ORIGINAL ARTICLE

The Association between Medication Adherence, Belief about Medicine, and Other Factors among Patients with Gout in a Tertiary Hospital in Bangkok

Ratanapha Phuan-udom, MD[1], Manathip Osiri, MD[2]

[1] Division of Rheumatology, Department of Medicine, Faculty of Medicine Vajira Hospital, Navamindradhiraj University, Bangkok, Thailand

[2] Division of Rheumatology, Department of Medicine, Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand

Objective: Medication adherence is essential for the effective treatment of gout, as the primary goal is to maintain serum uric acid levels below 6 mg/dL. Various factors, including clinical, psychological, and socioeconomic factors, can influence patients' adherence to treatment and subsequently affect gout control. The present study aimed to assess the relationship between medication beliefs and adherence to uric acid-lowering therapy in patients with gout and explore the associated factors.

Materials and Methods: In this cross-sectional study, patients with gout aged 20 to 80 years receiving urate-lowering therapy at a tertiary hospital were enrolled. Medical adherence was assessed using the 8-item Morisky Medication Adherence Scale. Data on the Beliefs about Medicines Questionnaire (BMQ), demographics, socioeconomic, and clinical information were collected. The correlation between BMQ and adherence scores was assessed, and the risk factors for nonadherence were analyzed.

Results: Among the 302 participants, 87 (28.8%) were nonadherent. Adherence and BMQ scores exhibited a negatively weak correlation. The following were significant predictors of nonadherence: age less than 60 years (odds ratio (OR) 1.85 95% confidence interval (CI) 1.05 to 3.24; p=0.032), serum uric acid level (OR 1.29 95% CI 1.09 to 1.53; p=0.004), treatment duration of less than one year (OR 3.59 95% CI 1.28 to 10.09; p=0.015), and BMQ score (OR 1.04 95% CI 1.02 to 1.07; p=0.001). Meanwhile, comorbidities were classified as a negative predictor (OR 0.82 95% CI 0.69 to 0.97; p=0.022).

Conclusion: Strong medication beliefs influence medication adherence among patients with gout. If patients, particularly those under 60 years of age, newly diagnosed, or with few comorbidities, fail to achieve their target serum uric acid levels, it is crucial to explore their medication adherence, including their beliefs about the treatment.

Keywords: Gout; Medication adherence; Belief about medicine; Urate-lowering therapy

Received 29 May 2024 | Revised 15 July 2024 | Accepted 16 July 2024

J Med Assoc Thai 2025;108(Suppl.1):S46-55

Website: http://www.jmatonline.com

Gout is a common inflammatory joint disease that causes severe pain and remarkably impacts quality of life[1]. The primary treatment for this illness is uric acid-lowering therapy, which requires consistent long-term adherence to maintain serum uric acid levels below 6 mg/dL[2]. Among seven chronic diseases, namely, hypertension, hypothyroidism, type 2 diabetes, seizure, hypercholesterolemia, and osteoporosis, gout has the lowest medication adherence rates[3]. Prior studies have examined adherence rates and associated clinical factors[4,5]. Nevertheless, the influence of patients' medication beliefs, particularly in gout, remains underexplored. Medication adherence is a multifactorial issue, and understanding patient beliefs and low adherence predictors may enable physicians to address these challenges effectively.

The present study aimed to evaluate the association between medication belief and adherence behavior in patients with gout. The low adherence rate and associated factors contributing to adherence were also explored using the Capability, Opportunity, and Motivation model of Behavior as a framework, following the recommendation of the European Alliance of Associations for Rheumatology (EULAR)[6].

Materials and Methods

This cross-sectional analytical study was approved by

Correspondence to:

Phuan-udom R.

Division of Rheumatology, Department of Medicine, Faculty of Medicine Vajira Hospital, Navamindradhiraj University, 131/6 Kao Road, Dusit, Bangkok 10330, Thailand

Phone: +66-2-2443461

Email: ratanapha@nmu.ac.th

How to cite this article:

Phuan-udom R, Osiri M. The Association between Medication Adherence, Belief about Medicine, and Other Factors among Patients with Gout in a Tertiary Hospital in Bangkok. J Med Assoc Thai 2025;108 (Suppl.1):S46-55.

DOI: 10.35755/jmedassocthai.2025.S01.S46-S55

The Institutional Review Board of the Faculty of Medicine Vajira Hospital, Thailand (approval number: 179/2564). Data were collected from late February to November 2022. Eligible participants were Thai patients with gout aged 20 to 80 years who had an ICD-10 diagnosis of gout confirmed in at least two visits, were treated with a urate-lowering agent, and had been followed-up at the Faculty of Medicine Vajira Hospital for at least one month before enrolment. Participants who were unable to communicate independently, had life-threatening conditions, were unconscious, or had advanced-stage malignancy were excluded.

