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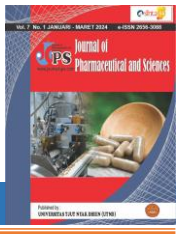

Implementation of Pharmacist Education to Improve Knowledge, Adherence, and Treatment Success in Hyperuricemia Patients in Community Pharmacy

Implementasi Edukasi Apoteker Untuk Meningkatkan Pengetahuan, Kepatuhan Dan Keberhasilan Terapi Pada Pasien Hiperurisemia Di Farmasi Komunitas

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Abstract
Hyperuricemia is a condition characterized by elevated uric acid levels that may lead to gout arthritis and metabolic complications. Therapeutic success is strongly influenced by patients' knowledge and adherence, highlighting the important role of pharmacist-led education in community pharmacy settings. This study aimed to evaluate the effect of pharmacist education on improving knowledge, medication adherence, and treatment success among hyperuricemia patients. A quasi-experimental pretest–posttest study with a control group was conducted involving 170 patients (85 intervention and 85 control) recruited through consecutive sampling. The intervention group received structured pharmacist education and counseling, while the control group received usual care. Outcomes were assessed at baseline and after a 14-day follow-up period. Patient knowledge was measured using a validated questionnaire, adherence was assessed using the MARS-5, and treatment success was evaluated through changes in pain intensity (VAS), serum uric acid levels, and treatment satisfaction using the TSQM-9.The Wilcoxon and Mann–Whitney U tests showed significant improvements in the intervention group compared to the control group. The intervention group demonstrated increased knowledge (Δ3.37), improved adherence (Δ3.67), greater reduction in uric acid levels (Δ1.25 mg/dL), more substantial pain reduction—particularly in disruptive pain (37% vs 13%)—and higher treatment satisfaction (95.29% vs 62.35%).In conclusion, a short-term pharmacist-led educational intervention with a 14-day follow-up effectively improves knowledge, adherence, and therapeutic outcomes in hyperuricemia patients in community pharmacies, supporting its feasibility for routine implementation.

***Keywords*: Pharmacist Education, Hyperuricemia, Knowledge, Adherence, Treatment Success.**

Abstrak
Hiperurisemia merupakan kondisi meningkatnya kadar asam urat yang berpotensi menyebabkan gout artritis dan berbagai komplikasi metabolik. Keberhasilan terapi sangat dipengaruhi oleh tingkat pengetahuan dan kepatuhan pasien terhadap pengobatan, sehingga edukasi dan konseling oleh apoteker di farmasi komunitas memegang peranan penting dalam meningkatkan pemahaman dan perilaku pasien. Penelitian ini bertujuan menganalisis pengaruh edukasi apoteker terhadap peningkatan pengetahuan, kepatuhan, dan keberhasilan terapi pasien hiperurisemia. Desain penelitian menggunakan quasi-experimental pretest–posttest with control group melibatkan 85 pasien kelompok intervensi dan 85 pasien kelompok kontrol yang dipilih melalui concecutive sampling. Intervensi berupa edukasi dan konseling terstruktur oleh apoteker. Pengukuran pengetahuan dilakukan menggunakan kuesioner tervalidasi, kepatuhan dinilai dengan MARS-5, keberhasilan terapi dinilai melalui tingkat nyeri menggunakan VAS, kadar asam urat, serta kepuasan terapi dengan TSQM-9. Hasil analisis Wilcoxon dan Mann–Whitney U menunjukkan perbedaan signifikan antara kelompok intervensi dan kontrol. Kelompok intervensi mengalami peningkatan pengetahuan (Δ3,37), peningkatan kepatuhan (Δ3,67), penurunan kadar asam urat (Δ1,25), penurunan nyeri lebih besar terutama pada kategori nyeri mengganggu (37% vs 13%), serta tingkat kepuasan terapi pada kelompok intervensi 95,29% menyatakan puas sedangkan kelompok kontrol hanya mencapai 62,35% menyatakan puas. Penelitian ini menyimpulkan bahwa edukasi apoteker secara efektif meningkatkan pengetahuan, kepatuhan, dan keberhasilan terapi pada pasien hiperurisemia di farmasi komunitas.

