet gout treatment needs	Well-being during attack	Gout concern during attack
HAQ, r					
Dressing	0.29**	0.33**	0.16	0.15	0.23*
Rising	0.32**	0.36**	0.19	0.23*	0.25*
Eating	0.16	0.06	0.05	−0.03	0.01
Walking	0.24*	0.25*	0.09	0.01	0.10
Hygiene	0.18	0.15	0.07	0.03	0.06
Reaching	0.20*	0.19	0.09	0.05	0.10
Gripping	0.14	0.02	0.01	0.03	0.02
Activity	0.29**	0.31**	0.12	0.08	0.18
HAQ-DI, r	0.27**	0.26*	0.12	0.07	0.15
EQ-5D-3L, r					
Mobility	0.19	0.28**	0.46**	0.07	0.14
Self-care	0.23*	0.35**	0.23*	0.21*	0.18
Usual activity	0.31**	0.43**	0.16	0.19	0.29**
Pain/Discomfort	0.44**	0.40**	0.38**	0.13	0.27**
Anxiety/Depression	0.22*	0.22*	0.29**	0.13	0.23*
EQ-5D-3L utility score, r	0.25*	0.34**	0.42**	0.13	0.20*
Patient global assessment, r	0.47**	0.36**	0.33**	0.02	0.29**

EQ-5D-3L = EuroQol-5 dimension-3 level, HAQ = Health Assessment Questionnaire, HAQ-DI = Health Assessment Questionnaire-disability index.
*P < 0.05; **P < 0.01; ***P < 0.001.

Discriminative validity according to the gout-specific characteristics

The mean ± SD gout concern overall score was 61.06 ± 26.18 in the patients with bone erosion and 47.27 ± 28.58 in the patients without bone erosion (P = 0.041). Patients who received ULT or had SU levels less than 6 mg/dL showed a lower gout concern overall score than those who did not receive ULT or had SU levels ≥ 6 mg/dL (49.74 ± 27.16 vs. 68.75 ± 29.32, P = 0.043 for ULT; 46.92 ± 28.09 vs. 65.30 ± 26.70, P = 0.003 for SU levels). Similarly, patients who had three or more gout flares in the past year had worse gout medication side effects and gout concern during attack scores than those with fewer than three gout flares (**Table 6**). Patients with three or more comorbidities had better gout concern overall and well-being during attack scores (**Table 6**). However, there were no significant associations between the GIS subscales and subgroups according to the presence or absence of tophi. In contrast, the overall HAQ-DI and EQ-5D-3L utility scores did not differ between the two subgroups according to gout-specific characteristics, although the patient global assessment was worse in those with more frequent flares or higher SU levels (**Table 6**).

DISCUSSION

This analysis provides sufficient evidence for the validity of the K-GIS as a gout-specific HRQOL instrument for assessing disease-specific functions and health among Korean patients with gout. We found that the K-GIS subscales showed good internal consistency, test-retest reliability, and were better associated with gout-specific characteristics.

It is well established that adherence to ULT is important for reducing the risk of gout flares and gout-related comorbidities, and knowledge of modifiable factors associated with ULT adherence is essential. A previous study found a significant association between lower baseline HRQOL and medication nonadherence in patients with heart failure.[29] Similar results were reported in a large, prospective, multicenter study of 700 patients with breast cancer, which showed that the rates of long-term nonadherence to aromatase inhibitors

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Table 6. Discriminative properties of the Gout Impact Scale according to the gout-specific characteristics

