

ORIGINAL ARTICLE

PATTERNS, RISKS, AND THE KNOWLEDGE PARADOX OF SELF-MEDICATION WITH PAINKILLERS AND SLEEP DRUGS AMONG UNIVERSITY HOSTEL STUDENTS IN PAKISTAN

Mouizza Ahmad¹, Rahal Warda¹, Wajid Ullah Khan^{1*}, Khadija Bibi¹, Hina Khan¹,
Syeda Shahnoor Zainab¹, Naeem Ur Rehman¹

ABSTRACT

Objectives: This study aims to assess the patterns, risks, and the knowledge paradox of self-medication with painkillers and sleep drugs among university hostel students in Pakistan.

Methods: This cross-sectional study was conducted among hostel students of Gomal University, Dera Ismail Khan, Pakistan, from February to March 2026. Data were collected using a structured, self-administered questionnaire on self-medication practices, non-steroidal anti-inflammatory drug (NSAIDs) use on an empty stomach, knowledge of NSAIDs-related problems, and future self-medication intentions. Associations between categorical variables were analyzed using chi-square and Fisher-Freeman-Halton Exact tests in statistical packages for social sciences (SPSS) version 27.

Results: The prevalence of self-medication was 65.3%, with NSAIDs being the most commonly used drugs (89.4%). A significant gender disparity was observed, with males using nearly four times more sleep medications than females (12.5% vs. 3.3%, $p = 0.035$). Also, a knowledge paradox revealed showing that medical students had significantly higher awareness of NSAIDs risks than non-medical students (60.9% vs. 30.8%, $p = 0.008$), yet this knowledge was associated with stronger intentions to self-medicate in the future (47.6% vs. 13.6%, $p < 0.001$, $\phi = 0.32$). Additionally, 28.8% of NSAIDs users were taking these medications on an empty stomach.

Conclusion: Self-medication is common among hostel students, with males using sleep medications more than females. The knowledge paradox suggests that simply teaching students about drug risks is not enough to change behavior. We need to address overconfidence bias and improve healthcare access. We also need to target the unique vulnerabilities of students living on their own.

Keywords: Self Medication; Anti-Inflammatory Agents; Non-Steroidal; Hypnotics and Sedatives; Health Knowledge; Attitudes; Practice; Students; Universities; Pakistan

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¹ Faculty of Pharmacy Gomal University, Dera Ismail Khan, Khyber Pakhtunkhwa, Pakistan

*Corresponding Author: Faculty of Pharmacy Gomal University, Dera Ismail Khan, Khyber Pakhtunkhwa, Pakistan. Email: wajidullah2004@gmail.com

INTRODUCTION

Self-medication is defined as the use of pharmaceutical products to manage self-diagnosed conditions without consulting a professional healthcare. It is a growing global health concern [1]. Although, it is acceptable for minor and temporary ailments, but taking medicine without supervision carries well-documented risks, such as adverse drug reactions, drug interactions, masking of serious diseases, and delay in appropriate care [2,3].

The risk of self-medication is particularly high in university students because of different factors like living away from home, facing academic pressures, and having easy access to over-the-counter (OTC) medications. All these factors create a suitable and conducive environment for unsupervised drug use [2]. According to a systematic review and meta-analysis, approximately 70% of university students are engaged in self-medication globally [3]. Interestingly, medical students reported higher rates of self-medication than their non-medical peers [3,4]. Analgesics and antipyretics were listed as most commonly self-administered drugs, used for headaches and minor illnesses [3,4].

A similar picture emerges in Pakistan. A study conducted in Lahore shows that academic stress, time constraints, easy access to pharmacies, and prior medication knowledge are the key factors that encourage students to treat themselves rather than consulting a doctor [5]. A recent cross-sectional study conducted in Pakistani universities found that 64.9% of medical and non-medical students were treating themselves. The primary contributors were advice from their peers and access to pharmacies [6]. Among medical students specifically, 68.5% reported self-medicating with analgesics [6].

