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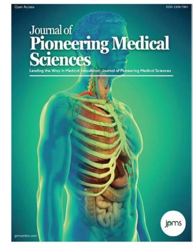


Exploring Knowledge, Attitudes and Practices About the Role of Artificial Intelligence in Analgesic Prescribing in Saudi Arabia

Safaa M. Alsanosi[1], Khalid Basamih[2], Randa Aljohani[3], Lama Alrashidi[4], Lama Aljohani[5], Donia Alghamdi[6], Assal Hobani[7], Mohanad Hobani[8], Yosra Al-Hindi[9], Mohammed Shaikhomer[10], Asim M. Alshanberi[11] and Maram H. Alshareef[12]

[1,9]Department of Pharmacology and Toxicology, Faculty of Medicine, Umm Al-Qura University, Makkah, Saudi Arabia
[2,6]Faculty of Medicine, Umm Al-Qura University, Makkah, Saudi Arabia
[3]College of Medicine, Al Rayan National Colleges, Madinah, Saudi Arabia
[4]Faculty of Medicine, Prince Sattam bin Abdulaziz University, Riyadh, Saudi Arabia
[5]Faculty of Medicine, King Abdulaziz University, Jeddah, Saudi Arabia
[7]Faculty of Medicine, Ibn Sina National College for Medical Studies, Jeddah, Saudi Arabia
[8]College of Pharmacy, Jazan University, Jazan, Saudi Arabia
[10]Department of Internal Medicine, Faculty of Medicine, King Abdulaziz University, Jeddah, Saudi Arabia
[11]General Medicine Practice Program, Batterjee Medical College, Jeddah, Saudi Arabia
[12]Department of Community Medicine and Pilgrims Health Care, Faculty of Medicine, Umm Al-Qura University, Makkah, Saudi Arabia

Author Designation: [1,9-12]Associate Professor, [2,3,4,5,6,7]Medical Intern, [8]Pharmacy Student

*Corresponding author: Safaa M. Alsanosi (e-mail: smsanosi@uqu.edu.sa).

Abstract **Introduction:** The widespread use of analgesics has raised global concerns regarding inappropriate consumption and associated adverse effects. Artificial Intelligence (AI) offers the potential to enhance safety, improve adherence and provide personalised medication guidance. This study aimed to evaluate the Knowledge, Attitudes and Practices (KAP) of Saudi adults concerning the role of AI in analgesic prescribing. **Method:** A cross-sectional survey was conducted among Saudi adults over six months, from February to July 2025. Composite KAP scores were generated. Data were analysed using descriptive statistics, chi-square tests, ANOVA and Pearson correlation coefficients, with statistical significance set at $p<0.05$. **Results:** A total of 665 valid responses were analysed (response rate: 99%), with females representing 53.7% of participants and young adults (18-29 years) comprising 50.5%. Less than half (47.8%) were aware of analgesic side effects, while 44-47% expressed openness to AI-supported pain management. Approximately 79% perceived AI alerts for reducing or discontinuing analgesics as beneficial and 77% favoured AI-based adherence systems. Notably, 44.1% trusted AI more than physicians for detecting side effects. Paracetamol was the most frequently used analgesic (57.0%), predominantly for headaches (45.6%). Significant associations were observed between KAP scores and gender, education, smoking status, chronic disease and medication use ($p<0.05$). Correlation analysis showed a moderate relationship between knowledge and attitudes ($r = 0.586$, $p<0.001$) and between attitudes and practices ($r = 0.468$, $p<0.001$). **Conclusion:** This study highlights moderate awareness of analgesic risks and cautious acceptance of AI in prescribing, with trust contingent on physician oversight. Strengthening health literacy, regulatory frameworks and patient education is essential for the safe integration of AI into pain management.