Kata Kunci: Edukasi Apoteker, Hiperurisemia, Pengetahuan, Kepatuhan, Keberhasilan Terapi.

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Introduction

A rise in serum uric acid levels over the normal threshold is known as hyperuricemia. Although normal uric acid levels vary by age and sex, they typically fall between 2.6 and 6.0 mg/dL for women and between 3.5 and 7.2 mg/dL for adult males [1]. A serious and pervasive metabolic health issue worldwide is hyperuricemia. In addition to being a significant etiological precursor to gout arthritis, this condition is also becoming more well acknowledged as a risk factor in and of itself for metabolic syndrome, cardiovascular morbidity, and the onset of urate nephropathy [2]. The need for more efficient management techniques to lessen the disease burden caused by hyperuricemia is highlighted by its rising prevalence in a variety of groups. According to the World Health Organisation (WHO), 11.9% of medical professionals' diagnoses in 2019 were for hyperuricemia, or gout (Ministry of Health of the Republic of Indonesia, 2019). According to a physician's diagnosis, the prevalence of hyperuricemia rises with age [3]

Long-term treatment with uric acid-lowering medications, like allopurinol, is typically necessary to address hyperuricemia [4]. However, the patient's degree of understanding, adherence to treatment, and lifestyle modifications all play a role in the outcome of therapy [5]. One of the biggest challenges in preventing gout recurrence and the emergence of chronic complications is low patient adherence to urate-lowering regimens, which is frequently caused by a lack of knowledge about the pathophysiology of the condition, the significance of ongoing therapy, and the management of medication side effects [6]. In order to attain the intended therapeutic results and lower medication errors, Fitriana et al.'s research from 2022 addresses drug information services customised to patients' pain circumstances. The education and control groups differed significantly ($p = 0.0044$) when the therapy results were analysed based on the attainment of a drop in VAS (Visual Analogue Scale) ratings before and after education. This indicates that drug information services have an impact on patient satisfaction and treatment results [7].

Community pharmacies, like drugstores, are the most accessible healthcare facilities for the general people, which makes them crucial in the context of primary healthcare services. Community chemists are highly accessible and strategic. Pharmacists are now clinical professionals who are directly in charge of maximising patient treatment results, in line with the principles of pharmaceutical care [8]. Personalised behavioural interventions to ensure consistent medication use and long-term dietary compliance; structured clinical education about the need to titrate uric acid medication doses and the use of early gout flare prophylaxis; and medication review to identify and resolve drug-related problems (DRPs) such as interactions and inappropriate dosages are among the clinical roles of chemists in the management of hyperuricemia [9].

Although pharmacist-led interventions have demonstrated positive effects on clinical outcomes and medication adherence in various chronic diseases, evidence in hyperuricemia management remains fragmented. Previous studies have predominantly focused on single outcomes, such as knowledge improvement or clinical parameters alone, without simultaneously evaluating patient-reported outcomes, including treatment satisfaction. Moreover, limited research has integrated behavioral outcomes (adherence), subjective clinical outcomes (pain intensity), and objective biomarkers (serum uric acid levels) within a single interventional framework, particularly in community pharmacy settings [10,11]. In the Indonesian context, evidence regarding the effectiveness of structured pharmacist education in hyperuricemia patients is still scarce, especially studies that comprehensively assess knowledge, adherence, clinical outcomes, and treatment satisfaction concurrently. Therefore, this study aims to address these gaps by implementing a pharmacist-led educational intervention in community pharmacies and evaluating its impact using a combined assessment of patient knowledge, medication adherence (MARS-5), pain intensity (VAS), serum uric acid levels, and

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treatment satisfaction (TSQM-9). This comprehensive approach is expected to provide more robust evidence on the clinical and practical value of pharmacist education in optimizing hyperuricemia management.

Experimental Section

With a pre-test, post-test, and non-equivalent control group design method, this study uses a quasi-experimental design. The study was carried out in pharmacies in the Deli Serdang Regency, North Sumatra's Percut Sei Tuan sub-district. The chemist's education, which included the drug information services offered in the module, was the intervention given to the sample. We collected pre-test and post-test data using a knowledge questionnaire, a therapy satisfaction questionnaire using the TSQM-9, and a therapy adherence questionnaire using the MARS-5. VAS values and the reduction in uric acid levels were also used to evaluate the effectiveness of therapy [12].

