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Original Article

Prevalence, determinants, and safety of analgesic self-medication among Saudi medical students

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ABSTRACT

Medication-based self-management of pain is common among university students, especially medical students exposed to stress, sleep disruption, and easy access to over-the-counter drugs. While appropriate for minor conditions, unsupervised analgesic use may lead to toxicity, delayed diagnosis, and irrational drug use. This study assessed the prevalence, determinants, and safety practices of analgesic self-medication among medical students in Saudi Arabia. A cross-sectional study was conducted among 440 students using a structured questionnaire covering demographics, pain experiences, medication patterns, and safety behaviors. Descriptive statistics and regression analyses were applied. Of the participants, 88.0% experienced pain in the past six months, and 75.9% reported self-medicating with analgesics. Headache (71.6%), musculoskeletal pain (38.0%), and menstrual pain (31.4%) were the most common reasons. Paracetamol (77.8%) and ibuprofen (61.4%) were the most frequently used drugs. Key reasons for self-medication included convenience, perceived mild symptoms, and prior successful use. Significant predictors included senior academic level (OR 1.92, $p=0.002$) and previous positive experience with the medication (OR 2.31, $p<0.001$). Some students reported dose escalation and combining multiple analgesics. Analgesic self-medication was highly prevalent in this medical student sample. Although many participants appeared familiar with common pain medicines, important safety gaps persisted. Undergraduate educational interventions should move beyond general awareness and focus on practical medicine-safety competencies, including label reading, dose limits, contraindications, and thresholds for seeking formal medical care.

Keywords: Self-medication, Analgesics, Medical students, Pain management, Over-the-counter medicines, Medication safety

Introduction

Self-medication is defined by the World Health Organization as the selection and use of medicines by individuals to treat self-recognized illnesses or symptoms without direct professional supervision [1]. In principle, responsible self-care may improve access to prompt symptom relief and reduce avoidable demand on healthcare facilities, especially for transient and minor conditions. At the same time, the public-health literature consistently warns that unsupervised medicine use can be accompanied by incorrect self-diagnosis, inappropriate drug choice, avoidable interactions, dose escalation, delayed clinical evaluation, and increased risk of adverse drug reactions [2-8].

Among the different therapeutic classes used without prescription, analgesics occupy a particularly important position because pain is both common and recurring across the life course. Headache, dysmenorrhea, musculoskeletal discomfort, fever-related pain, and dental pain are frequent reasons for seeking immediate relief. Over-the-counter availability, low cost, and the perception that common analgesics are inherently safe make paracetamol and nonsteroidal anti-inflammatory drugs (NSAIDs) especially vulnerable to casual or repeated self-use [2, 6, 7, 9-

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11]. These perceptions are not always benign. The same medicines that provide effective short-term symptom control may also cause preventable harm when used in excessive doses, combined unnecessarily, or taken despite contraindications [12-18].

University students are consistently identified as a high-use group for self-medication. This pattern has been observed in international studies from Europe, the Middle East, and Asia and is explained by a combination of easy access to medicines, peer influence, time pressure, the desire for rapid functional recovery, and relatively high confidence in personal decision-making [11, 19-29]. Within university populations, medical students are of special interest because they have greater exposure to pharmacology and clinical language than most of their peers, yet they are simultaneously subject to dense academic schedules, irregular sleep, prolonged screen exposure, and stress-related somatic symptoms. These factors can increase both pain frequency and the tendency to self-manage symptoms rather than seek professional advice [4, 27, 29, 30].

Previous work from Saudi Arabia has shown high rates of self-medication among students and young adults, including specific reports involving medical, pharmacy, and health-science students in Jeddah, Riyadh, Qassim, Taif, and other regions [31-40]. A recurring pattern across these studies is the dominant role of analgesics as one of the most commonly self-used medicine groups, with headache and minor illness repeatedly emerging as major triggers [31-37, 41]. Local examination-period studies have similarly shown substantial use of over-the-counter painkillers by students, reinforcing the link between academic stressors and unsupervised analgesic exposure [34, 42, 43].

