

# Knowledge, Attitude and Practice on Recurrence Prevention Among Patients with Rheumatoid Arthritis: A Cross-Sectional Study

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**Aim:** This study aims to explore the knowledge, attitude and practice (KAP) of patients with rheumatoid arthritis (RA) on recurrence prevention.

**Methods:** A cross sectional study was conducted between 20 July, 2023 and 25 September, 2023 to collect demographic information and KAP scores of patients with RA by distributing questionnaires.

**Results:** A total of 416 participants were enrolled in the statistical analyses. The median (25th percentile, 75th percentile) scores of knowledge, attitude, and practice were 11 (8, 13), 33 (32, 36), and 71 (63, 80), respectively. Multivariate analysis showed that graduating from junior college or undergraduate and above and longer duration of RA were independently associated with good knowledge. Knowledge score was independently associated with positive attitude. Patients who paid their medical expenses entirely out of pocket exhibited a more negative attitude compared with those receiving partial reimbursement. Furthermore, having a junior college or higher degree, and unemployed/retired were independently associated with proactive practice. However, it is interesting to note that patients with a monthly per capita household income of 4,000–6,000 yuan had less active practices than those with that of less than or equal to 2,000 yuan. Structural Equation Modeling (SEM) showed that knowledge directly affects attitude ( $\beta = 0.438$ ) and attitude directly affects practice ( $\beta = 0.647$ ).

**Conclusion:** Patients demonstrated adequate knowledge, a positive attitude, and passive practices toward RA recurrence prevention. To optimize clinical practice in preventing rheumatoid arthritis (RA) recurrence, targeted educational initiatives are crucial, especially for patients with lower education levels and shorter RA durations.

**Keywords:** knowledge, attitude, practice, rheumatoid arthritis, recurrence prevention

## Introduction

Rheumatoid arthritis (RA), a chronic systemic autoimmune disease of unknown cause, affects approximately 25 million people worldwide.<sup>1,2</sup> It is the most common chronic inflammatory arthritis, with an annual incidence of about 40 cases per 100,000 individuals.<sup>3,4</sup> RA has a prevalence of 0.3% to 1.5% and primarily affects joints, causing pain, inflammation, and joint damage.<sup>5,6</sup> Due to the absence of a complete cure, long-term management is essential to reduce relapses and prevent joint damage.<sup>7</sup> Moreover, recent studies suggest that RA is closely associated with comorbid conditions such as periodontal disease, highlighting its complex pathogenesis and the need for comprehensive management strategies.<sup>8</sup> RA poses a major global health challenge, profoundly affecting the quality of life of affected individuals. Although a cure remains unavailable, effective treatment and management strategies can greatly reduce symptoms, improve quality of life, and limit joint damage.<sup>9</sup> Achieving sustained remission and preventing relapses require active patient involvement and a comprehensive approach that integrates medication, lifestyle changes, and self-management. Because RA requires strict and continuous medication adherence, timely recognition of early symptoms, and long-term lifestyle adjustments, patient behaviors directly influence disease outcomes and prognosis. Compared with other chronic conditions, inadequate

adherence in RA can rapidly lead to irreversible joint damage and disability, underscoring the critical role of behavior change in recurrence prevention. Although some educational and behavioral interventions, such as patient education programs, self-management courses, and rehabilitation training, have been introduced in RA care, their effectiveness remains limited due to barriers in accessibility, long-term adherence, and lack of individualized support. In China, cultural beliefs regarding traditional medicine, differences in health insurance reimbursement, and uneven healthcare accessibility may further influence patients' participation in recurrence prevention, making it necessary to investigate KAP in this specific context. While prior studies and surveys have examined various aspects of patient management,<sup>10,11</sup> limited research has focused on patient participation in recurrence prevention. In this study, "recurrence prevention" refers to strategies aimed at reducing disease flare-ups, preventing the progression of joint damage, and minimizing hospital readmissions, consistent with established concepts of relapse and disease activity control in RA.<sup>7,12,13</sup> Understanding patients' knowledge, attitudes, and practices (KAP) regarding recurrence prevention can offer valuable insights into their role in disease management. In this study, recurrence prevention refers to the set of patient behaviors and practices aimed at reducing RA flare-ups, joint inflammation, and symptom exacerbation, based on established clinical guidelines. Given the complexity of RA treatment—including lifelong medication use, lifestyle modifications, and ongoing symptom monitoring—understanding patients' knowledge, attitudes, and behaviors is essential for sustained disease control. While some studies have examined patient education in RA, few have focused specifically on how KAP influences adherence to recurrence prevention strategies, leaving an important gap in the literature. To our knowledge, this is the first study by our team to apply the KAP framework specifically to RA recurrence prevention in this patient population. This study seeks to address this gap by investigating how patients' perspectives influence their behaviors in recurrence prevention.

The KAP survey is a diagnostic tool designed to assess a group's understanding, beliefs, and behaviors related to a specific topic, particularly in the context of health literacy. The KAP framework is based on the principle that knowledge positively influences attitudes, which subsequently shape behaviors.<sup>14–16</sup> Studying the KAP of patients with RA concerning recurrence prevention is significant because it can provide essential insights into managing this chronic disease. Understanding the KAP of RA patients helps healthcare providers better comprehend patients' perspectives on recurrence prevention. This understanding is crucial for developing interventions and educational strategies tailored to the needs and beliefs of the patient population. Additionally, such research can identify gaps in knowledge and highlight areas for improvement in patient education, ultimately enhancing care quality and outcomes for individuals with RA.

A KAP study on RA patients focused on recurrence prevention is particularly important due to the lack of research in this area. By thoroughly examining patients' KAP, healthcare providers can gain tailored insights to better address their needs, thereby improving their quality of life. Furthermore, the findings of this study could significantly contribute to reducing the risks of disease relapse and progression, positively influencing the overall management of RA.

## Materials and Methods

### Study Design and Participants

This cross-sectional study, conducted in Sanming, Putian, and Fuzhou, Fujian Province, from July to September 2023, targeted individuals diagnosed with RA. Inclusion criteria included a confirmed RA diagnosis based on the 2010 ACR/EULAR criteria, ongoing treatment, age of 18 years or older, adequate communication skills, the ability to understand and complete the questionnaire, willingness to provide informed consent, and no severe diseases or organ dysfunctions affecting RA evaluation. Participants were excluded if they completed the questionnaire in less than 114 seconds or more than 1800 seconds, or if their responses were incomplete or missing. Time-based exclusion criteria are commonly used in survey methodology to identify inattentive or invalid responses, as supported by recent methodological studies.<sup>17</sup>

The study received ethical approval from the Ethics Committee of the First Hospital of Sanming City (Ethics No.: (2023) 59), and informed consent was obtained from all participants.