This study was conducted in two community pharmacies located in Percut Sei Tuan District, Deli Serdang Regency, North Sumatra, Indonesia. Terang Farma Pharmacy was designated as the intervention site, while AMS Pharmacy served as the control site. The study was carried out from July to October 2025, encompassing participant recruitment, data collection, and data analysis.

Populations and Sample

Data were collected using three types of instruments: a self-developed knowledge questionnaire, the Medication Adherence Report Scale (MARS-5), and the Treatment Satisfaction Questionnaire for Medication (TSQM-9). The knowledge questionnaire consisted of 20 dichotomous items (correct = 1, incorrect/unsure = 0), covering six domains: definition, lifestyle factors, symptoms, pharmacological therapy, complications, and medication adherence.

Content validity of the knowledge questionnaire was assessed by an expert panel consisting of two pharmacists, one physician, and one academic researcher. Item validity testing was conducted on 30 respondents outside the study sample using the product–moment correlation method. All items demonstrated acceptable validity, with corrected item–total correlation coefficients (r count) ranging from 0.41 to 0.78, exceeding the r table value of 0.361 ($p < 0.05$).

Reliability analysis showed good internal consistency, with a KR-20 coefficient of 0.82, indicating high reliability. The MARS-5 and TSQM-9 instruments used in this study had been previously validated, with reported Cronbach's Alpha values exceeding 0.70.

Research Instruments and Validation

Three different kinds of questionnaire instruments—knowledge, therapy adherence, and therapy satisfaction that had been created or revalidated were used to collect data. Twenty questions made up the self-developed knowledge test, with a score of 1 for right answers and 0 for wrong or unsure. The validated MARS-5 instrument was used to measure therapy adherence, and the Treatment Satisfaction Questionnaire for Medication (TSQM-9) was used to measure therapy satisfaction. Additionally, the tool has objective indicators of therapy performance, such as Visual Analogue Scale (VAS) scores and serum uric acid levels. An expert panel of two practicing chemists, a doctor, and an academic verified the knowledge questionnaire prior to its usage. The product moment correlation approach (IBM SPSS 26) was used to test the validity of the instrument on 30 non-sample respondents. If the significant probability value is less than 0.05, the instrument is deemed valid. KR 20 (for dichotomous data) with a range from below 0.5 to above 0.9 and Cronbach's Alpha (minimum $\alpha = 0.60$) were used for reliability assessment [13].

Data Collection and Intervention Procedures

After receiving approval from the Research Ethics Commission, the research process starts. Informed permission was granted to patients who satisfied the requirements (pain complaints, a history of uric acid prescriptions, and uric acid screening results). As a pre-test to determine baseline homogeneity, both groups (Control and Intervention) filled out knowledge and adherence questionnaires. A chemist provided the Intervention Group with organised instruction on both pharmaceutical and non-pharmacological treatments, as well as Drug Information Services (DIS) and pamphlets. Only normal methods were used to treat the control group. Following a 14-day period, both groups came back to complete knowledge, adherence, and satisfaction questionnaires (post-test), as well as tests of uric acid levels and VAS scores [14,15].

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Uric acid levels were measured using a portable uric acid analyzer (EasyTouch® GCU Multi-Function Monitoring System, Bioptik Technology Inc., Taiwan) based on the electrochemical biosensor method. Capillary blood samples were obtained via finger-prick following standard operating procedures, and measurements were performed according to the manufacturer's instructions.

Data Analysis

Data analysis was performed using SPSS Statistics 26.0 software. The analysis stages were normality test, Wilcoxon test, Mann-Whitney test, and standardized effect size test, which aimed to describe the characteristics of the research objects thru sample data and compare the intervention group (pretest-posttest) and the control group (pretest-posttest).

Results and Discussion

Characteristics of Respondent Identity

The characteristics of the respondents in this study include gender, age, education level, and comorbid conditions. The number of respondents in each group is 85 people, for both the intervention and control groups. The analysis of these characteristics aims to ensure the equality of initial conditions between groups before educational interventions are carried out by pharmacists. The characteristics of the respondents can be seen in Table 1.