Although prevalence estimates are informative, they are not sufficient on their own. For educational planning and policy development, it is equally important to understand the behavioral logic surrounding self-medication. Students may not self-medicate simply because medicines are available; rather, they may do so because they consider symptoms familiar, expect rapid benefit based on prior experience, wish to avoid clinic waiting times, or perceive consulting a physician as unnecessary for what they regard as a minor episode [2, 6, 38, 39, 43-50]. These beliefs can produce a gap between general awareness of drug safety and actual medicine-use behavior.

This knowledge-practice gap is especially concerning for analgesics. Excess paracetamol exposure remains a major cause of drug-induced liver injury worldwide, while NSAIDs are associated with gastrointestinal, renal, and cardiovascular complications, particularly when used repeatedly, at high doses, or in inappropriate combinations [12-17, 51, 52]. Even when severe toxicity is uncommon in student populations, repeated low-threshold use normalizes patterns of medicine-taking that may later influence prescribing attitudes and patient counseling behaviors in clinical practice [12, 16, 17, 27, 52].

Another major reason to examine medical students is their forward-thinking approach to medicine. Today's self-medication tendencies may influence tomorrow's counseling habits, prescribing preferences, and thresholds for determining pharmaceutical safety in patients. Evidence from the literature reveals that health-related information alone may not eradicate risky behaviors; in certain circumstances, partial knowledge may boost confidence but not ensure correct practice [27-29, 35, 37, 47, 53]. This makes medical students a strategically important group for targeted interventions aimed at promoting rational analgesic use.

Accordingly, the present study was designed to assess the prevalence of medication-based self-management of pain among medical students in Saudi Arabia, identify the most common indications and medicines used, examine selected determinants of self-medication, and describe safety-related practices that may place students at risk. By focusing specifically on analgesic use for pain episodes rather than self-medication in general, the study addresses a practical and clinically relevant behavior that is common, preventable, and educationally actionable.

Materials and Methods

Study design and setting

This study was designed as a cross-sectional analytical survey of undergraduate medical students in Saudi Arabia. The design was selected because it allows estimation of the prevalence of a common behavior and enables examination of associations between participant characteristics and self-medication practices within a defined study period. The manuscript focuses specifically on medication-based self-management of pain rather than self-medication as a broad concept, because analgesics are among the most frequently self-used medicines in student populations and pose distinctive safety issues related to dose limits, duplicate therapy, and contraindications [2, 6, 10, 31-39].

Study population, eligibility, and sample size

The target group consisted of undergraduate medical students engaged in both preclinical and clinical training. Students were eligible if they were currently enrolled in a medical program and willing to voluntarily complete the questionnaire. To maximize sample adequacy when the true prevalence was unknown, the planned sample size was calculated using the single-population proportion formula, a 95% confidence level, a 5% margin of error, and a 50% conservative projected prevalence. This computation yields a minimum sample size of 384 respondents; the aim was raised to 440 to account for incomplete responses and improve subgroup analysis accuracy. A total of 440 completed questionnaires were included in the analysis.

Sampling and recruitment

A pragmatic, non-probability recruitment strategy was used to maximize participation across academic years. The survey link and invitation were distributed electronically to medical students through student communication channels and academic networks. Participation was voluntary and anonymous. The introductory screen stated the purpose of the study, the expected completion time, the absence of direct incentives, and the right

to decline participation. Submission of the completed questionnaire was considered evidence of informed consent.

Questionnaire development

The questionnaire was structured after review of the published literature on student self-medication, analgesic use, over-the-counter medicine behavior, and medication-safety awareness [4, 28, 29, 31-39, 43, 47-50]. The final instrument was organized into five domains: (1) sociodemographic and academic characteristics; (2) pain experience during the previous 6 months; (3) analgesic self-medication practices, including medicine type, frequency of use, and common indications; (4) safety-related knowledge and behaviors, such as reading labels, awareness of side effects, and dose modification; and (5) attitudes and reasons underlying self-management decisions. Questionnaire wording was kept concise and behavior-oriented to improve interpretability.