After ethical approval was obtained and under the hospital director's permission, the Information Technology Department provided a list of patients with gout (ICD-10 codes M1000 - M1099) aged 20 to 80 years who had taken urate-lowering medications and visited the hospital in the past year. This patient list was then randomized using computerized methods to prepare the invitation list. The eligible patients were invited by phone to participate in the study, scheduled an appointment for informed consent, and completed the questionnaire at the hospital. Owing to the COVID-19 social distancing policy, the researcher mailed the participants who could not visit the hospital an information sheet and consent form and conducted a telephone interview. The proportion of participants undergoing telephone interviews was maximum at 40% of the total study population. The questionnaire could be completed within 15 minutes. The participants' medical histories were also reviewed to confirm their clinical data and gout diagnosis according to the ACR Classification Criteria of Acute Gouty Arthritis (1977)[7], the ACR/EULAR Gout Classification Criteria in 2015[8], or the 2018 updated EULAR evidence-based recommendations for gout diagnosis[9]. The following demographic data were collected: age, gender, marital status, weight, height, alcohol consumption, current smoker, monthly income, employment status, education level, province of residence, and medical welfare scheme. Patient characteristics regarding gout, prescription complexity, coexisting diseases, current medications, adherence assessment, and belief about medication assessment were also recorded.

Variable definition

Prescription complexity is any regimen other than taking one pill once a day, which is the simplest regimen.

Current medications are defined as all medications currently used for all coexisting diseases during enrolment.

Alcohol consumption is defined as having two or more drinks of alcohol at least once a week.

Current smoking is defined as those who have cigarette smoking habitually, and the last smoke was within one month.

Overweight and obesity are defined as having a body mass index over 23 kilograms per square meter[10], calculated by dividing weight in kilograms by the square of height in meters.

Treatment duration is the period between initiating urate-lowering therapy, as documented in medical records, and enrolment.

Loss to follow-up is defined as having a history of missing appointments for over a month.

Adherent behavior was examined using the ©Morisky Medication Adherence Scale (MMAS-8-Item) translated into Thai by Apex Translations, Inc. This widely used self-reported tool has been used to assess medical adherence since 2008, demonstrating reliability and validity across various diseases, including gout[11,12]. For patients with gout, this scale has acceptable internal consistency (Cronbach's alpha = 0.725) and satisfactory test-retest reliability (Intraclass correlation coefficient = 0.70, 95% confidence interval (CI) 0.36 to 0.88)[11]. The MMAS-8-Item consists of eight items, with the first seven answerable by yes or no and the last item using a 5-point Likert scale. The total score, which ranges from 0 to 8, reflects the adherence levels. A score of 8 indicates high adherence, scores of 6 to 7 indicate medium adherence and scores below 6 indicate low adherence[13-15]. The present study defined non-adherence as having an MMAS-8-Item score below 6. Moreover, the questionnaire will ask specifically for urate-lowering therapy during the adherence assessment.

Horne developed the Belief About Medication Questionnaire (BMQ) in 1999[16]. It was used to evaluate participants' beliefs regarding the importance of urate-lowering therapy and concerns about its adverse effects. The BMQ comprises 18 items structured into four factors: the specific-necessity subscale (consisting of 5 items), which assesses beliefs about the necessity of prescribed medication; the specific-concern subscale (composed of 5 items), which evaluates concerns about dependence and long-term toxicity; and the general-harm and general-overuse subscales (each subscale consist of 4 items), which assess beliefs that medicines are harmful, addictive, poisonous, and overused. Each item is rated on a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree), with high scores indicating solid beliefs. Total score range between 0 and 90. Specific-necessity and specific-concern subscale scores range between 0 and 25, while general-harm and general-overuse subscale scores range from 0 to 20. The reliability test for chronic illness reported Cronbach's alpha between 0.76 and 0.77[16]. In patients with gout, the Cronbach's alpha was 0.775[17]. The Thai-BMQ, developed by Yosapon Leaungsomnapa et al, showed a Cronbach's alpha of 0.82 among patients with hypertension[18]. In this

study, the Thai-BMQ was utilized.

Three experts tested the content validity of the questionnaire used in the present study. Its internal consistency was assessed in a sample of 30 volunteer patients with gout aged 20 to 80 treated at the rheumatology clinic. Cronbach's alpha revealed moderate, 0.610 for the MMAS-8 and 0.618 for the Thai-BMQ. In addition, 7 out of the 30 patients (23.3%) demonstrated low adherence to urate-lowering therapy.

Based on the number of patients with gout diagnosed at the hospital over the previous year, the sample size was calculated using the finite population proportion formula[19,20] under an assumed 50% nonadherence rate[4] with a 95% confidence interval, 5% margin of error, and estimated incomplete questionnaire rate of 5%. Therefore, the sample size was 302. Given the challenges posed by the COVID-19 pandemic and considering a response rate of 45% based on previous research[21], the present study planned to contact 672 patients for enrolment invitation.

The patient characteristics and the questionnaire results were described. Continuous data were presented as mean with standard deviation (SD) or median with interquartile range (IQR) for nonnormally distributed data. Categorical data were described in terms of frequency and percentage. Differences between adherence and nonadherence groups were analyzed using independent two-sample t-tests or Mann–Whitney U tests for continuous data and Chi-square test or Fisher's exact test for categorical data. The correlation between MMAS-8-Item and BMQ scores was assessed using Spearman's correlation. Missing data on serum uric acid levels were inputted using previous test results.