Table 1. Characteristics of Respondent Identity

Characteristic	Participants (%)		Asymp. Sig. (p > 0,05)
Sex	**Intervetion**	**Control**	
Male	38 (44.7%)	37 (43.5%)	0.877
Femele	47 (55.3%)	48 (56.5%)	
Age (years)			
30 – 44	20 (23.5%)	24 (28.2%)	0.503
45 – 64	50 (58.8%)	51 (60%)	
> 65	15 (14.6%)	10 (11.8%)	
Education Level			
Elementary – Senior High School	64 (75.3%)	51 (60%)	0.541
Diploma (D3)	7 (8.2%)	6 (7.1%)	
Bachelor's Degree (S1)	14 (16.5%)	28 (32.9%)	
Comorbidity Status			
With comorbidities	39 (45.9%)	33 (38.8%)	0.352
Without comorbidities	46 (54.1%)	52 (61.2%)	

Prior to the implementation of the educational intervention, the two groups (Intervention and Control) had comparatively balanced homogeneity, according to the study of the respondents' fundamental features. Gender: In both groups, women made up the majority of responders (Intervention Group: 55.3% vs. Control Group: 56.5%). Males made up 43.5% of the control group and 44.7% of the intervention group. There was no discernible gender difference, according to the Pearson test (p=0.877). For outcomes to be compared objectively, this equality is crucial [16]. Age category: The majority of respondents (58.8% in the intervention group and 60% in the control group) were between the ages of 45 and 64. An elevated risk of hyperuricemia is linked to this age range. The age distribution did not differ significantly, according to the Pearson test (p=0.503). With 75.3% of respondents in the intervention group and 60% in the control group, the bulk of respondents have lower secondary education backgrounds (elementary to high school) [17].

The importance of the chemist's responsibility as an educator is demonstrated by this lower secondary school background. The percentage of higher education varied slightly (Bachelor's: Intervention 16.5%; Control 32.9%), but the Pearson test revealed no statistically significant variation (P=0.541) [18]. Nearly half of all respondents reported underlying diseases (comorbidities) such as heart disease, diabetes mellitus, dyslipidaemia, or hypertension, according to data gathered on comorbidities and clinical consequences. Comorbid responders made up 38.8% of the control group and 45.9% of the therapeutic group. Based on the existence of comorbidities, the Pearson test revealed no discernible difference between the two groups (p=0.352). Comorbidities have a substantial impact on treatment results. people with comorbidities typically

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react to reducing their uric acid levels more slowly or less effectively than people without comorbidities. This is caused by the impact of comorbid conditions (such as reduced kidney function in hypertension) on the excretion of uric acid as well as the possibility that concomitant drugs (such as diuretics) may raise uric acid levels. As a result, the study comes to the conclusion that multidisciplinary cooperation and pharmacist-reviewed pharmaceutical therapy are two more tactics that are necessary for educational interventions for patients with comorbidities [19].

Implementation of Pharmacist Education on Hyperuricemia Patient Knowledge in the Intervention and Control Groups

Explanations of the process of uric acid generation, foods to avoid, the significance of medication adherence, and the management of a healthy lifestyle are all included in the education. The researcher developed a questionnaire with 20 questions in six domains two for definition, six for lifestyle, four for symptoms, three for therapy, two for complications, and three for medication adherence to gauge patient understanding. Scores range from 0 at the lowest to 20 at the highest. According to the research findings, the intervention group's knowledge improved significantly, particularly in the areas of medicine use, definition of hyperuricemia, causative variables, and forbidden foods. For instance, awareness of the function of the medication allopurinol grew from 84.7% to 98.8%, and understanding of normal uric acid levels increased from 43.5% to 98.8%. On the other hand, the control group's proportion of right responses did not significantly improve and just slightly changed. These findings suggest that direct pharmacy education is crucial in helping patients better understand hyperuricemia, particularly with regard to its causes, management, and therapy [20].

As indicated in Table 2, the analysis was carried out using a number of statistical testing phases, including the Mann-Whitney U test, the Wilcoxon signed-rank test, and the standard effect test.

Table 2. Results of the Wilcoxon test, Mann-Whitney U test, and effect test on patient knowledge.