Key Words Artificial Intelligence, Analgesic Prescribing, Saudi Arabia

INTRODUCTION

The use of analgesics is widespread globally, including in Saudi Arabia and their impact on public health and healthcare systems is considerable [1]. Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) and paracetamol (acetaminophen) remain central to pain management; however, their availability differs substantially between countries [2]. Ongoing debate surrounds whether NSAIDs should be made available over-the-counter (OTC) or restricted to prescription-only use [3]. Significant safety concerns underscore this debate as inappropriate use is associated with drug intoxication, adverse interactions and harmful reactions [4]. For instance, diclofenac, ibuprofen and naproxen have been shown to increase the risk of gastrointestinal complications two- to fourfold and double the risk of hospitalisation for heart failure [2,4].

Paracetamol, which is widely accessible and manufactured in approximately 150 formulations, also carries notable risks. In adults, doses of 10-15 grams may cause hepatotoxicity, while ingestion of 25 grams can be fatal [5]. In countries such as England and France, a strong association has been observed between paracetamol sales and non-fatal overdoses, with increasing availability linked to higher rates of misuse, liver damage, deliberate self-poisoning and suicides [5,6]. In the United States, paracetamol overdose accounts for approximately 458 deaths annually, of which around 100 are accidental [7]. Since April 2009, Germany has restricted OTC sales of paracetamol to packs containing no more than 10 grams of active ingredient [8]. In Saudi Arabia, regulatory authorities face the challenge of striking a balance between ensuring access to effective pain relief and mitigating risks, particularly in ageing populations and in the context of rising chronic disease prevalence [9,10]. Thus, regulatory authorities face the challenge of striking a balance between ensuring access to effective pain relief and mitigating risks, particularly in ageing populations and in the context of rising chronic disease prevalence [9,10].

Artificial Intelligence (AI) is broadly defined as the application of algorithms that enable machines to perform functions such as reasoning, problem-solving, object and speech recognition, environmental interpretation and decision-making [11]. These functions are underpinned by technologies including machine learning, computer vision, natural language processing, expert systems and fuzzy logic [12]. Regarding pain medicine, AI has been deployed across a range of applications, including the optimisation of clinical trial design, enhancement of doctor-patient communication and evaluation of treatment outcomes [13,14]. Such innovations offer the potential to substantially transform the management of both acute and chronic pain by enabling more precise, efficient and individualised approaches to care [14]. The medical profession is experiencing a period of profound change with the integration of AI and automation [15]. AI systems have attracted significant attention owing to their capacity to harness advanced technologies to deliver high-quality healthcare.

In Saudia Arabia, the medical profession is experiencing a period of deep change with the integration of AI and automation [15]. AI systems have attracted significant attention owing to their capacity to harness advanced technologies to deliver high-quality healthcare. AI-driven prescribing systems have become increasingly prevalent, offering advantages such as greater accuracy and speed in clinical decision-making, reduced workloads for healthcare providers and a lower risk of medication errors and adverse events [12,16].

Although analgesic pharmacology has advanced considerably, there remain substantial gaps in understanding its use within the sociocultural framework of Saudi Arabia [17]. Current evidence offers limited insight into the behavioural, cognitive and adherence-related aspects that influence patients' use of analgesics [10]. Research is also scarce regarding public attitudes towards and engagement with, AI technologies in medication guidance, particularly for pain management [15]. Therefore, this study aims to evaluate KAP regarding the role of AI in analgesic prescribing in Saudi Arabia.

METHOD

Ethical Approval

This study was approved by the Local Committee for Research Ethics, General Directorate of Health Affairs for the Makkah region, Saudi Arabia (H APO-02-K-012-2024-12-2400), under the Declaration of Helsinki.

Study Design

A cross-sectional study was conducted among Saudi adults. They were randomly approached by sending them an electronic questionnaire over the six months from 1 February to 31 July 2025. The purpose of the research was explained re to participants. They were also informed that participation was voluntary.

Questionnaire Tool

The questionnaire was adapted from a previous study by Magadmi *et al.* [18]. It was designed using online cloud-based questionnaire development software (Google Forms). Experts (including two clinical pharmacologists and one pain management physician) provided their feedback and opinions for improving it and their suggestions were incorporated into the final questionnaire. The questionnaire was designed in English and translated into Arabic, the local spoken language, by proficient speakers of both languages and revised to suit the general population. It was divided into four main parts: (1) Socio-demographic characteristics, (2) Knowledge assessment, (3) Attitudes toward AI in healthcare and (4) Current practices regarding analgesic use.