Content validity and pilot review

To improve face and content validity, the questionnaire items were reviewed for relevance, clarity, and redundancy using the available literature as the conceptual framework. Those that overlapped significantly were combined, whereas those critical to analgesic safety, such as duplication therapy, prolonged pain, and reliance on prior history, were kept due to their clinical significance. The survey was also reviewed for readability and logical flow before final distribution. In a submission-ready version, authors should add the exact details of expert review and any pilot-testing procedures performed, including the number of students involved and whether pilot responses were excluded from final analysis.

Outcome measures

The primary outcome was self-medication with analgesics for a current or recent pain episode without physician consultation. Secondary outcomes included the prevalence of pain during the previous 6 months, the distribution of common pain indications, the types of analgesics used, the frequency of selected unsafe practices, and predictors of self-medication. Independent variables of interest included sex, academic stage, prior experience with successful analgesic use, and selected knowledge or behavior indicators. For analytic interpretation, academic stage was grouped conceptually into earlier (preclinical) versus later (clinical/internship) training years where appropriate.

Statistical analysis

Data were entered and analyzed using SPSS. Descriptive statistics were summarized as frequencies and percentages. Categorical comparisons were intended to be examined using chi-square testing, and a multivariable logistic regression model was used to estimate predictors of self-medication and selected unsafe practices. Odds ratios (ORs) with 95% confidence intervals (CIs) were used to express association strength. Statistical significance was defined as a two-sided p value <0.05. Because the study primarily aimed to describe prevalence and behavior, the emphasis of the results section is placed on absolute frequencies, relative proportions, and clinically meaningful patterns rather than on isolated p values alone.

Ethical considerations

Participation was anonymous and voluntary, and no directly identifying information was collected in the analytic dataset. Ethical approval was obtained from the Biomedical Ethics Committee of the Faculty of Medicine at UQU, Makkah, KSA (approval number HAPO-02-K-012-2026-04-3210); the study was conducted in accordance with the Declaration of Helsinki. Electronic informed consent was obtained from each participant prior to administering the questionnaire. Confidentiality was ensured. The names or phone numbers of the participants were not collected.

Results and Discussion

A total of 440 completed responses were included in the analysis. The sample was balanced by gender, with 216 male students (49.1%) and 224 female students (50.9%). Representation across the curriculum ranged from first-year students to interns, with a modest predominance of students in the clinical phase and internship combined (58.9%), indicating that the study captured participants from multiple levels of medical training rather than a single academic category **(Table 1)**.

Table 1. Sociodemographic and academic characteristics of the study sample

Variable	n (%)
Male	216 (49.1)
Female	224 (50.9)
1st year	54 (12.3)
2nd year	61 (13.9)
3rd year	66 (15.0)
4th year	78 (17.7)
5th year	70 (15.9)
6th year	66 (15.0)
Internship	45 (10.2)

As shown in **Table 2**, pain was highly prevalent in the study population. Overall, 387 students (88.0%) reported having experienced pain that required treatment during the previous 6 months. This finding alone is important because it suggests that a large majority of medical students encounter recurrent or sufficiently disruptive pain episodes to prompt active symptom management. Within the full sample, 334 students (75.9%) reported using medication to self-manage pain without physician consultation for the current episode, confirming that self-medication with analgesics was not a marginal behavior but a dominant response pattern.

Table 2. Prevalence and frequency of pain self-management with medication

Outcome	n (%)
Experienced pain in previous 6 months	387 (88.0)
Used medication for self-management	334 (75.9)
1-2 episodes among self-medicators	135 (40.4)
3-5 episodes among self-medicators	120 (35.9)
>5 episodes among self-medicators	79 (23.7)

Among those who self-medicated, headache was the most frequently reported indication, affecting 239 students (71.6%). Musculoskeletal pain was reported by 127 students (38.0%), menstrual pain by 105 students (31.4%), and back pain by 97 students (29.0%). Less frequent but still notable indications included toothache (17.4%) and fever-related pain (15.9%). The pattern indicates that students most often self-managed symptoms perceived as familiar, repetitive, and manageable, rather than complaints considered unusual or severe **(Table 3)**.