Description	Patient Knowledge (Intervetion)		Patient Knowledge (Control)	
	Pretest	*Posttest*	*Pretest*	*Posttest*
Mean ± SEM	12.82 ± 0.27	16.19 ± 0.23	13.12 ± 0.27	13.13 ± 0.26
Δ Mean ± SEM	3.37 ± 0.04		0.01 ± 0.01	
Wilcoxon Signed Rank Test (p – value)	< 0.001		0.980	
Mann–Whitney U Test (p-value)	< 0.001			
Effect Size (Standardized)	0.59			

According to Table 2, the study's findings demonstrate that patients with hyperuricemia gained a substantial amount of knowledge from the chemists' instruction. The control group's mean knowledge score only slightly changed from 13.12±0.27 to 13.13±0.26 (Δ mean 0.01±0.01), whereas the intervention group's climbed from 12.82±0.27 to 16.19±0.23 with a Δ mean of 3.37±0.04. Only patients who received education demonstrated an improvement in their knowledge, as evidenced by the Wilcoxon test, which revealed a significant difference between pretest and posttest scores in the intervention group ($p < 0.001$) but not in the control group ($p = 0.980$). These results were corroborated by the Mann-Whitney U test, which showed a significant difference in the two groups' post-intervention knowledge levels (p-value < 0.001) [21]. Furthermore, a significant intervention impact is shown both practically and clinically by the rank-biserial correlation value of 0.59. Overall, these findings support the notion that chemist education is crucial for enhancing patient health literacy, especially with regard to knowledge of diseases, prescription use, side effects, and the lifestyle modifications required to regulate uric acid levels. This result is in line with earlier studies showing that pharmacist-led educational initiatives can raise patients' awareness of chronic illnesses [22].

The categories of patient knowledge in the intervention and control groups can be seen in Table 3 below.

Table 3. Patient Knowledge Categories in the Intervention and Control Groups

Description	Patient Knowledge (Intervetion)		Patient Knowledge (Control)	
	Pretest	*Posttest*	*Pretest*	*Posttest*
Poor	28 (33%)	3 (4%)	33 (39%)	30 (35%)
Fair	44 (52%)	23 (27%)	34 (40%)	41 (48%)
Good	13 (15%)	59 (69%)	18 (21%)	14 (16%)

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Following the chemist's educational interventions, patients' knowledge levels significantly increased, as shown by the results in Table 4.4. Patients with strong knowledge rose substantially from 15% to 69% in the intervention group, whereas the percentage of patients with weak knowledge fell sharply from 33% to just 4%. This suggests that patients' perceptions of hyperuricemia, treatment, and the significance of lifestyle control were successfully altered by the chemist's instruction. On the other hand, there were not many changes in the control group. While the good category actually saw a decline from 21% to 16%, the percentage of patients with poor knowledge only dropped from 39% to 35%.

Implementation of Pharmacist Education on Hyperuricemia Patient Adherence in the Intervention and Control Groups

One of the primary determinants of therapy success is patient adherence, particularly in chronic conditions like hyperuricemia that call for long-term care. A set of statements characterising behaviour in adhering to therapy, such as consistency in following treatment instructions, regularity in taking medication, and refraining from altering the dose without advice, are used to measure patient adherence. These are the findings from the respondents' responses about patient compliance with hyperuricemia. Following the chemist's instructional intervention, the patient's compliance behaviour has changed. Patients who never forgot to take their medication rose from 25.9% to 43.5% in the intervention group, while those who always forgot fell from 4.7% to 0%. Similarly, after receiving education, the frequency of other undesirable behaviours, like altering their own dosage and quitting medication, significantly decreased [23]. As indicated in Table 4, the analysis was carried out using a number of statistical tests, including the standard effect test, the Mann-Whitney U test, and the Wilcoxon signed-rank test**.**

Table 4. Results of the Wilcoxon test, Mann-Whitney U test, and effect test on patient adherence.