Study Populations (Inclusion/Exclusion Criteria)

The inclusion criteria included Saudi adults (men and non-pregnant women) above 18 years, as the study was carried out in Saudi Arabia. Exclusion criteria included (1) Individuals younger than 18 years, (2) Visitors to Saudi Arabia, (3) Individuals who refused to provide informed consent and (4) Participants who did not complete the study questionnaire.

Sample Size and Data Collection

The minimum sample size was determined using OpenEpi version 3.0, based on Saudi Arabia's estimated population of 33 million, with a 95% confidence level and an assumed prevalence of 50%. This calculation yielded 385 participants, but the target was increased to 400 to accommodate possible data loss during collection and analysis. Only complete cases were included, as participants were required to finish all four sections of the survey. Incomplete responses were excluded. Data extracted from Google Forms spreadsheets were subsequently transferred to Microsoft Excel for analysis.

Statistical Analysis

Statistical analyses were performed using R software (version 4.3.0). Categorical variables were presented as frequencies and percentages, while continuous variables were described using means, standard deviations, medians and interquartile ranges as appropriate. Likert-type responses were visualised using heatmaps generated with the Likert package to illustrate response patterns across related questions. Three composite scores were developed to summarise participant responses across key domains. The Knowledge Score (range: 0-12) combined six variables assessing awareness of analgesic side effects, understanding of AI capabilities, medication change experiences and interest in AI monitoring systems. The Trust Score (range: 0-10) incorporated five variables measuring attitudes toward using AI to provide analgesic information, suggest treatment duration, identify side effects and assess overall confidence compared to physicians. Concerns about analgesic side effects were also measured. The Practice Score (range: 0-12) combined four variables reflecting healthcare consultation frequency, pain frequency, analgesic usage frequency and willingness to follow AI dosage recommendations.

Comparative and Association Analyses

Demographic associations with composite scores were examined to test differences across gender, age groups, geographic regions, education levels, income categories and smoking status. Chi-square tests were used for categorical variables, while t-tests or ANOVA were employed for continuous variables, as appropriate. Statistical significance was set at $p<0.05$. Correlation analyses between composite scores were conducted using Pearson correlation coefficients. The strength of correlations was interpreted using conventional guidelines: Weak ($r<0.30$), moderate ($r = 0.30$-0.70) and strong ($r>0.70$).

RESULTS

We received 670 responses. However, five responses were excluded due to incomplete information, yielding a response rate of 99%. As shown in Table 1, the study included 665 participants with a well-balanced gender distribution, where females formed a slight majority (53.7%). Most were young adults aged 18-29 years (50.5%), followed by 30-49 years (37.7%). The majority were from the Western (38.0%) and Southern (31.7%) Regions. Over half of the participants held a bachelor's degree, most earned under 5000 SAR monthly and the majority were non-smokers. Nearly half reported current medication use, while about one in five had at least one chronic disease.

As shown in Table 2, fewer than half of the participants (47.82%) were aware of analgesic side effects, with many either unsure (32.63%) or unaware (19.55%). Results of the approach to the use of AI in assessing side effects were divided: 34.14% agreed, 37.14% were uncertain and 28.72% disagreed. Around one-third (33.68%) had changed their pain medication due to side effects, while nearly half (45.26%) had not. Openness to AI in pain management was moderate, with about 44-47% receptive, one-third undecided and around 20% opposed. Only a minority (10.98%) of participants were consistently concerned about analgesic side effects, while most expressed occasional (46.62%) or no concern (42.41%). Trust in AI was generally moderate: about half selected "Sometimes" when asked about its role in providing information, suggesting duration, or predicting side effects. Notably, 44.06% trusted AI more than physicians in identifying side effects, indicating relatively high confidence in AI's predictive abilities. Finally, while