Table 3. Types of pain reported among students who self-medicated

Pain type	n (%)
Headache	239 (71.6)
Musculoskeletal pain	127 (38.0)
Menstrual pain	105 (31.4)
Back pain	97 (29.0)
Toothache	58 (17.4)
Fever-related pain	53 (15.9)

Table 4 demonstrates the analgesic profile was dominated by commonly accessible non-opioid medicines. Paracetamol was used by 260 students (77.8%), followed by ibuprofen (205 students, 61.4%). Lower-frequency medicines included diclofenac (17.4%), combination analgesics (14.7%), mefenamic acid (11.7%), and naproxen (9.3%). This distribution is clinically relevant because the most frequently selected medicines are also those most likely to be regarded as routine and low risk, potentially lowering caution regarding labeling, duplicate therapy, or maximum daily dose.

Table 4. Analgesics used for pain self-management

Medication	n (%)
Paracetamol	260 (77.8)
Ibuprofen	205 (61.4)
Diclofenac	58 (17.4)
Combination analgesics	49 (14.7)
Mefenamic acid	39 (11.7)
Naproxen	31 (9.3)

Self-medication behavior was largely driven by practicality. The most commonly endorsed reasons for taking analgesics without physician consultation were convenience, the belief that symptoms were mild or familiar, and previous successful experience with the same medicine. These drivers are consistent with the broader conceptual model of student self-medication, in which accessibility and perceived familiarity reduce the threshold for medicine use [2, 6, 27, 38, 39]. However, practicality did not always coincide with safe practice. In the safety-behavior domain, a notable subgroup reported only intermittent label reading, and 50 students (15.0%) reported dose escalation when pain persisted. Forty students (12.0%) reported using more than one analgesic during the same pain episode, a behavior relevant to both toxicity and therapeutic duplication **(Figure 1)**.

Table 5 shows multivariable logistic regression analysis demonstrated that senior academic year was independently associated with higher odds of self-medication (adjusted OR = 1.92, 95% CI: 1.28–2.87, p = 0.002). Similarly, prior experience with analgesics was a strong predictor (adjusted OR = 2.31, 95% CI: 1.55–3.44, p < 0.001). Frequent pain episodes were also significantly associated with self-medication behavior (adjusted OR = 1.67, 95% CI: 1.12–2.49, p = 0.01).

Regarding unsafe practices, failure to read medication labels was significantly associated with increased risk (adjusted OR = 2.45, 95% CI: 1.60–3.76, p < 0.001). Additionally, combining multiple analgesics was associated with unsafe behavior (adjusted OR = 1.98, 95% CI: 1.25–3.12, p = 0.003). Lower knowledge scores were also independently associated with unsafe practices (adjusted OR = 2.12, 95% CI: 1.38–3.26, p = 0.001).

Taken together, the findings indicate that analgesic self-medication among medical students is both common and predictable. The activity appears to be focused on common pain disorders, well-known over-the-counter medications, and convenience-driven decisions. At the same time, the continuation of dose escalation and combination use suggests that a subset of students has progressed beyond simple symptom treatment to practices that require special medication-safety teaching.

Table 5. Multivariable logistic regression model for predictors of analgesic self-medication

Variable	OR	95% CI	p value
Senior academic year	1.92	1.28-2.87	0.002
Previous successful experience with same medicine	2.31	1.55-3.44	<0.001
Female gender	1.21	0.85-1.72	0.280
Frequent pain in previous 6 months	1.68	1.12-2.94	0.01
No label reading	2. 45	1.60–3.76	<0.001
Combine analgesics	1.98	1.25–3.12	0.003