## Procedures

The questionnaire was developed based on existing literature<sup>12,18–21</sup> and subsequently reviewed and modified through group discussions. A preliminary assessment was conducted, yielding a Cronbach's  $\alpha$  of 0.937 and a KMO value of 0.929.

The final questionnaire, written in Chinese, comprised four sections. The first section collected demographic information through 13 questions. The second section assessed knowledge using 14 questions, each scored as 1 point for correct responses and 0 points for unclear or incorrect answers, resulting in a score range of 0–14 points. The third section evaluated attitudes through 8 questions using a five-point Likert scale, with scores ranging from 1 to 5 points per question, producing a total score range of 8–40 points. The fourth section assessed practices with 20 questions, also using a five-point Likert scale, with scores ranging from 1 to 5 points, resulting in a total score range of 20–100 points.

The digital survey was developed with the WeChat-based Questionnaire Star applet, and data collection was facilitated through a generated QR code. Participants accessed and completed the questionnaire by scanning the QR code distributed via WeChat. To ensure the integrity of the responses, each IP address was restricted to a single submission, and all fields were mandatory. All questions in the questionnaire were set as required items, and the platform did not allow submission unless every item was completed. Therefore, there were no item-level missing data in the final dataset. The exclusion criterion of “incomplete or missing responses” referred specifically to questionnaires that could not be submitted due to unanswered items. Data were exported from the Questionnaire Star platform into an Excel spreadsheet. The research team thoroughly reviewed all submissions to ensure completeness, internal consistency, and logical coherence.

To validate the questionnaire's scientific reliability and applicability, pretesting and expert consultations were conducted before the main survey. Two rheumatology experts reviewed the questionnaire to assess its clarity and relevance, providing feedback on phrasing, scale optimization, and item sequencing. Additionally, a pilot test involving 30 RA patients evaluated the questionnaire's feasibility, clarity, and response rate. Participants highlighted difficulties or ambiguities encountered during completion, leading to further revisions. Multiple rounds of revision resulted in the final version, which had an average completion time of approximately 10 minutes. The purpose of the pilot test was not to perform statistical inference but to evaluate the clarity, feasibility, completion time, and logical consistency of the questionnaire. A sample size of approximately 30 participants is commonly considered adequate for such qualitative pretesting in methodological studies.

## Statistical Analyses

Initially, a normality test was conducted for the distribution of scores in each dimension. If the data followed a normal distribution, the mean and standard deviation were used for representation. If the data did not conform to a normal distribution, the median, 25th percentile, and 75th percentile were used. For count data reflecting responses to questions based on different demographic characteristics, results were presented as  $n(\%)$ . Differences in scores across various dimensions among participants with different demographic characteristics were analyzed using Kruskal–Wallis analysis of variance, as the data did not meet the normality assumption. Correlations between scores for different dimensions were analyzed using Spearman correlation coefficient due to the non-normal distribution of data, and the results were categorized using the median scores for each dimension. Variables with  $P < 0.25$  in univariate analyses were included in the multivariate regression models.  $P$ -values were reported to three decimal places, with  $P < 0.05$  considered statistically significant. Statistical analyses were performed using SPSS 26.0 (IBM Corp., Armonk, N.Y., USA). Path diagrams illustrating the relationships between KAP and influencing factors in RA patients were constructed and adjusted as necessary using AMOS 21.0 software.

## Results

### Demographic Characteristics and Impact on KAP

A total of 450 questionnaires were distributed. After excluding 13 questionnaires without informed consent and 21 questionnaires with abnormal completion times ( $<150$  s or  $>1800$  s), 416 valid responses were retained for analysis, resulting in a response rate of 92.4%. Among the 416 participants included in the statistical analysis, 307 (73.8%) were females, with a mean age of  $54.6 \pm 13.1$  years. A total of 238 (57.2%) had a middle school education or below, 115 (27.6%) had RA for more than 10 years, 161 (38.7%) had deformed joints, 231 (55.5%) reported mild joint pain, and 247 (59.4%) had no history of comorbidities. The median (25th

percentile, 75th percentile) scores for knowledge, attitude, and practice were 11 (8, 13), 33 (32, 36), and 71 (63, 80), respectively. Analysis of demographic characteristics revealed significant differences in KAP scores based on education level ( $P = 0.014$ ,  $P < 0.001$ , and  $P < 0.001$ , respectively) and occupation ( $P = 0.015$ ,  $P = 0.047$ , and  $P = 0.003$ , respectively). Marital status was associated with differences in knowledge and practice scores ( $P = 0.037$  and  $P = 0.029$ , respectively). Attitude and practice scores varied significantly with different payment methods for medical expenses ( $P = 0.017$  and  $P = 0.023$ , respectively). Additionally, the duration of RA was associated with differences in knowledge scores ( $P = 0.003$ ) (Tables 1 and 2). Among the participants, 57.7%, 52.6%, and 52.9% had knowledge, attitude, and practice scores greater than or equal to the median, respectively (Table 3).