Table 1: Bio-Demographic for the Study Sample (N = 665)

Bio-Demographic	N (%)
Gender	
Female	357 (53.7%)
Male	308 (46.3%)
Age	
18-29	336 (50.5%)
30-49	251 (37.7%)
50+	78 (11.7%)
Region	
Central Region	118 (17.7%)
Eastern Region	49 (7.37%)
Northern Region	34 (5.11%)
Southern Region	211 (31.7%)
Western Region	253 (38.0%)
Education	
Basic Education *	202 (30.4%)
Undergraduate	366 (55.0%)
Postgraduate	97 (14.6%)
Income	
Less than 5000	364 (54.7%)
5000-10,000	135 (20.3%)
>10000-15000	80 (12.0%)
>15000	86 (12.9%)
Smoking Status	
Ex-smoker	33 (4.96%)
Non-smoker	562 (84.5%)
Smoker	70 (10.5%)
Current Medications (Yes)	307 (46.2%)
Chronic diseases (Yes)	118 (17.7%)

Percentages are based on the total sample size (N = 665), *Elementary, Intermediate and Secondary school

Table 2: Participants' Responses Reflected Their Knowledge and Attitude Toward AI in Analgesic Use and Side Effect Management

Statement	N (%)		
	Yes	Sometimes	No
Participants' responses on knowledge of AI in analgesia use			
AI can help you find the most effective analgesic for your specific condition	296 (43.5%)	239 (36%)	130 (19.5%)
I am interested in an AI system that monitors pain levels and suggests analgesics accordingly	313 (47%)	208 (31.1%)	144 (21.9%)
Ever changed your pain medication based on side effects	226 (34%)	140 (21%)	299 (45%)
AI can provide accurate information about painkiller side effects	260 (38.6%)	273 (41%)	129 (19.4%)
AI can be used to assess the side effects of analgesics	226 (34%)	241 (36.3%)	198 (28.7%)
Aware of the potential side effects of the analgesics you use	319 (48%)	220 (33%)	126 (20%)
Attitudes toward AI involvement in analgesic use and side effect management			
Risk of side effects from analgesics is a concern for you	73 (10.98 %)	310 (46.62 %)	282 (42.41 %)
Trust AI to provide information on analgesics	124 (18.65 %)	338 (50.83 %)	203 (30.53 %)
Trust AI to suggest the duration of analgesic use	163 (24.51 %)	281 (42.26 %)	221 (33.23 %)
Trust AI to identify possible side effects based on history	157 (23.61 %)	275 (41.35 %)	233 (35.04 %)
Trust AI over a physician to identify possible side effects based on medical history	293 (44.06 %)	240 (36.09 %)	132 (19.85 %)
AI should not advise on the duration of analgesic use	112 (16.84 %)	322 (48.42 %)	231 (34.74 %)

**Percentages are based on the total sample size (N = 665)

Table 3: Practice of Analgesic Use, Pain Experience and Consultation Behaviours Among Participants

Parameters	N (%)
Frequency of consulting a healthcare professional regarding analgesic use	
Never	130 (19.5%)
Sometimes	340 (51.1%)
Always	195 (29.3%)
Frequency of experiencing pain that requires treatment	
Never	180 (27.1%)
Monthly	292 (43.9%)
Weekly	123 (18.5%)
Daily	70 (10.5%)
Most frequently used analgesic	
Aspirin	155 (23.3%)
Ibuprofen	131 (19.7%)
Paracetamol	379 (57.0%)
Effectiveness of the used analgesics	
Not effective	43 (6.47%)
Moderately effective	427 (64.2%)
Very effective	195 (29.3%)
Frequency of analgesic use	
Never	257 (38.6%)
Monthly	196 (29.5%)
Weekly	145 (21.8%)
Daily	67 (10.1%)
Prefer prescription or OTC analgesics	
No preference	94 (14.1%)
OTC	327 (49.2%)
Prescription	244 (36.7%)
The most commonly experienced type of pain	
Abdominal pain	123 (18.5%)
Headache	303 (45.6%)
Musculoskeletal pain	145 (21.8%)
Other	94 (14.1%)