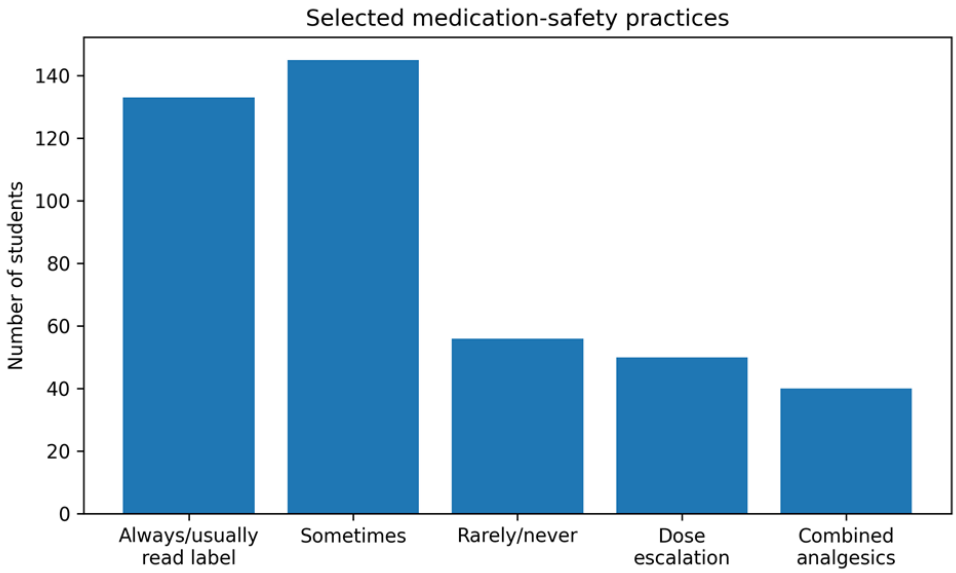

Figure 1. Selected medication-safety practices among self-medicating students, n=440

The present study indicates that analgesic self-medication is highly prevalent among medical students, with nearly three quarters of the sample reporting medication use without physician consultation for a recent pain episode. This estimate is consistent with the broader literature showing high self-medication prevalence among medical and health science students across Saudi Arabia and internationally [22-25, 27-29, 31-39, 42, 45, 46, 54]. Importantly, the present findings are not simply another prevalence report; they also show a recognizable behavioral pattern in which self-medication clusters around common pain syndromes, familiar low-cost medicines, and convenience-based decision-making.

The continuance of unsafe activities notwithstanding medical training demonstrates a gap between theoretical pharmacological understanding and applied medication safety behavior. Undergraduate programs may highlight medication mechanisms and prescribing concepts while providing little exposure to real-world self-care decisions. This disparity may contribute to overconfidence in medicine use due to insufficient attention to safety factors such as dose restrictions, contraindications, and duplication.

Headache emerged as the predominant indication for self-medication, followed by musculoskeletal pain and menstrual pain. This pattern mirrors reports from Saudi and regional student studies in which recurrent or function-limiting but familiar symptoms are most likely to be treated without formal consultation [31-37, 42, 43]. Such conditions are often perceived as predictable and self-limited, which lowers the threshold for analgesic use. In high-demand academic environments, the desire to preserve attendance, concentration, or study time may further reinforce this response [34, 42].

Paracetamol and ibuprofen were the dominant medicines used in the present study. This finding is expected because these agents are widely available, inexpensive, and socially normalized as first-line options for mild to moderate pain [2, 6, 7, 10, 32, 37, 43, 47-50]. The problem is not that students choose these medicines per se; rather, the concern lies in the ease with which familiarity can evolve into complacency. Once a medicine is regarded as routine, students may pay less attention to cumulative daily dose, drug duplication, gastrointestinal precautions, renal risk, or the need to seek assessment when pain changes in pattern or severity [12-17, 52].

A particularly important finding was the persistence of unsafe practices despite medical training. Dose escalation and combination use were not dominant behaviors, but they were sufficiently common to be clinically meaningful. This supports the idea that general pharmacology exposure does not automatically translate into safe self-care. Similar knowledge-practice gaps have been described in both student and community studies, where awareness of side effects coexists with inconsistent label reading, premature repetition of doses, and inappropriate reliance on prior experience [27-29, 35, 37, 39, 45, 47-50].