Univariate analysis was conducted to identify the factors potentially associated with medication adherence. The variables included in the univariate analysis comprised demographic data, socioeconomic factors, gout condition, comorbid diseases, current medication, and total BMQ score. Multivariable analysis was performed using a backward stepwise method (likelihood ratio). The significant variables ($p<0.2$) from the univariate analysis and the previously reported predictors were included. Estimated odds ratio (OR) with a 95% CI was reported. A p-value of less than 0.05 was considered statistically significant. Data analysis was performed using IBM SPSS Statistics for Windows, version 22.0.

Results

A total of 487 patients with the ICD-10 code gout were invited to participate in the present study. One hundred seventeen could not be contacted, and 45 declined to participate. In addition, 3 participants were aged over 80 years at the time of invitation, 11 were excluded due to communication difficulties or serious illnesses, and nine were misdiagnosed or had discontinued urate-lowering therapy by a physician. Upon reaching the target number of participants, further invitations were ended. Thus, the response rate was 62%.

Among the 302 participants (Table 1), 83% were male with a median (IQR) age of 65 (56 to 72) years, and 35% were younger than 60 years. Most of the participants were married and resided in Bangkok or adjacent provinces. Approximately 60% had at least 9 years of education, which is the current compulsory education level in Thailand. The majority (171 participants, 56.6%) were unemployed, and two-thirds had a monthly income of less than 20,000 Baht. Over 90% of them lived with family, and 83% reported self-administering their medication. Only a small percentage of the participants were current smokers (7%) or habitual alcohol drinkers (10%), and almost all of them had multiple comorbidities and were on polypharmacy regimens. The three most common comorbidities were hypertension, hyperlipidemia, and overweight or obesity, affecting approximately 75% of the participants.

In terms of gout, the median (IQR) duration of uric acid-lowering treatment among the enrolled patients was 57.5 (27 to 122) months, with 20 participants (6.6%) receiving treatment for less than 1 year. Disease duration is defined as the time between the first flare-up or official diagnosis and enrolment. Most of our patients could not accurately recall the onset of gout. In addition, 98 participants (32.5%) were diagnosed with gout from their previous hospitals. Of those who could give the exact date of gout onset, the median (IQR) disease duration was 71.5 (33 to 138.5) months. Approximately 40% of the participants were followed-up in the rheumatology clinic, and the rest were seen in general internal medicine, subspecialty clinics (e.g., cardiology, nephrology, and endocrinology), orthopedic clinics, and primary care clinics. Meanwhile, 21.5% of the patients experienced at least one gout flare during the past 6 months, 19.5% had a history of tophi, and 17.5% had a history of urinary calculi. A history of loss to follow-up was noted in 5.3% of the participants. The median (IQR) serum uric acid level was 5.8 (4.8 to 6.8) mg/dL; however, 38.4% of the patients had uric levels >6 mg/dL in the past 3 months. Additionally, 51 participants had missing serum uric acid data for the last 3 months. Allopurinol was the most commonly used urate-lowering agent, followed by febuxostat, and 13.6% of the participants were on combination therapy. Furthermore, nearly half of the participants were prescribed a complex medication regimen.

Medication adherence

In the present study, 87 out of 302 (28.8%) patients with gout exhibited low adherence to uric acid-lowering therapy, 115 (38.1%) had moderate adherence, and 100

Table 1. Patient characteristics

Patient characteristics	
Age (years), median (IQR)	65 (56 to 72)
Age less than 60-year-old, n (%)	106 (35.1)
Male, n (%)	252 (83.4)
Marital status, n (%)	
Single	51 (16.9)
Married	209 (69.4)
Widowed	26 (8.6)
Divorce	15 (5)
Province of residence, n (%)	
Bangkok	204 (67.5)
Nonthaburi	61 (20.2)
Others	37 (12.3)
Medical welfare scheme, n (%)	
Government or State Enterprise Officer	128 (42.4)
Universal Coverage Scheme	106 (35.1)
Social Security Scheme	51 (16.9)
Self-pay	17 (5.6)
Education less than 9-year, n (%)	126 (41.7)
Unemployment status, n (%)	171 (56.6)
Monthly income <20,000 Baht, n (%)	199 (65.9)
Living alone, n (%)	25 (8.3)
Taking medication by self, n (%)	250 (82.8)
Current smoker, n (%)	22 (7.3)
Alcohol consumption, n (%)	29 (9.6)
Comorbid disease, n (%)	
Diabetes mellitus	84 (27.8)
Hypertension	227 (75.2)
Coronary artery disease	49 (16.2)
Cerebrovascular disease	37 (12.3)
Hyperlipidemia	233 (77.2)
Overweight and obesity (BMI >23 kg/m^2)	233 (77.2)
Chronic kidney disease stage III - V	88 (29.1)
Number of comorbid diseases, median (IQR)	4 (3 to 5)
Number of current medications, median (IQR)	7 (4 to 10)
Gout flare in the past 6 months, n (%)	65 (21.5)
Urinary calculi, n (%)	53 (17.5)
Tophi, n (%)	59 (19.5)
Serum uric acid level (mg/dL), median (IQR)	5.8 (4.8 to 6.8)
Serum uric acid level >6 mg/dL in the last 3 months, n (%)	116 (38.4)
Follow-up in rheumatology clinic, n (%)	118 (39.2)
Treatment duration (months), median (IQR)	57.5 (27 to 122)
Treatment duration less than 1 year, n (%)	20 (6.6)
History of loss follow-up, n (%)	16 (5.3)

IQR=interquartile range; BMI=body mass index; kg/m^2, kilograms per square meter; mg/dL, milligrams per deciliter

(33.1%) demonstrated high adherence. Table 2 provided the frequency and percentage of individuals who scored less than 1 for each questionnaire item, revealing the cause of

Table 1. Cont.