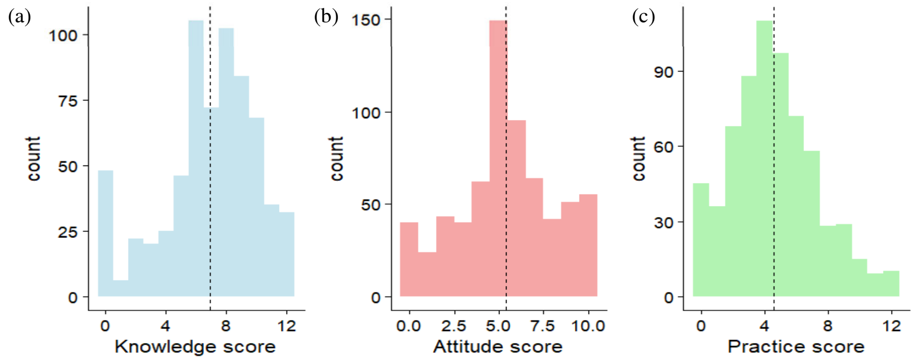
Percentages are based on the total sample size (N = 665)

some supported restrictions on AI advising about duration (16.84%), the majority were not firmly opposed, showing cautious openness to AI guidance.

Among 665 participants, most (51.1%) sometimes consulted healthcare professionals before using analgesics, while 29.3% always did and 19.5% never did, as shown in Table 3. Paracetamol was the most used analgesic (57.0%), with most rating its effectiveness as moderate (64.2%); use was mainly rare (38.6%) or monthly (29.5%). Nearly half preferred OTC analgesics (49.2%) and headache was the most common pain type (45.6%), followed by musculoskeletal (21.8%) and abdominal pain (18.5%).

As shown in Figure 1, the knowledge score was moderately correlated with the attitude score ($r = 0.586$, $p<0.001$) and weakly correlated with the practice score ($r = 0.235$, $p<0.001$). A moderate correlation was also observed between the attitude score and practice score ($r = 0.468$, $p<0.001$).

As shown in Table 4, group comparisons revealed statistically significant differences in several domains. Females had higher Knowledge Scores (7.52±2.76 vs. 6.2±3.31, $p<0.001$) and Trust Scores (5.64±2.48 vs. 5.11±2.9, $p = 0.011$) compared to males, while Practice Scores did not differ significantly by gender ($p = 0.301$).



The dashed line represents the mean score

Parameters	Knowledge score	Attitude score	Practice score
Knowledge score	-	0.586***	0.235***
Trust score	0.586***	-	0.468***
Practice score	0.235***	0.468***	-

Computed correlation used Pearson's method with listwise deletion, ***p<0.001

Figure 1: Distribution of (a) Knowledge Score, (b) Attitude Score and (c) Practice Score