**Table 1** Baseline Characteristics of Patients with Rheumatoid Arthritis

Variables	N (%)	Knowledge		Attitude		Practice	
		Median (25% Quartile, 75% Quartile)	P	Median (25% Quartile, 75% Quartile)	P	Median (25% Quartile, 75% Quartile)	P
Total	416	11(8,13)		33(32,36)		71(63,80)	
Gender			0.858		0.052		0.552
Male	109(26.2)	11(8,13)		32(31,36)		70(64,80)	
Female	307(73.8)	11(8,13)		33(32,37)		72(63,81)	
Age (years)	54.6±13.1	/		/		/	
Age classification (years)			0.562		0.680		0.753
≤50	151(36.3)	11(8,13)		33(32,37)		73(61,82)	
51-60	140(33.7)	11(7,13)		33(32,36)		71(63,80)	
>60	125(30.0)	11(9,13)		33(32,36)		70(64,82)	
Education			0.014		<0.001		<0.001
Middle school and below	238(57.2)	11(7,13)		32(31,35)		69(61,77)	
High School/Vocational High School	80(19.2)	11(9.5,13)		33(32,36)		72(67.5,82)	
Junior college/Undergraduate and above	98(23.6)	12(10,14)		34.5(32,39)		77(67,88)	
Marital status			0.037		0.151		0.029
Married	370(88.9)	11(8,13)		33(32,36)		71(63,80)	
Other	46(11.1)	13(9,14)		34.5(32,38)		75.5(66,86)	
Residence			0.752		0.409		0.403
Urban	333(80.0)	11(8,13)		33(32,36)		71(64,80)	
Non-urban	83(20.0)	11(8,14)		32(31,36)		70(60,84)	
Occupation			0.015		0.047		0.003
Freelance	111(26.7)	11(7,13)		33(32,36)		71(62,79)	
Farmer	124(29.8)	11(7,13)		32(31,35)		68(62,75)	
On leave/Retired	98(23.6)	11(9,13)		33(32,37)		73.5(68,85)	
Other	83(20.0)	12(10,14)		33(32,40)		74(61,83)	
Monthly per capita household income (yuan)			0.651		0.198		0.223
≤2000	83(20.0)	12(8,14)		33(32,39)		72(62,84)	
2000-4000	126(30.3)	11(7,13)		32(32,36)		72(65,80)	
4000-6000	97(23.3)	11(8,13)		32(32,37)		68(61,77)	
≥6000	110(26.4)	11(8,13)		33(32,36)		72(64,81)	
Payment method of medical expenses			0.214		0.017		0.023
Partial reimbursement	402(96.6)	11(8,13)		33(32,36)		71(64,80)	
Self-payment	14(3.4)	11(7,12)		31.5(31,32)		62(54,72)	
Duration of RA			0.003		0.252		0.395
≤1 years	90(21.6)	10(6,13)		33(32,37)		74(62,87)	
1-5 years	118(28.4)	12(9,13)		33(32,38)		71.5(64,81)	
5-10 years	93(22.4)	11(9,13)		33(32,37)		70(64,77)	
≥10 years	115(27.6)	11(9,13)		32(32,35)		71(64,80)	
Deformation of joints			0.245		0.950		0.703
Yes	161(38.7)	12(9,13)		33(32,37)		71(62,82)	
No	255(61.3)	11(8,13)		33(32,36)		71(64,80)	
Joints pain			0.418		0.738		0.369
No pain	93(22.4)	11(8,13)		33(32,36)		71(65,79)	
Mild pain	231(55.5)	11(9,13)		33(32,36)		70(62,80)	
Moderate/severe pain	92(22.1)	11(8,13)		32(32,36.5)		73(64.5,82.5)	

**Table 2** Distribution of Comorbidities Among Patients with Rheumatoid Arthritis

Your history of combinations or comorbidities: (Multiple choice)	N (%)
a. None	247(59.4)
b. Cerebrovascular disease (eg hypertension)	90(21.6)
c. Heart disease (eg coronary heart disease)	19(4.6)
d. Diabetes mellitus	24(5.8)
e. Renal disease	12(2.9)
f. Malignant tumour	12(2.9)
g. Other	44(10.6)

**Table 3** Score Situation

	Median	25% Quintile	75% Quintile	Minimum Value	Maximum Value	< Median N (%)	≥ Median N (%)
Knowledge Dimension	11	8	13	0	14	176(42.3)	240(57.7)
Attitude Dimension	33	32	36	24	40	197(47.4)	219(52.6)
Practice Dimension	71	63	80	21	100	196(47.1)	220(52.9)

## KAP Distribution

The distribution of knowledge scores showed that the three most correctly answered questions were “A sensible diet contributes to controlling the condition in patients with RA” (K14) with 92.3%, “Early diagnosis of RA significantly impacts treatment and prognosis” (K6) with 87.7%, and “Engaging in aerobic exercises 1–2 times per week (not high-intensity sports) helps improve joint function, enhance quality of life, and reduce fatigue” (K13) with 85.6%. Notably, for the question “RA typically occurs only in the elderly” (K5), 61.8% of participants correctly chose “Wrong” (Table 4).

**Table 4** Distribution of Knowledge Dimension

	a. Correct	b. Wrong	c. Unclear
1. RA is an autoimmune disease primarily characterized by erosive arthritis.	338(81.3)	3(0.7)	75(18.0)
2. Epidemiological data show that women are more susceptible to RA.	314(75.5)	10(2.4)	92(22.1)
3. With the prolonged duration of RA, the rates of disability and functional limitations increase.	340(81.7)	2(0.5)	74(17.8)
4. RA can lead to complications such as lung diseases, cardiovascular diseases, malignancies, and depression.	227(54.6)	17(4.1)	172(41.3)
5. RA typically occurs only in the elderly.	58(13.9)	257(61.8)	101(24.3)
6. Early diagnosis of RA significantly impacts treatment and prognosis.	365(87.7)	6(1.4)	45(10.8)
7. Currently, RA is an incurable lifelong condition, but it can be effectively managed by treat—to—target, which alleviates symptoms and controls the disease.	351(84.4)	8(1.9)	57(13.7)
8. The arthropathy of RA is caused by infiltration of inflammatory cells and their release of inflammatory mediators, the early use of disease-modifying antirheumatic drugs (DMARDs) that improve the condition can suppress cytokine production and its effects, effectively preventing or slowing synovial and cartilage arthropathy.	261(62.7)	1(0.2)	154(37)
9. Studies indicate that irregular use of DMARDs to improve the condition is one of the independent risk factors for limited joint function in patients with RA.	267(64.2)	3(0.7)	146(35.1)
10. Cohort studies demonstrate that patients with RA who accumulate higher doses of traditional synthetic DMARDs (eg, methotrexate) in the first year after diagnosis delay joint replacement.	204(49.0)	19(4.6)	193(46.4)
11. For patients who do not achieve the treatment goals with drugs such as methotrexate, leflunomide, or sulfasalazine when used as monotherapy, combination therapy should be considered.	287(69.0)	3(0.7)	126(30.3)
12. Obesity and smoking not only increase the incidence of RA but also worsen the condition.	314(75.5)	14(3.4)	88(21.2)
13. Engaging in aerobic exercises 1–2 times per week (not high-intensity sports) not only helps improve joint function and enhance the quality of life for patients but also aids in reducing fatigue.	356(85.6)	5(1.2)	55(13.2)
14. A sensible diet contributes to controlling the condition in patients with RA.	384(92.3)	2(0.5)	30(7.2)

Patient attitudes toward RA prevention and recurrence exhibited similar distributional trends. Regarding medication use, cessation of smoking and alcohol, follow-ups, infection prevention, avoiding prolonged postures, warmth, rehabilitation exercises, and anxiety relief, more than 25% of participants demonstrated a very positive attitude, and over 87.5% expressed a good attitude (including “strongly agree” and “agree”) (Figure 1).

In terms of related practices, patients most actively adhered to taking medication as prescribed (P1), keeping warm (P8), and eating easily digestible foods (P16), with over 75% reporting that they “always” or “often” engaged in these activities. Conversely, the least practiced activities were distracting themselves from pain by listening to music or watching TV (P18), acquiring knowledge about the disease (P19), and communicating with other patients about the disease and its treatment (P20), with no more than 50% reporting that they “always” or “often” engaged in these activities (Figure 2). Spearman correlation analysis showed that knowledge was positively correlated with attitude ( $r = 0.428, P < 0.001$ ) and practice ( $r = 0.316, P < 0.001$ ), while attitude was positively correlated with practice ( $r = 0.587, P < 0.001$ ).