Keterangan	Pengetahuan Pasien (Intervensi)		Pengetahuan pasien (Kontrol)	
	Pretest	***Posttest***	***Pretest***	***Posttest***
Mean ± SEM	17.53 ± 0.48	21.20 ± 0.41	17.47 ± 0.51	17.14 ± 0.40
Δ Mean ± SEM	3.67 ± 0.07		0.33 ± 0.11	
Wilcoxon Signed Rank Test (p – value)	< 0.001		0.499	
Mann–Whitney U Test (p-value)	< 0.001			
Effect Size (Standardized)	0.50			

The study's findings show that chemists' educational interventions greatly increase hyperuricemia patients' adherence. With a Δ mean of 3.67 ± 0.07, the mean adherence score in the intervention group rose from 17.53 ± 0.48 to 21.20 ± 0.41. The control group, on the other hand, saw a minor decline from 17.47 ± 0.51 to 17.14 ± 0.40 (Δ mean –0.33 ± 0.11). This variation in change patterns demonstrates how pharmacist education directly affects patients' adherence to treatment. According to the Wilcoxon test, adherence significantly increased in the intervention group ($p < 0.001$), but not in the control group ($p = 0.499$). This finding suggests that adherence is only improved when chemists deliver information in a focused way. Patients who get education are better able to comprehend the significance of adhering to the treatment plan, dose guidelines, when to take medications, and the possible health risks associated with skipping therapy. It has been demonstrated that chemist education increases patients' knowledge and motivation to regularly follow their treatment plans. Patients who received education had significantly greater levels of adherence, according to a between-group analysis using the Mann-Whitney U test, which also revealed a significant difference between the intervention and control groups ($p < 0.001$). This finding is consistent with studies by Ahmad et al. (2021), which demonstrated that pharmacist-led educational interventions can improve adherence in patients with chronic illnesses by as much as 30% when compared to those who do not get intervention. In addition to being statistically significant, the educational effect's strength was demonstrated to be substantial with a rank-biserial correlation value of 0.50, which Cohen classifies as a strong effect.

This figure shows that the instruction given by chemists was able to considerably alter patient behaviour in addition to increasing knowledge. Patients who were educated demonstrated greater self-discipline in taking their prescriptions, paying attention to their dosages, and leading the suggested healthy lifestyle. Increased compliance lowers the risk of symptom recurrence and elevated uric acid levels by improving the efficacy of hyperuricemia therapy. Overall, the study's findings support the notion that chemist education plays a significant role in enhancing treatment adherence for hyperuricemia and reinforcing the link between improved therapeutic behaviour modification and enhanced knowledge [24,25].

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Implementation of Pharmacist Education on the Success of Hyperuricemia Therapy in the Intervention and Control Groups

The Visual Analogue Scale (VAS) was used to measure changes in clinical outcomes and pain levels in order to assess the effectiveness of the therapy in this study. The patient's pharmacological and non-pharmacological treatments, including as medication adherence and lifestyle modifications, have been successful, as seen by the drop in uric acid levels. To find out how much pharmacist education affected patients' clinical improvement, the mean uric acid levels at the pretest and posttest were compared between the intervention and control groups.

Table 5. Results of AU Levels in the Intervention Group, Control Group, and Comorbidities

Variable	Pretest (Mean ± SEM)	Pretest (Mean ± SEM)	*ΔX*
Uric Acid Level Group			
Intervensi	8.15 ± 0.13	6.90 ± 0.12	Δ 1.25
Control	7.77 ± 0.11	7.26 ± 0.12	Δ 0.51
Uric Acid Level by Comorbidity Status			
Comorbid	8.59 ± 0.16	7.56 ± 0.14	Δ 1.03
Non – Comorbid	7.80 ± 0.17	6.36 ± 0.12	Δ 1.44

In the intervention group, uric acid levels significantly decreased, falling from 8.15 ± 0.13 mg/dL before the test to 6.90 ± 0.12 mg/dL after the test (Mean ± SEM). On the other hand, uric acid levels in the control group hardly decreased, going from 7.77 ± 0.11 mg/dL to 7.26 ± 0.12 mg/dL. those with comorbidities experienced a drop in uric acid levels from 8.59 ± 0.16 mg/dL to 7.56 ± 0.14 mg/dL, while those without comorbidities experienced a higher decrease, from 7.80 ± 0.17 mg/dL to 6.36 ± 0.12 mg/dL. According to these findings, patients who did not have comorbidities reacted to treatment more favourably than those who did. The study's clinical findings support the significance of the chemist's role in carrying out thorough therapy monitoring, which includes assessing medication use that may raise uric acid levels in addition to patient education.