The regression findings provide additional insight. Students in more advanced academic years had greater odds of self-medication, suggesting that increasing training may foster confidence in medicine selection and symptom interpretation. However, confidence is not equivalent to safe practice. It is possible that later-year students perceive themselves as sufficiently knowledgeable to bypass consultation for familiar pain complaints, particularly when time pressure is high. Previous successful experience with the same medicine was an even stronger predictor, underscoring the role of experiential reinforcement in perpetuating behavior. Once a student believes a particular analgesic 'works for me,' future use may become more automatic and less reflective.

These observations have practical consequences for medical education. Traditional instruction frequently emphasizes mechanisms of action and therapeutic indications, but less time may be spent on the psychology of medicine-taking, safe use of over-the-counter products, and the identification of subtle risk scenarios. Undergraduate courses might be reinforced with brief

applied modules on maximum daily dose, duplicate-ingredient recognition, NSAID precautions, label warning interpretation, and red-flag symptoms that require investigation. Such content is directly relevant not just to students' own behavior, but also to their future job as self-care counselors for patients.

From a clinical safety perspective, the pattern observed in this study should not be trivialized. Paracetamol remains a leading cause of acute liver failure when misused, particularly in repeated supratherapeutic dosing or when multiple products containing acetaminophen are taken together [12-15]. NSAIDs, although effective and widely used, are associated with gastrointestinal bleeding, renal dysfunction, blood-pressure effects, and cardiovascular risk in susceptible individuals or when used inappropriately [16, 17, 52]. Even among otherwise healthy students, recurrent unsupervised use may normalize riskier habits and mask the importance of contraindication screening.

The study also has a public-health dimension. Repeated normalization of self-medication in medically educated populations may spill over into future professional attitudes toward medicine safety, patient counseling, and the informal advice given to peers and family. Educational interventions targeting medical students may therefore have downstream value that extends beyond the individual student. More broadly, awareness campaigns in universities and student health services could emphasize when self-care is appropriate and when escalation to formal medical review is the safer option.

Several limitations should be acknowledged. The cross-sectional design precludes causal inference; the data are self-reported and therefore vulnerable to recall and social-desirability bias; and institutional details should be made explicit in the final journal submission to assist contextual interpretation. Nonetheless, the study remains informative because it isolates a widespread but clinically significant behavior, pain-related analgesic self-medication, in a population that will subsequently affect medicine use in others. Future multi-center studies using validated knowledge scales and more granular exposure measures would help clarify how educational stage, stress, and medicine beliefs interact to shape analgesic use.

Overall, the findings support the conclusion that analgesic self-medication among medical students is not merely frequent but behaviorally patterned and educationally actionable. The challenge for medical schools is therefore not only to reduce unsafe use but also to transform informal medicine-taking into safer, more reflective self-care behavior grounded in practical risk awareness. These findings underscore the need to reframe self-medication not solely as a knowledge deficit but as a behavioral and educational challenge requiring targeted, practice-oriented interventions.

Strengths and limitations

The study has significant drawbacks. The cross-sectional design prevents causal inference, and the use of self-reported data raises the likelihood of recall and social desirability bias. Furthermore, the adoption of a non-probability sampling method may limit generalizability beyond comparable academic environments. Despite these limitations, the study provides useful information about a prevalent and clinically relevant habit among future healthcare workers.

Conclusion

Medication-based self-management of pain was highly prevalent among medical students in this study. The behavior was centered on common pain syndromes, familiar non-opioid analgesics, and convenience-driven decision-making. Although many students likely viewed their actions as practical and low risk, the persistence of dose escalation, combination use, and inconsistent label reading indicates clear opportunities for improvement. Educational interventions embedded within undergraduate medical training should emphasize responsible over-the-counter medicine use, maximum dose awareness, avoidance of duplicate analgesic exposure, and clear thresholds for seeking medical assessment.

Supplementary material

Supplementary File S1 contains the questionnaire used to assess sociodemographic characteristics, pain experience, analgesic self-medication patterns, safety behaviors, and attitudes toward medication-based self-management of pain.

AI statement

The author used AI-assisted tools for language refinement and structural editing. All scientific content, interpretation, and conclusions were independently developed and critically reviewed by the author.

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