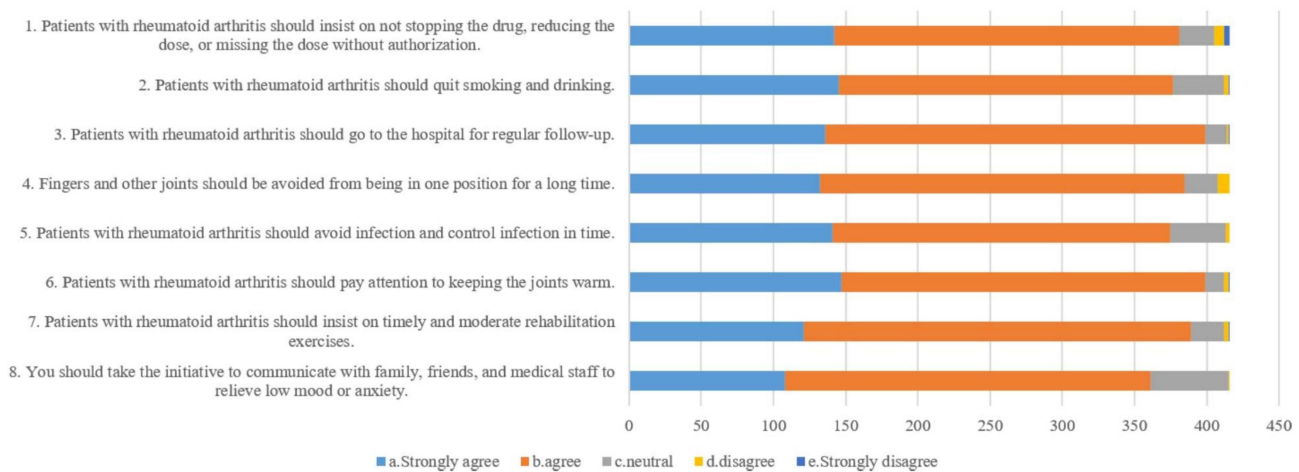


Figure 1 Distribution of Attitude dimension.

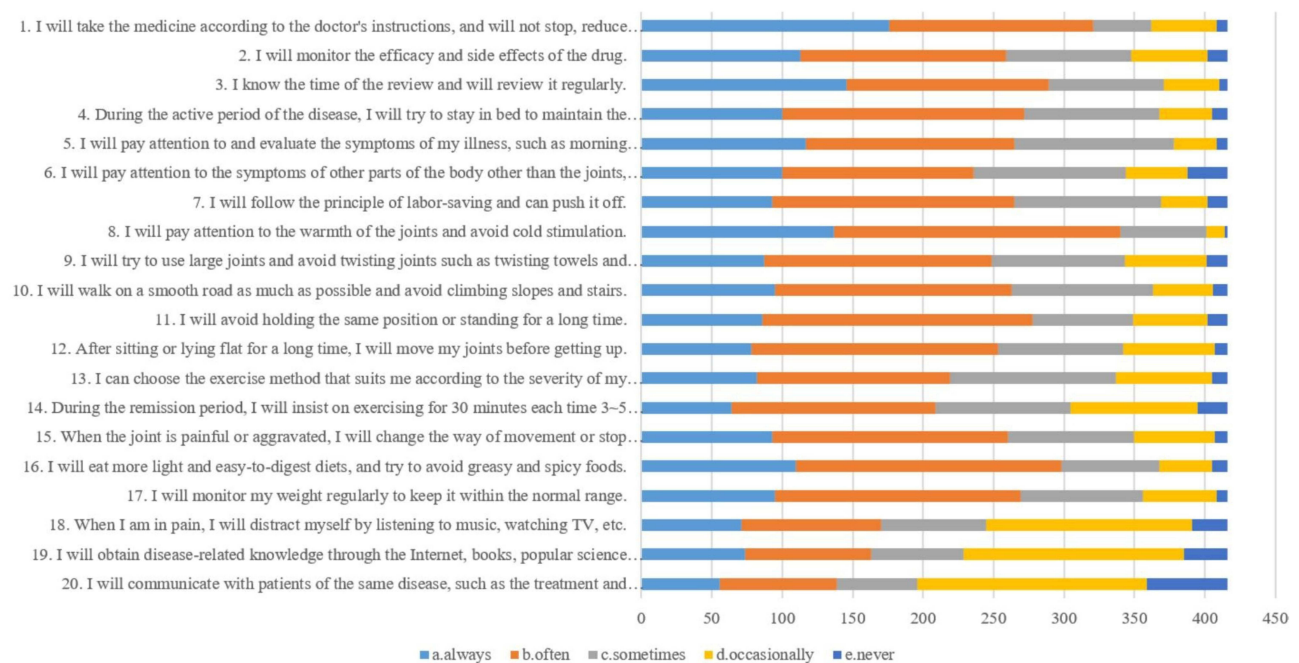


Figure 2 Distribution of Practice dimension.

## Factors Associated with KAP Levels

In the multivariate analysis, variables with p-values less than 0.1 from the univariate analysis were included. The results indicated that graduating from junior college or having an undergraduate degree or higher (OR = 2.655, 95% CI: [1.569–4.493], P < 0.001) and a longer duration of RA (eg,  $\geq 10$  years, OR = 2.778, 95% CI: [1.540–5.013], P = 0.001) were independently associated with higher knowledge levels (Table 5). Additionally, knowledge scores were independently associated with a positive attitude (OR = 2.730, 95% CI: [1.823–4.089], P < 0.001). Participants who relied on self-payment for medical expenses exhibited more negative attitudes compared to those with partial reimbursement (OR = 0.219, 95% CI: [0.059–0.816], P = 0.024) (Table 6). Furthermore, graduating from junior