Patient characteristics	
Urate-lowering agent, n (%)	
-Allopurinol	215 (71.2)
-Benzbromarone	20 (6.6)
-Sulfinpyrazone	11 (3.6)
-Probenecid	2 (0.7)
-Febuxostat	41 (13.6)
-Combination therapy	13 (4.3)
Complex prescription, n (%)	139 (46)

IQR=interquartile range; BMI=body mass index; kg/m^2, kilograms per square meter; mg/dL, milligrams per deciliter

Table 2. Frequency and percentage of individual who impaired adherence for each questionnaire item

The content of the ©Morisky Medication Adherence Scale	Frequency (%)
1) Do you sometimes forget to take your medications?	140 (46.4%)
2) Over the past 2 weeks, were there any days when you did not take your medications?	73 (24.2%)
3) Have you ever cut back or stopped taking your medications without telling your doctor, because you felt worse when you took it?	16 (5.3%)
4) When you travel or leave home, do you sometimes forget to bring along your medications?	91 (30.1%)
5) Did you take your medications yesterday?	42 (13.9%)
6) When you feel like your disease is under control, do you sometimes stop taking your medications?	50 (16.6%)
7) Taking medications every day is a real inconvenience for some people. Do you ever feel hassled about sticking to your treatment plan?	47 (15.6%)
8) How often do you have difficulty remembering to take all your medications?	52 (17.2%)

medication adherence impairment. The three most common issues that negatively influenced the MMAS-8-Item score were forgetting to take medication (46.4%), failing to bring medication when traveling or leaving home (30.1%), and missing doses for reasons other than forgetting within the past 2 weeks, which affected 24.2% of the participants. Only a few participants intentionally stopped urate-lowering therapy because they felt worse.

Comparison revealed statistically significant differences in several patient characteristics between the low adherence group and the moderate to high adherence group (Table 3). The patients in the low adherence group were younger, with a median (IQR) age of 60 (48 to 69) years, than those in the moderate to high adherence group (median [IQR] 66 [58 to 73] years) (p=0.001). The proportion of patients under 60 years old was also higher in the low adherence group (p=0.005). Regarding socioeconomic factors, the percentage of unemployed patients and those with a monthly income

Table 3. Patient characteristics based on low and moderate to high adherence

Patient characteristic	Low adherence (n=87)	Moderate to high adherence (n=215)	p-value
Age (years), median (IQR)	60 (48 to 69)	66 (58 to 73)	0.001
Age less than 60-year-old, n (%)	41 (47.1)	65 (30.2)	0.005
Male, n (%)	71 (81.6)	181 (84.2)	0.585
Married, n (%)	54 (62.1)	155 (72.1)	0.114
Living in Bangkok, n (%)	57 (65.5)	147 (68.4)	0.631
Medical welfare scheme, n (%)			
Government or State Enterprise Officer	29 (33.3)	99 (46.0)	0.194
Universal Coverage Scheme	35 (40.2)	71 (33.0)	
Social Security Scheme	16 (18.4)	35 (16.3)	
Self-pay	7 (8.1)	10 (4.7)	
Education less than 9-year, n (%)	37 (42.5)	89 (41.4)	0.856
Unemployment status, n (%)	40 (46.0)	131 (60.9)	0.018
Monthly income <20,000 Baht, n (%)	50 (57.5)	149 (69.3)	0.050
Living alone, n (%)	6 (6.9)	19 (8.8)	0.579
Taking medication by self, n (%)	71 (81.6)	179 (83.3)	0.731
Current smoker, n (%)	10 (11.5)	12 (5.6)	0.073
Alcohol consumption, n (%)	6 (6.9)	23 (10.7)	0.310
Comorbid disease, n (%)			
Diabetes mellitus	26 (29.9)	58 (27.0)	0.609
Hypertension	54 (62.1)	173 (80.5)	0.001
Coronary artery disease	11 (12.6)	38 (17.7)	0.283
Cerebrovascular disease	12 (13.8)	25 (11.6)	0.603
Hyperlipidemia	62 (71.3)	171 (79.5)	0.121
Overweight and obesity (BMI >23 kg/m^2)	64 (73.6)	169 (78.6)	0.345
Chronic kidney disease stage III - V	18 (20.7)	70 (32.6)	0.040
Number of comorbid diseases, median (IQR)	3 (2 to 5)	4 (3 to 5)	0.006
Number of current medications, median (IQR)	6 (3 to 9)	7 (5 to 10)	0.021
Gout flare in the past 6 months, n (%)	27 (31.0)	38 (17.7)	0.011
Urinary calculi, n (%)	15 (17.2)	38 (17.7)	0.929
Tophi, n (%)	15 (17.2)	44 (20.5)	0.522
Serum uric acid level (mg/dL), median (IQR)	6.5 (5 to 7.8)	5.5 (4.7 to 6.6)	<0.001
Serum uric acid level >6 mg/dL in the last 3 months, n (%)	46 (52.9)	70 (32.6)	0.001
Follow-up at rheumatology clinic, n (%)	30 (34.50)	88 (40.9)	0.285
Treatment duration (months), median (IQR)	43 (19 to 115)	58 (30 to 125)	0.060
Treatment duration <1 year, n (%)	12 (13.8)	8 (3.7)	0.001
History of loss follow-up	12 (13.8)	4 (1.9)	0.001
Complex prescription	35 (40.2)	104 (48.4)	0.199