Visual Analog Scale (VAS) Results

The success of the therapy in this study can also be seen by measuring pain intensity using the Visual Analog Scale (VAS), as shown in Table 6.

Table 6. Visual Analog Scale (VAS) Results for the Intervention and Control Groups

Variable	Intervention VAS		*Chi- Square*	Control VAS		*Chi- Square*
	Pretest	*Posttest*		*Pretest*	*Posttest*	
No Pain	0%	33%	< 0.001	0%	32%	< 0.001
Mild Pain	33%	55%		44%	39%	
Moderate pain	49%	12%		38%	25%	
Severe Pain	14%	0%		15%	5%	
Very severe pain	4%	0%		4%	0%	
Worst possible pain	0%	0%		0%	0%	

The results of the study show that pharmacist-led educational initiatives significantly lower pain levels in hyperuricemia patients. Prior to education, the majority of patients in the intervention group fell into the mild pain category (33%) and the bothersome pain category (49%), with only a tiny percentage falling into the upsetting pain category (14%), and the severe pain category (4%). The percentage of patients who did not experience pain increased to 33% and the percentage of patients in the light pain category increased to 55% following the provision of education, indicating a significant clinical improvement. Furthermore, every patient who had previously been classified as having disturbing or severe pain was able to move to a category with less severe pain. The chi-square test, which revealed a significant difference between the pretest and posttest in the intervention group ($p < 0.001$), supports this finding and demonstrates that pharmacist education directly lowers the intensity of pain. Although it was not as significant as in the intervention group, pain did improve in the control group as well. While the percentage of patients with disruptive pain stayed quite high (25%), the percentage of patients with mild pain actually fell slightly (44% → 39%). Compared to the intervention group, only 32% of patients were able to reach the pain-free category. Even while the control

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group's chi-square test also revealed a significant difference ($p < 0.001$), this change was probably more impacted by the therapeutic benefits and clinical advancement than by increased health literacy. Patients' capacity to control their pain, follow treatment plans, and embrace healing behaviours is hampered in the absence of proper education [24,25].

Satisfaction with Hyperuricemia Therapy

Based on the TSQM-9 instrument, the research results show a very distinct difference in satisfaction ratings between the intervention and control groups. Overall, patients in the intervention group expressed much better levels of satisfaction in every category, including overall contentment, comfort, medication ease of use, and treatment efficacy [23]. In the efficacy category, a considerably greater percentage of respondents in the intervention group than in the control group reported feeling satisfied or extremely satisfied. While none of the patients in the control group expressed great satisfaction with the medicine, those who got pharmacist instruction assessed it as better capable of controlling their illness, reducing symptoms, and working within a reasonable timescale [26] . The ease domain is another area where the disparities are really noticeable. In terms of dosage form, scheduling medication times, and convenience in taking the drug as prescribed, the intervention group reported far greater ease of medication use. It has been demonstrated that chemist education improves patients' perceptions of ease and comfort throughout therapy by teaching them how to take their prescriptions correctly. The control group, on the other hand, expressed less happiness and none of them thought it was particularly convenient or easy [27]. The biggest disparities are found in the area of overall satisfaction. Nearly every patient in the intervention group was certain that taking the drug was the appropriate choice and that its advantages exceeded its drawbacks. Furthermore, compared to the control group, a larger percentage of patients in the intervention group reported feeling extremely satisfied. This result demonstrates that positive opinions of the therapy being used are much enhanced by chemist education. With 95.29% of patients in the intervention group reporting satisfaction with the therapy, compared to just 62.35% in the control group, the study's findings demonstrate a considerable difference in therapy satisfaction levels. This difference is statistically significant, according to the chi-square test findings, which reveal a p-value of less than 0.001. In order to improve the perceived advantages and efficacy of the treatment being received, chemist education helps patients feel more confident in the outcome of therapy, define treatment goals, and fortify the therapeutic alliance. Overall, these results demonstrate that chemist education directly raises patient happiness with hyperuricemia therapy in addition to improving knowledge, adherence, and clinical outcomes. Increased satisfaction is a result of better patient experiences during treatment, good communication, and efficient pharmaceutical services [28,29].