**Table 5** Knowledge Dimension

Cut-off value: $\geq 11$ / $< 11$	No.	Univariate		Multivariate (Forward Method, P<0.1)		Multivariate (Forward Method, P<0.25)	
		OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P
Gender							
Male	63/109	Ref.					
Female	177/307	0.994(0.639,1.547)	0.979				
Age classification (years)							
$\leq 50$	93/151	Ref.					
51-60	79/140	0.808(0.506,1.290)	0.371				
$> 60$	68/125	0.744(0.460,1.204)	0.228				
Education							
Middle school and below	123/238	Ref.		Ref.		Ref.	
High School/Vocational High School	48/80	1.402(0.838,2.346)	0.198	1.365(0.809,2.305)	0.244	1.365(0.809,2.305)	0.244
Junior college/Undergraduate and above	69/98	2.225(1.346,3.678)	0.002	2.655(1.569,4.493)	<0.001	2.655(1.569,4.493)	<0.001
Marital status							
Married	209/370	Ref.					
Other	31/46	1.592(0.831,3.049)	0.161				
Residence							
Urban	194/333	Ref.					
Non-urban	46/83	0.891(0.549,1.446)	0.640				
Occupation							
Freelance	59/111	Ref.					
Farmer	66/124	1.003(0.600,1.676)	0.991				
On leave/Retired	60/98	1.392(0.802,2.416)	0.240				
Other	55/83	1.731(0.961,3.118)	0.067				
Monthly per capita household income (yuan)							
$\leq 2000$	50/83	Ref.					
2000-4000	70/126	0.825(0.470,1.448)	0.503				
4000-6000	57/97	0.941(0.518,1.709)	0.840				
$\geq 6000$	63/110	0.885(0.496,1.579)	0.679				
Payment method of medical expenses							
Partial reimbursement	232/402	Ref.					
Self-payment	8/14	0.977(0.333,2.868)	0.966				
Duration of RA							
$\leq 1$ years	39/90	Ref.		Ref.		Ref.	
1-5 years	75/118	2.281(1.302,3.996)	0.004	2.631(1.472,4.705)	0.001	2.631(1.472,4.705)	0.001
5-10 years	53/93	1.733(0.965,3.110)	0.066	1.981(1.082,3.625)	0.027	1.981(1.082,3.625)	0.027
$\geq 10$ years	73/115	2.273(1.293,3.994)	0.004	2.778(1.540,5.013)	0.001	2.778(1.540,5.013)	0.001
Deformation of joints							
Yes	98/161	Ref.					
No	142/255	0.808(0.541,1.207)	0.298				
Joints pain							
No pain	48/93	Ref.					
Mild pain	140/231	1.442(0.888,2.342)	0.139				
Moderate/severe pain	52/92	1.219(0.683,2.175)	0.503				

**Table 6** Attitude Dimension

Cut-off value: $\geq 33$ / $< 33$	No.	Univariate		Multivariate (Forward Method, $P < 0.1$ )		Multivariate (Forward Method, $P < 0.25$ )	
		OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P
Gender							
Male	52/109	Ref.					
Female	167/307	1.308(0.844,2.026)	0.230				
Age classification (years)							
$\leq 50$	80/151	Ref.					
51-60	73/140	0.967(0.610,1.533)	0.886				
$> 60$	66/125	0.993(0.618,1.596)	0.976				
Education							
Middle school and below	112/238	Ref.					
High School/Vocational High School	42/80	1.243(0.749,2.065)	0.400				
Junior college/Undergraduate and above	65/98	2.216(1.357,3.618)	0.001				
Marital status							
Married	191/370	Ref.					
Other	28/46	1.458(0.779,2.727)	0.238				
Residence							
Urban	178/333	Ref.					
Non-urban	41/83	0.850(0.525,1.375)	0.508				
Occupation							
Freelance	58/111	Ref.					
Farmer	58/124	0.803(0.481,1.341)	0.402				
On leave/Retired	57/98	1.270(0.735,2.197)	0.392				
Other	46/83	1.136(0.642,2.011)	0.661				
Monthly per capita household income (yuan)							
$\leq 2000$	50/83	Ref.					
2000-4000	60/126	0.600(0.342,1.052)	0.075				
4000-6000	48/97	0.647(0.357,1.170)	0.149				
$\geq 6000$	61/110	0.822(0.461,1.465)	0.506				
Payment method of medical expenses							
Partial reimbursement	216/402	Ref.		Ref.		Ref.	
Self-payment	3/14	0.235(0.065,0.854)	0.028	0.219(0.059,0.816)	0.024	0.219(0.059,0.816)	0.024
Duration of RA							
$\leq 1$ years	50/90	Ref.					
1-5 years	62/118	0.886(0.511,1.536)	0.666				
5-10 years	55/93	1.158(0.644,2.081)	0.624				
$\geq 10$ years	52/115	0.660(0.379,1.150)	0.143				
Deformation of joints							
Yes	84/161	Ref.					
No	135/255	1.031(0.695,1.531)	0.879				
Joints pain							
No pain	53/93	Ref.					
Mild pain	121/231	0.830(0.511,1.348)	0.452				
Moderate/severe pain	45/92	0.723(0.405,1.290)	0.272				
Knowledge score							
$< 11$	68/176	Ref.		Ref.		Ref.	
$\geq 11$	151/240	2.695(1.805,4.023)	$< 0.001$	2.730(1.823,4.089)	$< 0.001$	2.730(1.823,4.089)	$< 0.001$

college or having an undergraduate degree or higher (OR = 2.283, 95% CI: [1.173–4.442],  $P = 0.015$ ) and being unemployed or retired (OR = 2.015, 95% CI: [1.063–3.819],  $P = 0.032$ ) were independently associated with proactive practices. However, patients with a monthly per capita household income of 4,000–6,000 yuan (OR = 0.344, 95% CI: [0.171–0.694],  $P = 0.003$ ) demonstrated less active practices compared to those with an income of  $\leq 2,000$  yuan (Table 7).