IQR=interquartile range; BMI=body mass index; kg/m^2, kilograms per square meter; mg/dL, milligrams per deciliter

less than 20,000 Baht was higher in the moderate to high adherence group (p=0.018 and p=0.05, respectively). In addition, the participants in the moderate to high adherence group had a higher proportion of hypertension (p=0.001) and CKD (p=0.04). As a consequence, the number of comorbid diseases and current medications was also higher in this group (p=0.006 and p=0.021, respectively). In terms of gout-related characteristics, 31% of the participants in the low adherence group experienced at least one gout flare in the past 6 months, which was higher than the 17.7% in the moderate to high adherence group (p=0.011). Furthermore, the low adherence group had a higher median serum uric acid level (p<0.001) and a greater proportion of participants with a treatment duration of less than 1 year (p=0.001) and a history of loss to follow-up (p=0.001). The Cronbach's alpha for the MMAS-8-Item was 0.506 in the sample of 302 patients with gout. In comparison, the value for 332 participants was 0.515.

Belief about medication

The internal consistency of the Thai-BMQ questionnaire among the 302 participants was acceptable (Cronbach's alpha=0.764). Furthermore, the BMQ score showed a weak negative correlation with the medication adherence score, with a correlation coefficient of -0.228 (p<0.001). This finding indicated that substantial beliefs in medication were associated with low adherence. Furthermore, concern about medication is the most influential belief on adherence, according to the specific-concerns subcategory correlation coefficient -0.284 (p<0.001). The other subcategories' correlation coefficients were 0.103 (p=0.073), -0.236 (p<0.001), and -0.227 (p<0.001), respectively, for specific necessity, general overuse, and general harm. In addition, the total BMQ score was significantly higher in the low adherence group than that in the moderate to high adherence group (p<0.001) (Table 4). The necessity-concern difference, which reflects patients' weighing of necessity over concern regarding medication, was observed in both groups. However, this difference was smaller in the low adherence group than in the other group.

In the subcategory scores, scores on beliefs about the necessity of prescribed medication were lower in the low adherence group, though the difference was not statistically significant (p=0.111). Significantly higher scores for the other subcategories were recorded for the low adherence group. In the specific-concern subcategory, the participants with low adherence expressed stronger concerns about long-term adverse effects, excessive dependence on medications, feeling mysterious on their medications, and feeling of life disruption due to their medications. In the general overuse subcategory, patients with low adherence held a strong belief that doctors overprescribe medications and have excessive trust in these drugs. They also believed that medicines do more harm than good, all medicines are poisons, and people should stop taking their medicines for a while. Interestingly, the participants in both adherence groups agreed that doctors would prescribe fewer medicines if they spend more time with their patients.

Risk factors for low adherence

According to the univariate analysis (Table 5), several variables were potentially related to low adherence in gout patients. Previously reported variables[4], such as gender, were also included in the multivariable model. However, some potential variables (e.g., hypertension, hyperlipidemia, chronic kidney disease, unemployment status, number of current medications, serum uric acid level >6 mg/dL in the last 3 months, and treatment duration) were eliminated due to their potential correlations with other variables in the model. Therefore, the variables included in the multivariable model were age less than 60 years, gender, marriage, current smoking, monthly income less than 20,000 baht, number of comorbid diseases, gout flare in the past six months, treatment duration less than one year, serum uric acid level, and BMQ score. The independent risk factors of low adherence were number of comorbid diseases (OR 0.82 95% CI 0.69 to 0.97; p=0.022), serum uric acid level (OR 1.29 95% CI 1.09 to 1.53; p=0.004), treatment duration of less than 1 year (OR 3.59 95% CI 1.28 to 10.09; p=0.015), and BMQ score (OR 1.04 95% CI 1.02 to 1.07; p=0.001).

Discussion

Results confirmed the impact of medication beliefs on adherence behavior among patients with gout receiving urate-lowering therapy, although the correlation was weak. Moreover, the risk of low adherence can be increased by elevated serum uric acid levels, younger age (<60 years), and recent diagnosis and decreased by a great number of comorbidities. These results were consistent with previous studies[17,22].

The present study revealed that having more comorbidities is a protective factor against nonadherence. This may be explained by patients with multiple chronic conditions having experience in self-care from other diseases or understanding the consequences of nonadherence[17]. Also, being younger than 60 years old is a predictor for nonadherence. That might be because the patient had fewer experiences about illness and gave less importance to disease treatment.