Table 4: Univariate Analysis for Factors Associated with KAP

Variable	Group	Knowledge	Attitude	Practice
Gender	Female	7.52 (2.76)b	5.64 (2.48)b	4.69 (2.54)a
	Male	6.2 (3.31)a	5.11 (2.9)a	4.47 (2.9)a
	p-value	< 0.001	0.011	0.301
Age	18-29	6.78 (3.41)a	5.07 (2.96)a	4.24 (2.91)a
	30-49	7.1 (2.79)a	5.78 (2.37)b	4.94 (2.46)b
	50+	6.86 (2.54)a	5.51 (2.31)b	4.99 (2.39)b
	p-value	0.475	0.006	0.003
Region	Central Region	7.08 (2.69)a	5.55 (2.2)ab	5.35 (2.35)bc
	Eastern Region	7.41 (2.87)a	6.16 (2.5)a	4.2 (2.65)ab
	Northern Region	7.47 (3.15)a	5.88 (2.54)ab	6.74 (2.76)c
	Southern Region	7.03 (2.92)a	5.54 (2.67)ab	4.62 (2.73)ab
	Western Region	6.56 (3.42)a	4.98 (2.92)b	4 (2.64)a
	p-value	0.181	0.017	< 0.001
Education	School	6.69 (3.38)ab	5.11 (2.94)a	4.24 (2.88)b
	Bachelor's degree	7.2 (2.96)b	5.45 (2.64)a	4.55 (2.67)b
	Postgraduate	6.29 (2.86)a	5.74 (2.26)a	5.47 (2.3)a
	p-value	0.017	0.136	< 0.001
Income	10000 to 15000	6.75 (2.63)a	5.94 (2.42)a	5.6 (2.73)b
	5000 - 10,000	6.4 (3.04)a	5.47 (2.37)a	5.32 (2.45)ab
	Less than 5000	7.03 (3.29)a	5.19 (2.86)a	4.12 (2.73)c
	More than 15000	7.36 (2.62)a	5.61 (2.62)a	4.52 (2.53)ac
	p-value	0.101	0.114	< 0.001
Smoker	Ex-smoker	7 (2.87)a	5.61 (2.55)a	5.27 (2.54)a
	Non-smoker	6.82 (3.13)a	5.25 (2.71)a	4.46 (2.69)a
	Smoker	7.57 (2.81)a	6.4 (2.43)a	5.33 (2.78)a
	p-value	0.159	0.003	0.013
Chronic Diseases	No	6.75 (3.22)a	5.31 (2.76)a	4.34 (2.63)a
	Yes	7.64 (2.27)b	5.79 (2.33)a	5.74 (2.77)b
	p-value	0.004	0.078	< 0.001
Current Medications	No	6.4 (3.31)a	5.04 (2.86)a	3.97 (2.62)a
	Yes	7.5 (2.7)b	5.81 (2.43)b	5.32 (2.64)b
	p-value	< 0.001	< 0.001	< 0.001
Prescription Preference	No preference	7 (3.15)a	5.06 (2.93)a	3.32 (2.25)b
	OTC	6.9 (2.9)a	5.4 (2.35)a	4.67 (2.5)a
	Prescription	6.88 (3.33)a	5.51 (3)a	4.97 (2.99)a
	p-value	0.951	0.396	< 0.001
Pain Type	Abdominal pain	6.98 (2.8)a	5.67 (1.83)a	4.82 (2.2)bc
	Headache	6.99 (3.26)a	5.26 (3.01)a	4.48 (2.99)ab
	Musculoskeletal pain	6.75 (2.91)a	5.75 (2.41)a	5.19 (2.37)c
	Other	6.82 (3.21)a	4.89 (2.89)a	3.73 (2.62)a
	p-value	0.873	0.05	< 0.001

SD: Values are reported as mean, [a,b,c]Indicate results of post-hoc pairwise comparisons, Means sharing the same letter are not significantly different (Games-Howell test), Statistical significance was evaluated using ANOVA or t-tests, as appropriate

Table 5: Reliability of the Included Scales

Scale	N items	N cases	Cronbach Alpha	Interpretation
Knowledge	6	665	0.73	Acceptable
Attitude	5	665	0.79	Acceptable
Practice	6	665	0.70	Acceptable

Cronbach's alpha for the included scales was 0.7 or higher, indicating good reliability of the scales

Regional differences were significant for Trust (p = 0.017) and Practice (p<0.001) but not Knowledge (p = 0.181). Participants from the Northern Region had notably higher Practice Scores. Education level was associated with both Knowledge (p = 0.017) and Practice (p<0.001), with postgraduate participants reporting higher Practice Scores. Income was not significantly associated with Knowledge (p = 0.101) or Trust (p = 0.114) but showed a significant relationship with Practice Scores (p<0.001). Smoking status was linked to both Trust (p = 0.003) and Practice Scores (p = 0.013), with smokers reporting higher values. Presence of chronic diseases was significantly associated with higher Knowledge (p = 0.004) and Practice Scores (p<0.001). Similarly, those on current medications scored higher in all three domains: Knowledge (p<0.001), Trust (p = 0.0002) and Practice (p<0.001). Pain type was not associated with Knowledge (p = 0.873), marginally associated with Trust (p = 0.050) and significantly associated with Practice Scores (p<0.001) (Table 5).