**Table 7** Practice Dimension

Cut-off value: $\geq 71$ / $< 71$	No.	Univariate		Multivariate (Forward Method, $P < 0.1$ )		Multivariate (Forward Method, $P < 0.25$ )	
		OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P
Gender							
Male	52/109	Ref.					
Female	168/307	1.325(0.855,2.053)	0.208				
Age classification (years)							
$\leq 50$	84/151	Ref.					
51-60	74/140	0.894(0.564,1.419)	0.635				
$> 60$	62/125	0.785(0.488,1.263)	0.318				
Education							
Middle school and below	104/238	Ref.		Ref.		Ref.	
High School/Vocational High School	49/80	2.037(1.214,3.417)	0.007	1.695(0.909,3.160)	0.097	1.695(0.909,3.160)	0.097
Junior college/Undergraduate and above	67/98	2.785(1.694,4.577)	$< 0.001$	2.283(1.173,4.442)	0.015	2.283(1.173,4.442)	0.015
Marital status							
Married	188/370	Ref.					
Other	32/46	2.213(1.143,4.282)	0.018				
Residence							
Urban	179/333	Ref.					
Non-urban	41/83	0.840(0.519,1.359)	0.477				
Occupation							
Freelance	56/111	Ref.		Ref.		Ref.	
Farmer	49/124	0.642(0.382,1.077)	0.093	0.754(0.398,1.431)	0.388	0.754(0.398,1.431)	0.388
On leave/Retired	65/98	1.935(1.105,3.388)	0.021	2.015(1.063,3.819)	0.032	2.015(1.063,3.819)	0.032
Other	50/83	1.488(0.837,2.647)	0.176	1.530(0.785,2.983)	0.211	1.530(0.785,2.983)	0.211
Monthly per capita household income (yuan)							
$\leq 2000$	47/83	Ref.		Ref.		Ref.	
2000-4000	72/126	1.021(0.584,1.787)	0.941	1.080(0.568,2.053)	0.814	1.080(0.568,2.053)	0.814
4000-6000	38/97	0.493(0.272,0.895)	0.020	0.344(0.171,0.694)	0.003	0.344(0.171,0.694)	0.003
$\geq 6000$	63/110	1.027(0.577,1.825)	0.928	0.582(0.279,1.213)	0.149	0.582(0.279,1.213)	0.149
Payment method of medical expenses							
Partial reimbursement	216/402	Ref.					
Self-payment	4/14	0.344(0.106,1.116)	0.076				
Duration of RA							
$\leq 1$ years	53/90	Ref.					
1-5 years	61/118	0.747(0.429,1.300)	0.302				
5-10 years	46/93	0.683(0.381,1.226)	0.201				
$\geq 10$ years	60/115	0.762(0.436,1.329)	0.338				
Deformation of joints							
Yes	90/161	Ref.					
No	130/255	0.820(0.552,1.219)	0.328				
Joints pain							
No pain	51/93	Ref.					
Mild pain	112/231	0.775(0.478,1.256)	0.301				
Moderate/severe pain	57/92	1.341(0.746,2.411)	0.327				
Knowledge score							
$< 11$	78/176	Ref.					
$\geq 11$	142/240	1.821(1.229,2.698)	0.003				
Attitude score							
$< 33$	62/197	Ref.		Ref.		Ref.	
$\geq 33$	158/219	5.640(3.7,8.597)	$< 0.001$	5.596(3.569,8.774)	$< 0.001$	5.596(3.569,8.774)	$< 0.001$

Using residual connections, the SEM model was adjusted to achieve a better fit (CMIN/DF = 2.205, RMSEA = 0.037, GFI = 0.825, AGFI = 0.802) (Figures 3 and 4). The SEM results showed that knowledge directly influenced attitude ( $\beta = 0.438$ ), and attitude directly influenced practice ( $\beta = 0.647$ ). However, knowledge was also found to have a small negative direct effect on practice ( $\beta = -0.011$ ) (Table 8).

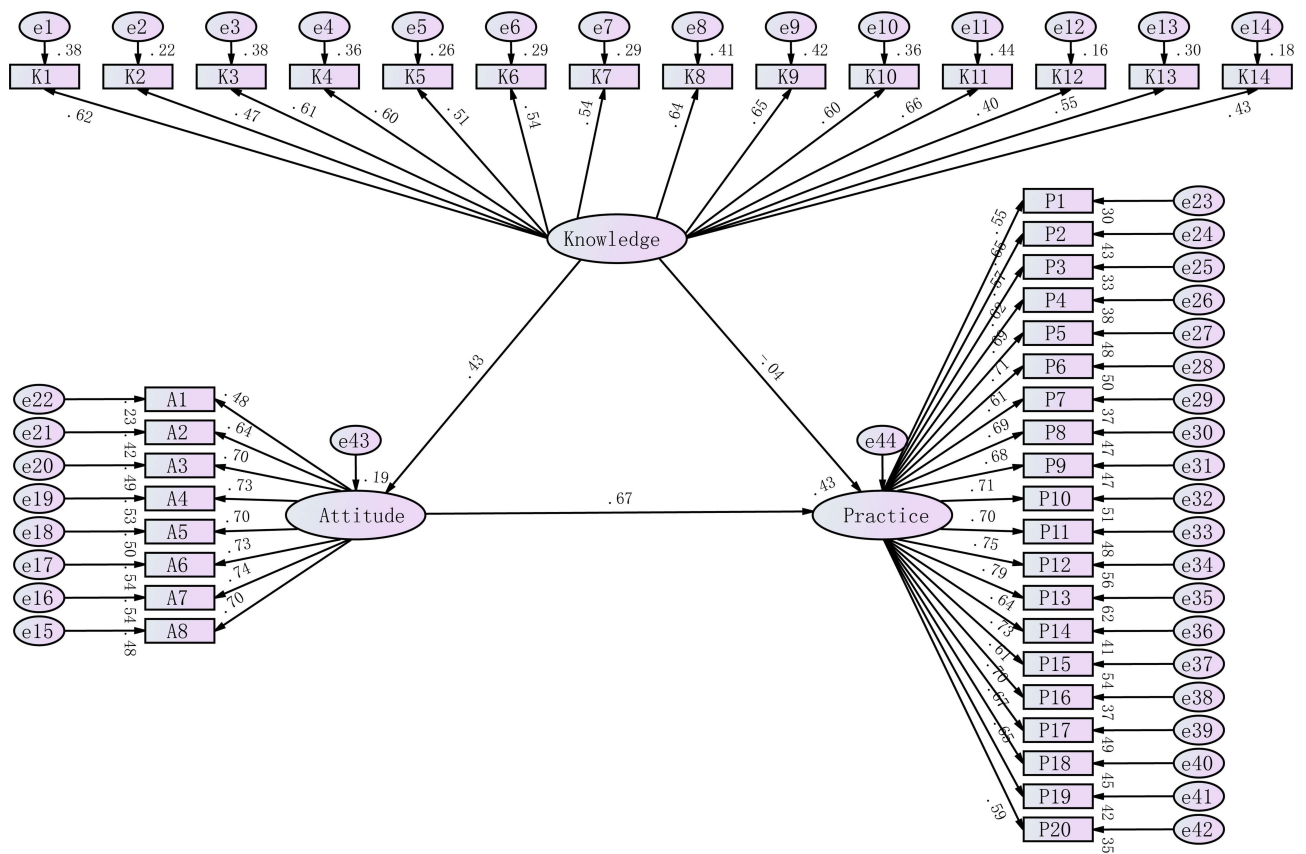


Figure 3 Initial modelling of structural equation models. CMIN/DF=2.852, RMSEA=0.044, GFI=0.766, AGFI=0.741.