Mechanisms underlying improved adherence and outcomes

The observed improvements in knowledge and medication adherence in the intervention group likely reflect more than the transfer of factual information. Structured pharmacist education may have acted as a behavioral catalyst by increasing patients' understanding of hyperuricemia as a chronic condition requiring continuous management, thereby reducing misconceptions that treatment is only needed during acute pain episodes. In addition, the intervention may have strengthened patients' self-management capacity by clarifying dosing schedules, expected time to benefit, and how to handle potential adverse effects, which can reduce unplanned discontinuation and self-directed dose changes. These behavioral mechanisms plausibly contributed to downstream clinical benefits, including greater reductions in pain intensity and serum uric acid levels [30].

Linking adherence improvement to the Health Belief Model

The adherence improvement can be interpreted through the Health Belief Model (HBM) framework. Pharmacist-led education may have increased *perceived susceptibility* and *perceived severity* by explaining the risks of uncontrolled hyperuricemia (e.g., gout flare recurrence and complications). At the same time, counseling likely enhanced *perceived benefits* of consistent therapy (symptom control and uric acid reduction) while reducing *perceived barriers* such as fear of adverse effects, uncertainty about long-term medication use, and confusion about lifestyle recommendations. The educational leaflet and counseling session served as *cues to action*, reminding patients to take medication regularly and adopt diet/lifestyle changes. Finally, repeated clarification and personalized counseling may have improved *self-efficacy*—patients' confidence that they can adhere to medication schedules and implement behavioral modifications—thereby sustaining adherence beyond immediate symptom relief [5,31].

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Why treatment satisfaction increased beyond symptom improvement

The significant increase in treatment satisfaction (TSQM-9) in the intervention group may not be attributable solely to symptom improvement. A plausible explanation is the formation of a stronger therapeutic relationship through pharmacist–patient interaction during education and counseling. Patients who receive structured counseling may perceive higher service quality, greater empathy, and better responsiveness to concerns, which can positively shape their overall evaluation of therapy [32]. Clear explanations about treatment goals, expected outcomes, and side effect management can also improve patients' sense of control and reassurance, thereby increasing satisfaction even before maximal clinical benefit is achieved. This is important because satisfaction is not only an outcome but also a potential mediator of adherence: patients who feel supported and informed are more likely to trust the therapy plan and persist with long-term medication use.

Integrating patient-reported and objective outcomes

Taken together, the simultaneous improvement in knowledge, adherence (MARS-5), pain (VAS), serum uric acid levels, and treatment satisfaction (TSQM-9) suggests a coherent pathway: education improves cognitive understanding and perceived value of treatment, which supports adherence behaviors; improved adherence and lifestyle compliance then contribute to better clinical control and reduced pain; and the combination of improved outcomes and enhanced therapeutic alliance increases satisfaction. This integrated interpretation reinforces the role of community pharmacists not only as medication dispensers but as behavioral and educational partners in chronic disease management. This study has several limitations that should be considered when interpreting the findings. First, due to the nature of the educational intervention, blinding of participants and pharmacists delivering the intervention was not feasible. Participants were aware of receiving pharmacist-led education, and pharmacists were actively involved in providing counseling, which may have introduced performance bias.

To minimize potential bias, outcome assessments were conducted using standardized and validated instruments. However, blinding of outcome assessors was not fully implemented and therefore cannot be excluded as a potential source of bias. Future studies are encouraged to apply assessor blinding and longer follow-up periods to strengthen causal inference and evaluate the sustainability of behavioral and clinical outcomes.

Conclusions

This study proves that pharmacist education significantly improves knowledge, adherence, and therapeutic success in hyperuricemia patients in community pharmacies. Patients who received education showed improved understanding of the disease and treatment, better adherence to therapy, more optimal reduction in uric acid levels and pain intensity, and significantly higher levels of treatment satisfaction compared to the control group. Thus, pharmacist education is an effective intervention that plays an important role in optimizing the management of hyperuricemia.

Conflict of Interest

The authors declare that there are no conflicts of interest associated with this study. The authors have no financial, personal, or professional relationships that could have influenced the design of the study, data collection, data analysis, interpretation of the results, or the writing of this manuscript.

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