DISCUSSION

This study aims to evaluate the KAP regarding the application of AI in analgesic prescribing in Saudi Arabia. Our results reveal that approximately 79% of respondents perceived AI-driven alerts for reducing or discontinuing analgesics as advantageous. This finding is consistent with Syrowatka *et al.* [19], who reported that 86% of studies (67 out of 78) focused on developing, validating, or testing AI-based prediction models to reduce adverse drug events. Additionally, 77% of participants expressed a preference for AI-based alert systems to enhance medication adherence. This aligns with Krishna Prasad [20], who highlighted AI's capability to monitor adherence patterns, identify patients at risk of non-compliance and provide personalised reminders, thereby improving patient engagement, enabling early interventions and reducing healthcare costs.

The observed trends may reflect growing awareness of pain management and increasing trust in technological solutions. These factors suggest a cautious yet optimistic inclination towards personalised care, which may reduce medication-related side effects. Notably, over half of the participants (52.3%, n = 348) indicated that they would occasionally follow AI-generated dose recommendations without consulting a healthcare professional, indicating significant trust in AI systems and a potential shift toward technology-driven medication management. Conversely, Li *et al.* [21] found lower adherence to AI-generated medical advice compared to that of human clinicians, underscoring the varying levels of trust in AI versus human practitioners. Their study also noted that slow-response latency led participants to perceive greater health benefits and patient-centredness from human doctors, while the opposite was true for AI systems. These findings underscore the importance of patient education on AI's capabilities and limitations, alongside sustained human oversight, to bridge trust gaps and ensure the acceptance of AI-driven recommendations.

Regarding awareness of analgesic side effects, only 48% of participants were informed about potential risks, with 34-39% believing AI could accurately identify or explain these risks. This limited awareness, despite widespread analgesic use, echoes findings from Siddig *et al.* [22], who reported that 29% of respondents in Saudi Arabia were unaware of opioid and NSAID adverse effects. Similar knowledge gaps regarding drug interactions have been observed in Jordan and New Zealand [23]. In terms of perceptions of AI in healthcare, our findings align with those of Syed *et al.* [24], who noted that 84% of Saudi adults were aware of AI in healthcare, with 61% viewing it as a valuable tool. Pharmacy students in Riyadh also expressed moderate confidence in AI's clinical applications. However, uncertainty about AI's accuracy in managing clinical details, such as side effects, reflects the early-stage integration of AI in Saudi Arabia's healthcare system, where trust is still developing [25,26].

Participants identified several benefits of AI in mitigating analgesic side effects, with 37.7% citing enhanced patient safety, 31.4% noting faster risk identification and 30.8% valuing personalised side effect predictions. These findings indicate growing public confidence in AI's potential to improve medication safety, despite moderate awareness of such technologies. Although limited local studies explore AI in pain management, a recent Saudi polypharmacy survey highlighted its role in preventing medication-related harm through proactive risk identification [27]. Global studies further confirm that machine learning achieves satisfactory accuracy in detecting safety signals, offering potential for earlier risk prediction. This confidence in AI's safety contributions suggests increasing recognition of its value in near-real-time pharmacovigilance and risk stratification [28].

Surprisingly, 44.1% of respondents expressed greater confidence in AI than human clinicians for detecting side effects, though approximately one-third opposed AI advising on dosage duration, indicating concerns about its clinical decision-making reliability. A Saudi study reported that 12.5% of participants believed AI could replace physicians, yet current evidence suggests AI serves as a supportive tool rather than a replacement for healthcare providers [29,30]. Concerning healthcare interactions, only 29.3% of participants consistently consulted professionals regarding analgesic use, while 51.1% did so intermittently and 19.5% never consulted them. Consultation rates varied, with elderly individuals, women and those from lower socioeconomic backgrounds consulting more frequently [31].