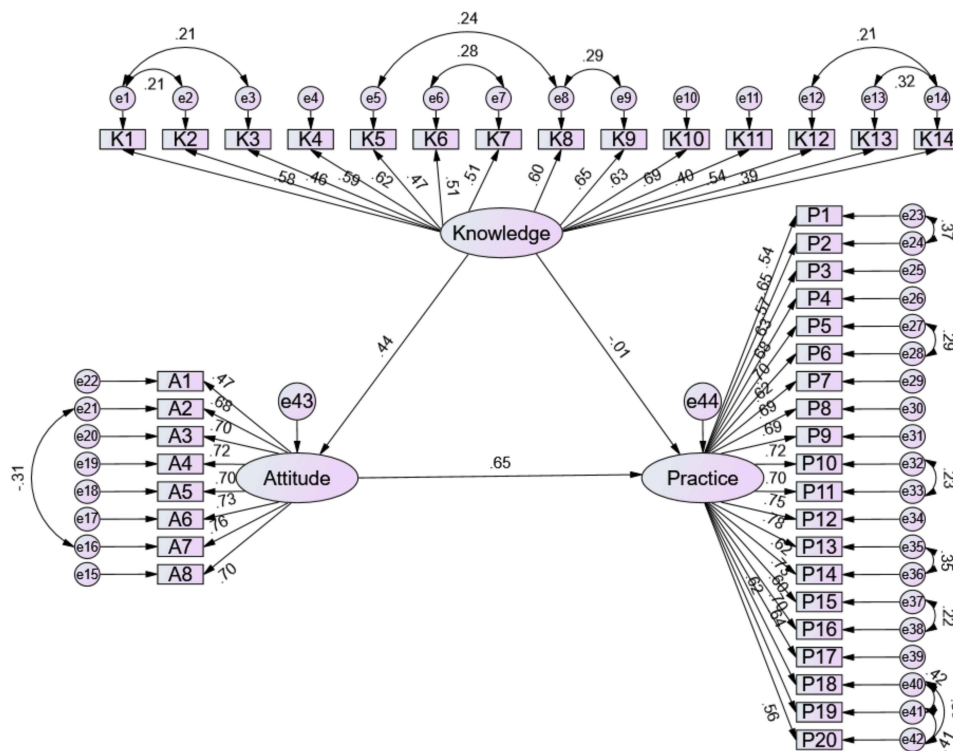


Figure 4 Adaptation modelling of structural equation models.

**Table 8** Path Correlation of Structural Equation Modelling

			Estimate
Attitude	<—	Knowledge	0.438
Practice	<—	Knowledge	-0.011
Practice	<—	Attitude	0.647
K1	<—	Knowledge	0.585
K2	<—	Knowledge	0.457
K3	<—	Knowledge	0.594
K4	<—	Knowledge	0.615
K5	<—	Knowledge	0.474
K6	<—	Knowledge	0.506
K7	<—	Knowledge	0.512
K8	<—	Knowledge	0.601
K9	<—	Knowledge	0.646
K10	<—	Knowledge	0.632
K11	<—	Knowledge	0.688
K12	<—	Knowledge	0.402
K13	<—	Knowledge	0.535
K14	<—	Knowledge	0.387
A8	<—	Attitude	0.695
A7	<—	Attitude	0.759
A6	<—	Attitude	0.726
A5	<—	Attitude	0.704
A4	<—	Attitude	0.719
A3	<—	Attitude	0.695
A2	<—	Attitude	0.678
A1	<—	Attitude	0.471
P1	<—	Practice	0.538
P2	<—	Practice	0.646
P3	<—	Practice	0.570
P4	<—	Practice	0.629
P5	<—	Practice	0.682
P6	<—	Practice	0.704
P7	<—	Practice	0.622
P8	<—	Practice	0.691
P9	<—	Practice	0.693
P10	<—	Practice	0.717
P11	<—	Practice	0.700
P12	<—	Practice	0.751
P13	<—	Practice	0.778
P14	<—	Practice	0.618
P15	<—	Practice	0.730
P16	<—	Practice	0.603
P17	<—	Practice	0.695
P18	<—	Practice	0.643
P19	<—	Practice	0.622
P20	<—	Practice	

## Discussion

Patients demonstrated sufficient knowledge, a positive attitude, and passive practices regarding RA recurrence prevention. In this study, “passive practice” refers to high adherence to directive behaviors prescribed by healthcare professionals (eg, taking medication, keeping warm), but low engagement in self-initiated behaviors such as acquiring disease

knowledge and peer communication. Improving clinical practice in preventing RA recurrence necessitates targeted educational initiatives, particularly for patients with lower education levels and shorter RA durations.

The findings indicate that patients with RA generally possess adequate knowledge and maintain a positive attitude but exhibit passive practices toward recurrence prevention. These results highlight the importance of patient education and awareness in RA management, consistent with RA-focused KAP research. For instance,<sup>22</sup> reported that RA patients had inadequate knowledge and relatively inactive practices toward dietary management despite generally positive attitudes. Similarly,<sup>23</sup> found that although RA patients showed moderate knowledge regarding bee venom acupuncture, their attitudes and practices remained suboptimal. The study establishes a significant association between education level and knowledge scores, a trend observed in various health contexts.<sup>24,25</sup> Furthermore, the positive correlation between longer RA duration and higher knowledge scores aligns with the concept that experience with a chronic condition enhances understanding of its management.<sup>26</sup> However, the results challenge the assumption that higher income correlates with better health-related practices, as they reveal a discrepancy requiring further investigation.<sup>27</sup> This may be explained by the fact that patients with incomes of 4000–6000 yuan often face heavy work and family pressures, limiting their time for proactive health practices, whereas those with  $\leq 2000$  yuan may include retirees or patients unable to work full-time, who have more time and motivation to engage in low-cost preventive behaviors. In addition, better economic status may create a perceived sense of invulnerability, reducing the urgency to engage in daily preventive practices, while middle-income groups may prioritize work and family responsibilities over health management.

Group comparisons based on demographic characteristics reveal variations in knowledge, attitude, and practice scores. Education is identified as a critical factor, with participants holding junior college or undergraduate degrees or higher achieving better knowledge scores. Occupation also emerges as a significant determinant, emphasizing the complex influence of socioeconomic factors on attitudes and practices. Notably, the association between self-payment for medical expenses and more negative attitudes supports the view that financial support through medical insurance fosters positive health behaviors.<sup>28</sup> These findings underscore the importance of tailoring interventions to patients' educational backgrounds and addressing financial barriers.

Statistical analyses, including multivariate analysis and SEM, provide deeper insights into the relationships between knowledge, attitude, and practice. The independent associations of higher education levels and longer RA duration with good knowledge emphasize the need for educational interventions targeting diverse patient groups. The SEM model reveals complex dynamics, showing that while knowledge positively influences attitude ( $\beta = 0.438$ ), it has a small negative direct effect on practice ( $\beta = -0.011$ ). These results challenge conventional models suggesting a linear progression from knowledge to attitude to behavior.<sup>29</sup> Future research should investigate mediating variables to explain the intricate interplay between knowledge, attitude, and practice. Such insights could guide the development of interventions that go beyond traditional education to effectively promote positive health behaviors.