According to Table 4, the percentage of unemployed patients and those with a monthly income of less than 20,000 Baht was statistically significantly higher in the moderate to high adherence group. This could be because these two

Table 4. Belief about medication score based on low and moderate to high adherence

BMQ score	Low adherence	Moderate to high adherence	p-value
Total score, median (IQR)	52 (43 to 61)	46 (40 to 53)	<0.001*
Specific-Necessity, median (IQR)	20 (17 to 24)	21 (18 to 24)	0.111
Specific-Concern, median (IQR)	11 (8 to 16)	8 (5 to 12)	<0.001*
General Overuse, median (IQR)	12 (8 to 14)	9 (8 to 12)	0.001*
General-Harm, median (IQR)	9 (7 to 12)	8 (6 to 10)	<0.001*
Necessity - Concern difference, median (IQR)	8 (4 to 12)	11 (7 to 16)	<0.001*

IQR=interquartile range

Table 5. Univariable analysis and multivariable analysis of low adherence risk factors

	Univariable analysis		Multivariable analysis	
	Odds ratio (95% CI)	p-value	Odds ratio (95% CI)	p-value
Age less than 60 years old	2.06 (1.23 to 3.43)	0.006*	1.85 (1.05 to 3.24)	0.032
Gender	1.20 (0.62 to 2.31)	0.586		
Married	1.53 (0.90 to 2.60)	0.115*		
Living in Bangkok	0.88 (0.52 to 1.49)	0.631		
Medical welfare scheme				
Government or State Enterprise Officer	1			
Universal Coverage Scheme	1.68 (0.94 to 3.00)	0.078		
Social Security Scheme	1.56 (0.76 to 3.21)	0.227		
Self-pay	2.39 (0.84 to 6.83)	0.104		
Education less than 9-year	1.05 (0.63 to 1.74)	0.856		
Unemployment status	0.55 (0.33 to 0.90)	0.018*		
Monthly income <20,000 Baht	0.60 (0.36 to 1.00)	0.051*		
Living alone	0.76 (0.29 to 1.98)	0.580		
Taking medication by self	1.12 (0.59 to 2.15)	0.732		
Current smoker	2.20 (0.91 to 5.29)	0.079*		
Alcohol drinking	0.62 (0.24 to 1.58)	0.314		
Diabetes mellitus	1.15 (0.67 to 2.00)	0.610		
Hypertension	0.40 (0.23 to 0.69)	0.001*		
Coronary artery disease	0.67 (0.33 to 1.39)	0.285		
Cerebrovascular disease	1.22 (0.58 to 2.55)	0.604		
Hyperlipidemia	0.64 (0.36 to 1.13)	0.123*		
Overweight and obesity	0.76 (0.43 to 1.35)	0.345		
CKD stage III-V	0.54 (0.30 to 0.98)	0.042*		
Number of comorbid diseases	0.80 (0.69 to 0.94)	0.006*	0.82 (0.69 to 0.97)	0.022
Number of current medications	0.94 (0.88 to 0.99)	0.035*		
Gout flare in the past 6 months	2.10 (1.18 to 3.72)	0.011*		
Urinary calculi	0.97 (0.50 to 1.87)	0.929		
Tophi	0.81 (0.42 to 1.55)	0.523		
Serum uric acid level	1.37 (1.17 to 1.61)	<0.001*	1.29 (1.09 to 1.53)	0.004
Serum uric acid level >6 mg/dL in the last 3 months	3.66 (2.02 to 6.64)	<0.001*		
Follow-up at rheumatology clinic	0.75 (0.45 to 1.27)	0.286		
Treatment duration	1.00 (0.99 to 1.00)	0.090*		
Treatment duration <1 year	4.14 (1.63 to 10.52)	0.003*	3.59 (1.28 to 10.09)	0.015
Complex prescription	1.58 (0.50 to 4.96)	0.436		
BMQ score	1.04 (1.02 to 1.07)	<0.001*	1.04 (1.02 to 1.07)	0.001

* p<0.2 in the univariable analysis

CKD=chronic kidney disease; mg/dL=milligrams per deciliter

variables correlate to the age group, an independent predictor of nonadherence. Furthermore, most elderly participants were unemployed and also had low incomes.

The present study revealed a nonadherence rate of approximately 29%, indicating a relatively high adherence rate to urate-lowering therapy among Thai patients with gout compared to a previous report where the pooled adherence rate ranged from 17.4% to 78.5%[4]. The history of loss follow-up or non-persistence was notably low at 5.3%. Variations in adherence rates may be attributed to differences in population demographics and assessment methods. Moreover, the present study enrolled participants from a large tertiary care hospital in Bangkok, including individuals with severe diseases predisposed to adhere to treatment. The social distancing policy during the COVID-19 pandemic in Thailand could have influenced adherence that some nonadherent patients might have suspended their treatment during lockdowns. The invitation list was based on patient data from 2020 to 2021, potentially excluding nonadherent individuals. A recent study in China during the pandemic

also reported higher adherence rates among patients with gout[23].