The study found that 57% of participants primarily used paracetamol, consistent with its status as the most common self-administered analgesic due to its safety and efficacy [32]. Paracetamol was followed by ibuprofen and diclofenac, aligning with regional and global trends where paracetamol is the preferred OTC analgesic [33]. A German study similarly identified paracetamol and ibuprofen as the most used analgesics, with musculoskeletal pain (32.6%) and headaches (39.7%) being the primary reasons for analgesic use, consistent with findings from the Multi-Ethnic Study of Atherosclerosis and other US and European studies [33,34]. Over 70% of participants obtained OTC analgesics, reflecting widespread self-medication practices in Saudi Arabia and elsewhere, such as Jordan, where 65% of respondents self-medicated with NSAIDs [22,23]. Gastrointestinal upset (21.8%) was the most frequently reported side effect, followed by dizziness and drowsiness, which aligns with the known NSAID adverse effect profiles [8]. The 48% awareness rate of side effects highlights a significant health literacy gap, consistent with New Zealand findings, where nearly half the population lacked drug safety knowledge [35].

This study provides a comprehensive examination of analgesic use patterns and public perceptions of AI in pain management, thereby contributing to the intersection of clinical care and digital health. Its structured methodology, including participant selection, data collection and composite scoring of knowledge, trust and practice, enhances the reliability and reproducibility of the findings. The study's public health relevance lies in its insights into the use of OTC analgesics and AI readiness, informing patient education and digital health policies. However, limitations include a restricted pool of participants with informed AI perspectives, demographic heterogeneity and potential biases from convenience sampling and self-reported data. Language or regional constraints may further limit generalizability and the cross-sectional design precludes tracking changes over time. Future research should employ longitudinal or interventional designs, standardise outcome measures and include underserved populations, as well as explore clinician and system-level perspectives to support effective AI integration in pain management.

Few limitations must be acknowledged when interpreting the findings of this study. First, reliance on an online survey may limit the sample's representativeness, as individuals who do not use social media are excluded. Second, the study did not specify the platforms utilized for data collection. Nevertheless, the study offers valuable insights into knowledge, attitudes and practices concerning the role of artificial intelligence in analgesic prescribing in Saudi Arabia, thereby contributing to a relatively underexplored research area.

Overall, the results suggest that AI has significant potential to complement conventional healthcare delivery in Saudi Arabia by supporting safer prescribing, improving adherence and mitigating risks of misuse. However, its successful implementation will require sustained physician oversight, patient education and the development of regulatory frameworks that balance innovation with patient safety. Future research should adopt longitudinal and interventional designs to assess the long-term impact of AI-assisted prescribing on clinical outcomes, healthcare utilisation and public trust.

CONCLUSIONS

This study offers valuable insights into the KAP of the Saudi population regarding analgesic use and the evolving role of AI in prescribing practices. The findings highlight both opportunities and challenges in integrating AI into pain management. While awareness of analgesic side effects was limited among participants, there was cautious openness toward AI-supported systems, particularly in enhancing safety, adherence and personalised recommendations. Notably, trust in AI was moderate, with a considerable proportion of respondents expressing greater confidence in AI than in human clinicians for detecting adverse effects.

The observed demographic variations in knowledge, trust and practice underscore the influence of gender, education, socioeconomic status and chronic disease burden on public perceptions of AI. The reliance on OTC analgesics, coupled with partial consultation with healthcare professionals, reinforces the urgent need for public health strategies that strengthen health literacy and promote safe medication practices.

Overall, the results suggest that AI has significant potential to complement conventional healthcare delivery in Saudi Arabia by supporting safer prescribing, improving adherence and mitigating risks of misuse. However, its successful implementation will require sustained physician oversight, patient education and the development of regulatory frameworks that balance innovation with patient safety. Future research should adopt longitudinal and interventional designs to assess the long-term impact of AI-assisted prescribing on clinical outcomes, healthcare utilisation and public trust.

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