The results of the knowledge dimension assessment indicate a strong understanding among participants of key aspects of RA, including its autoimmune nature, the importance of early diagnosis, and the benefits of a healthy diet and exercise. However, notable gaps remain, such as misconceptions about the age of onset, limited awareness of RA-related complications, and inadequate knowledge of the mechanisms underlying RA arthropathy and the role of disease-modifying antirheumatic drugs (DMARDs). Addressing these gaps in clinical practice requires targeted educational interventions to correct misconceptions, raise awareness about the diverse demographic groups affected by RA, and emphasize lifestyle factors that influence disease progression.<sup>30,31</sup> Additionally, comprehensive education on RA mechanisms and the optimal use of DMARDs is essential, aligning with previous research advocating for a treat-to-target approach and combination therapy in RA management.<sup>12</sup> Such tailored interventions can significantly improve patients' knowledge, enabling them to play an active role in managing RA and improving long-term outcomes.

The analysis of patient attitudes toward RA prevention and recurrence reveals a generally positive orientation, with a large proportion of patients exhibiting very positive attitudes and the majority expressing overall positivity across preventive measures. While these findings indicate a favorable mindset, it is important to recognize that attitudes alone do not consistently predict adherence to preventive behaviors. Other factors, including perceived barriers, self-efficacy, and social support, play significant roles in translating positive attitudes into action.<sup>32</sup> Therefore, clinical interventions to enhance preventive behaviors should go beyond fostering positive attitudes and address these additional factors. Patient education programs focusing on skill

development, fostering social support networks, and implementing personalized goal-setting strategies can improve the effectiveness of preventive measures by aligning with broader health behavior change theories.<sup>33,34</sup>

The results highlight variations in the frequency of related practices among patients, with some activities being highly engaged in while others are less frequently practiced. High adherence was observed in practices such as taking medication as prescribed, keeping warm, and consuming easily digestible foods. Conversely, low engagement was noted in activities such as distracting oneself from pain through activities like listening to music or watching TV, acquiring disease-related knowledge, and communicating with other patients about RA and its treatment. To address these deficiencies, clinical practice should focus on interventions that encourage patient engagement in educational and supportive activities. Previous studies have emphasized the importance of education and social support in chronic disease management, as these factors enhance treatment adherence and overall well-being.<sup>35</sup> Incorporating multimedia resources, support groups, and educational sessions into routine care can address gaps in pain distraction and disease knowledge. Additionally, collaborative care models that promote patient communication and shared experiences have demonstrated positive effects on treatment adherence and psychological well-being, highlighting the value of addressing these deficiencies through multifaceted interventions.<sup>36</sup> These findings suggest that clinical interventions should not stop at knowledge delivery. Targeted education is particularly important for patients with lower educational levels and those newly diagnosed, while behavior change techniques such as patient support groups and non-pharmacological pain management strategies may help transform positive attitudes into active self-management. At the policy level, expanding medical insurance coverage could reduce the negative attitudes of self-paying patients, and greater attention should be paid to the psychosocial needs of retirees and other specific groups to create a supportive environment for sustained health management.

Despite the valuable insights provided by this study, several limitations should be acknowledged. First, the reliance on self-reported data collected through questionnaires may introduce response bias, as participants may provide socially desirable answers or inaccurately report their knowledge, attitudes, and practices. To mitigate this bias, data were collected anonymously, and participants were informed that their responses would remain confidential, reducing social desirability pressures. Additionally, a pilot test was conducted to refine question clarity based on participant feedback, minimizing errors related to misinterpretation. First, this study relies on self-report data, which may introduce recall bias and social expectation bias, where participants may tend to report more positive attitudes and behaviors. To mitigate this bias, an anonymous survey was conducted in this study and participants were assured of the confidentiality of the data. Second, as this study was conducted using an online questionnaire distributed via the WeChat platform, there is a risk of selection bias. Patients who do not use smartphones, have lower digital literacy (particularly some elderly patients), or live in areas with poor internet access may have been excluded, which could affect the representativeness and generalizability of the findings. Future studies could consider combining online surveys with offline interviews to recruit a broader patient population. Another limitation is that the practice dimension relied on self-reported data, which may have led to overestimation of patients' actual behaviors. Future studies could incorporate more objective measures, such as verifying follow-up visits through medical records, assessing medication adherence using pharmacy data, or tracking physical activity with wearable devices, to validate self-reported practices. Third, the cross-sectional design of the study limits the ability to establish causation. Longitudinal studies are recommended to better understand the dynamics between knowledge, attitude, and practice over time. Despite these limitations, the study has notable strengths. The large sample size (416 participants) improves the generalizability of the findings to a broader population of RA patients. The use of multivariate analysis and structural equation modeling adds depth to the results, allowing for the exploration of complex relationships among variables. Moreover, the identification of associations between demographic factors and knowledge, attitude, and practice scores offers valuable insights for designing targeted interventions in clinical practice.

## Conclusion

Patients demonstrated sufficient knowledge, positive attitudes, and passive practices toward RA recurrence prevention. Enhancing RA recurrence prevention requires tailored educational programs for patients with lower education levels and shorter disease durations. Increased financial support is recommended, particularly for patients who self-pay for medical expenses. Targeted interventions should be developed for retirees or individuals on leave to encourage proactive practices. Closing the knowledge–practice gap through practical strategies is essential. A comprehensive approach is

critical to improving outcomes in RA recurrence prevention. These findings also suggest the need for integrating behavioral strategies, such as peer support and digital learning tools, into chronic care models to enhance patient engagement. Moreover, the unexpected inverse relationship between income and proactive behavior highlights the importance of further research into behavioral and systemic barriers, which may inform strategies not only for RA but also for other chronic conditions requiring self-management. In this study, higher and lower levels of KAP were defined using the median scores of each dimension as thresholds, and the term “passive practice’ specifically refers to patients’ greater adherence to passive compliance behaviors (eg, taking medication, keeping warm) but relatively lower engagement in proactive self-management behaviors (eg, acquiring disease knowledge, peer communication).

## Data Sharing Statement

The data presented in this study are available within the article.

## Ethics Approval and Consent to Participate

This study was conducted in accordance with the Declaration of Helsinki (2000) of the World Medical Association. Ethical approval was obtained from the Ethics Committee of the First Hospital of Sanming City (Ethics No.: (2023) 59), and written informed consent was obtained from all participants.

## Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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## Disclosure

The authors declare no competing interests in this work.

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