In terms of belief, the results indicated that the participants with low adherence expressed significant concerns about medications. This finding aligned with previous studies, which suggested that medication adherence correlates with high levels of perceived necessity and few concerns[17,24,25]. In addition, the BMQ score, identified as an independent predictor for low adherence in patients with gout, consistent with the findings from a previous study in Singapore[17]. A recent publication examining patient adherence and beliefs among 101 Chinese participants also found that nonadherent patients with gout exhibited a shorter disease duration, lower necessity scores regarding medication, higher medication concern scores, and a smaller necessity-concern difference compared with the adherent group[23].

It was previously noted that the MMAS-8-Items questionnaire had shown acceptable internal consistency[11,12]. However, when the reliability of the questionnaire was tested in pilot and study groups, the results indicated a lower value than the generally acceptable range for Cronbach's alpha (0.7 to 0.95). This finding is consistent with a previous study[26] that aimed to examine MMAS-8-Item validity and reliability in 303 Thai patients with type 2 diabetes, which also reported moderate internal consistency reliability (Cronbach's alpha=0.61). This difference may be due to variations in the study population, and it is important to note that the study was not primarily designed to analyze reliability. Additionally, the concept of reliability assumes a single dimension in a sample of test items[27]. However, the MMAS-8-Item questionnaire assesses three dimensions of adherence, including forgetting to take medications, stopping medications, and the complexity of the drug regimen.

The authors also considered potential variables that might influence adherence behavior, including demographic, socioeconomic, clinical, and psychological data such as beliefs about medication. However, the present study did not include other psychological factors that could impact adherence, including illness perception, patient trust, and medical knowledge, thus representing a limitation. Therefore, further study, including those psychological factors and beliefs, may be needed. Its nature as a single-center study poses another limitation for generalizability. Additionally, limitations arise from the retrospective clinical data review, particularly concerning the disease duration and treatment duration. Some patients were diagnosed and began treatment at other hospitals, but they could not recall the exact time. However, the author chose to present information on the duration of treatment instead, as this study primarily focuses on medication use. Another limitation was the cross-sectional design, which limits the ability to establish causality between medication beliefs and adherence behavior. Further, longitudinal studies may need to examine the dynamic nature of medication adherence over time.

Nevertheless, the strength of this work lies in its methodology. First, the authors investigated beliefs regarding urate-lowering therapy among approximately 300 individuals with gout, constituting a relatively larger sample than previous reports. Second, the authors employed random sampling rather than convenience sampling during recruitment, allowing for the enrolment of patients with gout from every clinic in the hospital other than the rheumatology clinic. Consequently, the results may apply to general patients with gout in urban areas of developing countries.

Conclusion

The present study emphasizes the impact of medication beliefs on medication adherence, which is mandatory for sustaining target serum uric acid levels. We also identified the predictors of low adherence to urate-lowering therapy. In patients with gout who are unable to achieve their target serum uric acid levels, exploring their medication adherence and beliefs is essential. Moreover, the present study elucidated patients' barriers to high medication adherence and their concerns regarding urate-lowering therapy. Guided by these findings, physicians can devise strategies to enhance patient adherence.

What is already known on this topic?

Low adherence to urate-lowering therapy is a prevalent issue in clinical practice. Various clinical predictors, including age, gender, comorbidities, and serum uric acid level, have been documented.

What this study adds?

This study reveals that adherence to urate-lowering therapy among Thai patients with gout in Bangkok during the COVID-19 pandemic is relatively higher than previously reported. We also emphasize the significance of medication beliefs in adherence behavior, irrespective of clinical predictors such as serum uric acid level. In addition, this study addresses patients' issues related to adherence and describe their concerns about the treatment.

Acknowledgements

We are grateful to Professor Donald E. Morisky for permitting the use of the MMAS-8, and Yosapon Leaungsomnapa for the Thai-BMQ. We also appreciate the valuable advice from Siriporn Manavathongchai and Wasee Tulvatana. Finally, we acknowledge the Faculty of Medicine Vajira Hospital for funding the language editing

of this manuscript.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Conflicts of interest

The authors declare no conflict of interest.