Variables	Gout Impact Scale					Generic measures		
	Gout concern overall	Gout medication side effects	Unmet gout treatment needs	Well-being during attack	Gout concern during attack	HAQ-DI	EQ-5D-3L	Patient global assessment
Tophi								
Yes (n = 15)	55.00 (30.18)	43.33 (21.58)	26.11 (14.39)	43.64 (30.23)	53.75 (25.96)	0.28 (0.66)	0.79 (0.31)	2.27 (3.06)
No (n = 84)	52.38 (28.32)	40.18 (21.87)	28.03 (18.02)	56.66 (28.28)	49.78 (24.17)	0.08 (0.26)	0.92 (0.17)	1.55 (2.61)
P value	0.745	0.607	0.698	0.107	0.568	0.258	0.122	0.341
Erosion								
Yes (n = 26)	61.06 (26.18)	44.23 (15.50)	26.76 (14.82)	57.17 (29.41)	56.01 (24.14)	0.17 (0.50)	0.87 (0.23)	2.15 (3.22)
No (n = 55)	47.27 (28.58)	38.18 (21.57)	28.03 (18.31)	51.58 (29.66)	47.27 (25.62)	0.05 (0.19)	0.94 (0.15)	1.22 (2.12)
P value	0.041*	0.204	0.759	0.430	0.149	0.215	0.189	0.186
No. of flare in the past year								
0–2 (n = 80)	49.53 (27.73)	37.66 (20.62)	26.41 (17.84)	55.21 (30.08)	46.56 (24.76)	0.11 (0.36)	0.92 (0.17)	1.29 (2.33)
≥ 3 (n = 20)	63.13 (31.14)	52.50 (22.06)	32.08 (15.60)	52.39 (22.66)	65.94 (13.97)	0.11 (0.33)	0.83 (0.29)	3.05 (3.46)
P value	0.059	0.005*	0.196	0.645	< 0.001***	0.972	0.164	0.041*
Urate-lowering therapy								
Yes (n = 72)	49.74 (27.16)	39.24 (20.48)	26.33 (17.08)	55.44 (27.03)	49.83 (23.76)	0.12 (0.38)	0.92 (0.17)	1.21 (2.08)
No (n = 10)	68.75 (29.32)	52.50 (26.22)	27.50 (15.74)	48.41 (33.61)	56.88 (25.25)	0.19 (0.46)	0.87 (0.29)	2.80 (3.99)
P value	0.043*	0.067	0.838	0.457	0.385	0.599	0.419	0.245
Serum urate level, mg/dL								
< 6 (n = 71)	46.92 (28.09)	38.91 (22.42)	25.41 (17.65)	51.99 (28.28)	48.06 (24.47)	0.11 (0.38)	0.91 (0.20)	1.06 (1.89)
≥ 6 (n = 29)	65.30 (26.70)	44.83 (19.34)	32.76 (16.20)	61.13 (29.06)	56.25 (23.02)	0.11 (0.29)	0.87 (0.20)	3.07 (3.64)
P value	0.003**	0.216	0.056	0.149	0.126	0.986	0.367	0.008**
No. of comorbidities								
0–2 (n = 68)	56.80 (26.71)	41.73 (20.21)	29.04 (17.66)	60.97 (25.72)	43.40 (21.77)	0.10 (0.35)	0.90 (0.19)	1.64 (2.67)
≥ 3 (n = 32)	42.58 (31.09)	38.28 (24.58)	24.35 (16.94)	41.19 (30.33)	44.14 (28.13)	0.13 (0.36)	0.90 (0.23)	1.64 (2.71)
P value	0.020*	0.460	0.212	0.001**	0.106	0.698	0.948	0.999

EQ-5D-3L = EuroQol-5 dimension-3 level, HAQ-DI = Health Assessment Questionnaire-disability index.
*$P < 0.05$; **$P < 0.01$; ***$P < 0.001$.

were higher in individuals with lower baseline HRQOL.[30] These observations suggest that baseline HRQOL can be used to optimize the management of gout by identifying patients who may be at a high risk of ULT discontinuation. Moreover, given that patients with gout are typically asymptomatic throughout the intercritical period, regular assessment of HRQOL and SU levels may improve adherence to ULT. Regular assessment of HRQOL, along with educational interventions, can provide positive feedback to patients and help them perceive the benefits of ULT in improving their quality of life.[31] Therefore, there is substantial merit in implementing HRQOL questionnaires in the routine care of patients with gout requiring long-term ULT.

Consistent with the published literature, the results of our study showed sufficient internal consistency across the different subscales of the K-GIS after adjusting to a 10-item scale.[14-17] In addition, all K-GIS subscales demonstrated good-to-excellent 4-week test-retest reliability. Although the unmet gout treatment need had a relatively low ICC among GIS subscales, it demonstrated better ICC compared than other validation studies, where ICC was 0.52–0.56.[14-16] The lower ICC observed for the unmet gout treatment need in our study, which is consistent with previous studies, may be attributed to the fact that this need was met following the initiation of ULT for gout.