References

1. Chandratre P, Mallen CD, Roddy E, Liddle J, Richardson J. "You want to get on with the rest of your life": a qualitative study of health-related quality of life in gout. Clin Rheumatol 2016;35:1197-205.
2. Dalbeth N, Choi HK, Joosten LAB, Khanna PP, Matsuo H, Perez-Ruiz F, et al. Gout. Nat Rev Dis Primers 2019;5:69. doi: 10.1038/s41572-019-0115-y.
3. Briesacher BA, Andrade SE, Fouayzi H, Chan KA. Comparison of drug adherence rates among patients with seven different medical conditions. Pharmacotherapy 2008;28:437-43.
4. Scheepers L, van Onna M, Stehouwer CDA, Singh JA, Arts ICW, Boonen A. Medication adherence among patients with gout: A systematic review and meta-analysis. Semin Arthritis Rheum 2018;47:689-702.
5. De Vera MA, Marcotte G, Rai S, Galo JS, Bhole V. Medication adherence in gout: a systematic review. Arthritis Care Res (Hoboken) 2014;66:1551-9.
6. Ritschl V, Stamm TA, Aletaha D, Bijlsma JWJ, Böhm P, Dragoi RG, et al. 2020 EULAR points to consider for the prevention, screening, assessment and management of non-adherence to treatment in people with rheumatic and musculoskeletal diseases for use in clinical practice. Ann Rheum Dis 2021;80:707-13.
7. Wallace SL, Robinson H, Masi AT, Decker JL, McCarty DJ, Yü TF. Preliminary criteria for the classification of the acute arthritis of primary gout. Arthritis Rheum 1977;20:895-900.
8. Neogi T, Jansen TL, Dalbeth N, Fransen J, Schumacher HR, Berendsen D, et al. 2015 Gout classification criteria: an American College of Rheumatology/ European League Against Rheumatism collaborative initiative. Ann Rheum Dis 2015;74:1789-98.
9. Richette P, Doherty M, Pascual E, Barskova V, Becce F, Castaneda J, et al. 2018 updated European League Against Rheumatism evidence-based recommendations for the diagnosis of gout. Ann Rheum Dis 2020;79:31-8.
10. World Health Organization Regional Office for the Western Pacific. The Asia-Pacific perspective: redefining obesity and its treatment. Sydney: Health Communications Australia; 2000.
11. Tan C, Teng GG, Chong KJ, Cheung PP, Lim A, Wee HL, et al. Utility of the Morisky Medication Adherence Scale in gout: a prospective study. Patient Prefer Adherence 2016;10:2449-57.
12. Moon SJ, Lee WY, Hwang JS, Hong YP, Morisky DE. Accuracy of a screening tool for medication adherence: A systematic review and meta-analysis of the Morisky Medication Adherence Scale-8. PLoS One 2017;12:e0187139.
13. Morisky DE, Ang A, Krousel-Wood M, Ward HJ. Predictive validity of a medication adherence measure in an outpatient setting. J Clin Hypertens (Greenwich) 2008;10:348-54.
14. Berlowitz DR, Foy CG, Kazis LE, Bolin LP, Conroy MB, Fitzpatrick P, et al. Effect of intensive blood-pressure treatment on patient-reported outcomes. N Engl J Med 2017;377:733-44.
15. Bress AP, Bellows BK, King JB, Hess R, Beddhu S, Zhang Z, et al. Cost-effectiveness of intensive versus standard blood-pressure control. N Engl J Med 2017;377:745-55.
16. Horne R, Weinman J, Hankins M. The beliefs about medicines questionnaire: The development and evaluation of a new method for assessing the cognitive representation of medication. Psychol Health 1999;14:1-24.
17. Chua XHJ, Lim S, Lim FP, Lim YNA, He HG, Teng GG. Factors influencing medication adherence in patients with gout: A descriptive correlational study. J Clin Nurs 2018;27:e213-22.
18. Leaungsomnapa Y, Leaungsomnapa S, Promproh S, Thasirasawad P, Keawchaum R, Suraworawathanakul W. Confirmatory factor analysis of beliefs about medicine questionnaire in Thai version. J Prapokklao Hosp Clin Med Educ Cent 2014;31:297-310.
19. Ngamjarus C. n4Studies: Sample size calculation for an epidemiological study on a smart device. Siriraj Med J 2016;68:160-70.
20. Daniel WW. Biostatistics: a foundation for analysis in the health sciences. 6th ed. New York: Wiley & Sons; 1995.
21. Harrold LR, Mazor KM, Peterson D, Naz N, Firneno C, Yood RA. Patients' knowledge and beliefs concerning gout and its treatment: a population based study. BMC Musculoskelet Disord 2012;13:180. doi: 10.1186/471-2474-13-180.
22. Harrold LR, Andrade SE, Briesacher BA, Raebel MA, Fouayzi H, Yood RA, et al. Adherence with urate-lowering therapies for the treatment of gout. Arthritis Res Ther 2009;11:R46. doi: 10.1186/ar2659.
23. Yin R, Lu J, Xu Z, Yan Q, Wang M, Xu R. Urate-lowering therapy adherence and the association with medication beliefs, self-efficacy, depression, anxiety, and COVID-19 pandemic-related concern in Chinese gout patients: a cross-sectional study. Psychol Health Med 2023;28:1698-708.
24. Uhlig T, Karoliussen LF, Stjärne J, Haavardsholm EA, Kvien TK, Hammer HB. FRI0250 Beliefs about medicines among gout patients – data from the nor-gout study. Ann Rheum Dis 2018;77 Suppl 2:665. doi: 10.1136/annrheumdis-2018-eular.4435.

25. Dalbeth N, Petrie KJ, House M, Chong J, Leung W, Chegudi R, et al. Illness perceptions in patients with gout and the relationship with progression of musculoskeletal disability. Arthritis Care Res (Hoboken) 2011;63:1605-12.
26. Sakthong P, Chabunthom R, Charoenvisuthiwongs R. Psychometric properties of the Thai version of the 8-item Morisky Medication Adherence Scale in patients with type 2 diabetes. Ann Pharmacother 2009;43:950-7.
27. Tavakol M, Dennick R. Making sense of Cronbach's alpha. Int J Med Educ 2011;2:53-5.