As expected through previous studies, each GIS subscale demonstrated low-to-moderate correlations with the generic HRQOL measures, HAQ and EQ-5D, in our study. Notably, well-being during attack and gout concern during attack showed no significant correlation with the HAQ or EQ-5D. These two subscales were assessed based on the time of the last gout flare and might differ from the HAQ or EQ-5D, which evaluate recent HRQOL. The most

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robust correlation (r = 0.44) was observed between gout concern overall and EQ-5D pain/discomfort, which evaluates the most characteristic symptoms of gout. Interestingly, the EQ-5D-3L index score displayed a moderate correlation with unmet gout treatment needs (r = 0.42), indicating that suboptimal gout management has an impact on overall HRQOL.

We found that bone erosion, high SU levels, and nonuse of ULT were associated with poorer gout concern overall on the GIS subscale. The gout flare frequency in the previous year was associated with gout medication side effects, and gout concern during attack; gout concern overall also showed a similar trend, which was not statistically significant. These findings imply that each GIS subscale reflects a distinct patient perspective on gout; however, further research is required to ascertain the significance of each GIS subscale. In contrast, the HAQ or EQ-5D did not differ in terms of gout-specific characteristics. Previous studies have shown that patients with severe gout who had high SU levels (≥ 10 mg/dL) or multiple tophi demonstrated a trend toward worse HRQOL as measured by SF-36, HAQ-DI, or EQ-5D.[32,33] In contrast, the patients in our study had mild, stable gout: 15% had tophi, 92% had ULT, 60% had no flare in the previous year, and 71% had achieved target SU levels. Higher ceiling effects (no problem/need) of the HAQ and SF-36 in gout have been reported in previous studies. Therefore, the HAQ or SF-36 may not be able to detect clinical improvement in patients with gout, especially in those with nonsevere gout, which is more prevalent in the real world.

Notably, we found that a higher number of comorbidities was associated with lower GIS score. One possible explanation is that individuals with more comorbidities perceive their gout-related quality of life to be better than their overall quality of life, which is affected by comorbidities. In contrast, previous studies of generic HRQOL measures have shown that gout patients with diabetes, renal disease, or cardiovascular diseases had worse SF-36 scores than those without these conditions.[8,9] Comorbid conditions have been found to have a significant impact on patients' scores on generic HRQOL measures and on estimates of disease-specific treatment effects. However, the impact of comorbidities on disease-specific HRQOL and treatment effect estimates is rather small.[34] Therefore, GIS may be a better option than generic HRQOL measures to estimate gout-specific treatment effect in gout patients with comorbidities.

Our study has several limitations. First, we were unable to assess the sensitivity to changes in the K-GIS because of the small number of patients with acute gout flare. However, each item in the GIS is more suitable for measuring outcomes of chronic gout than of acute gout. We were also unable to evaluate the responsiveness of K-GIS to long-term ULT. The minimally important differences for the GIS subscales range from 5 to 8 points on a 0–100 scale.[35] A previous study has already demonstrated that the GIS subscale improve significantly by over 50% within the 1st year of initiating ULT.[3] Second, instead of the SF-36, we assessed the EQ-5D and HAQ. A wide variety of instruments exist to measure HRQOL, all of which have strengths and weaknesses. Considering the greater impact of physical HRQOL in patients with gout than mental HRQOL, comparison with the EQ-5D or HAQ in this study may be sufficient. Third, the Korean version of HAQ and EQ-5D have not been validated in Korean patients with gout. However, the English version of HAQ has been validated for measuring physical function when assessing patients with gout.[36] Lastly, the sample size used to assess test-retest reliability and discriminative validity based on gout-specific features was relatively small.

In summary, our findings indicate that the Korean version of the GIS has acceptable internal consistency and validity in Korean patients with gout. Some K-GIS subscales

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showed moderate correlations with generic HRQOL measures. The K-GIS exhibited a better association with gout-specific characteristics than generic HRQOL measures. In future studies, as well as in routine care, this gout-specific instrument could be an effective tool for assessing disease-specific HRQOL in Korean patients with gout. For Korean patients with gout with recurrent flares or tophaceous gout, evaluating the baseline GIS can help identify patients at risk of low adherence to ULT. Such patients can be targeted for focused management. During long-term ULT, SU levels and GIS can be assessed together, enabling patients to monitor their disease-specific status and improve their adherence to ULT. Furthermore, the Korean GIS can contribute to the HRQOL study of gout patients in Korea.

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SUPPLEMENTARY MATERIAL

Supplementary Table 1
Korean Gout Impact Scale Questionnaire

Click here to view

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