However, several important questions remain unanswered. Despite the growing literature on self-medication in Pakistani universities, research on hostel residents is limited. The hostel residents face a qualitatively different set of circumstances compared to students who live at home. Separated from family oversight, they tend to rely on peers for health advice, skip meals irregularly, and often have

no quick or affordable way to see a doctor when they fall ill. A day scholar who develops a headache or cannot sleep can consult a parent or family physician the same evening; a hostel student in the same situation is far more likely to reach for whatever medication is available in the room. Shared living spaces also mean that medications circulate informally between students, which adds another layer of risk that is simply absent in home-dwelling populations. For these reasons, findings from broader university-based studies cannot be straightforwardly applied to hostel students, who represent a subgroup with their own vulnerabilities, behaviors, and exposure to unsupervised drug use [7-11].

Therefore, this study aimed to assess the prevalence, patterns, and determinants of self-medication with painkillers, sleeping pills, and stress-relief medications among medical and non-medical hostel students at Gomal University, Dera Ismail Khan, Pakistan. We put a particular focus on examining the relationship between pharmacological knowledge and self-medication intentions, with the aim of exploring whether greater knowledge is associated with higher rates of intended self-medication rather than safer practices. It is a paradox that would have important implications for medical education and health policy, if confirmed by future longitudinal research.

METHODOLOGY

This cross-sectional questionnaire-based study was conducted among hostel students of Gomal University, Dera Ismail Khan, Pakistan. The study evaluated the pattern of self-medication with painkillers (NSAIDs) and sleep medicines in both male and female hostels. Students of both medical and non-medical disciplines are present in these hostels. Data were collected from 20 February 2026 to 22 March 2026 over a period of one month. Participation was open to all hostel residents at Gomal University. The study included only those students who gave informed consent and filled the questionnaire. Written informed consent was obtained from all eligible participants prior to data collection. Participation was entirely voluntary, and

students were free to withdraw at any time without consequence.

This study used a structured, self-administered questionnaire specifically designed for this study to collect data from participants. The questionnaire was developed in Google Forms and also print copies were available for students who did not have access to a reliable internet connection. It was reviewed by two faculty members for content validity, and a preliminary version was tested on a small group of students before finalizing. Items that yielded inconsistent responses during this pre-testing phase were revised or removed. The following questions were asked from participants in the questionnaire; Demographics (gender, field of study), self-medication practices (types of medications used, frequency, duration), NSAIDs use on an empty stomach, self-reported gastrointestinal side effects, knowledge of NSAIDs-related problems, and future intentions to self-medicate. NSAIDs included commonly available over the counter analgesics such as ibuprofen, diclofenac, and mefenamic acid. Sleep medications referred to any self-administered sedative, hypnotic, or anxiolytic drugs used to aid sleep, including antihistamines with sedative properties such as diphenhydramine, as well as benzodiazepines.

The sample size was calculated using the formula: $n = Z^2 \times p \times q / d^2$, with $Z = 1.96$ (95% confidence level), p = expected prevalence of self-medication (0.685 based on [6]), $q = 1-p$, and $d = 0.05$ (5% margin of error). The total number of students at hostels of Gomal University is approximately 2,000. After applying the finite population correction, a sample of 285 participants was required. To account for non-response an additional 10% was added which gave a target of 314. The achieved sample ($n = 202$) was lower than the calculated target ($n = 314$), mainly because data collection coincided with university examinations, which reduced student availability. A post hoc calculation showed that with $n = 202$ and an observed prevalence of 65.3%, the margin of error

at 95% confidence level is approximately $\pm 6.6\%$, compared to the planned $\pm 5\%$. This modest reduction in precision is acknowledged as a limitation and discussed further in the Limitations section.

Students were selected using stratified random sampling technique combined with systematic sampling. The male and female hostels were divided into four wings. Within each wing, rooms were selected systematically at a fixed interval of every third room. The starting room in each wing was chosen randomly (could be room number 1, 2, or 3). All eligible students in the selected rooms were invited to participate. However, since participation was voluntary, only those who completed the questionnaire were included in the final analysis.

Data were collected using a structured, self-administered questionnaire. The questionnaire was developed in Google Forms and was also printed as hard copies for students who did not have reliable internet access. A simple non-technical language was used in the questionnaire to ensure understanding by non-medical students. The questionnaire asked students whether they had taken any painkillers (NSAIDs) or sleep medications without a doctor's prescription during the one-month period preceding the survey.

The final version of the questionnaire included information on: gender, field of study (medical or non-medical), self-medication practices (types of medications used, frequency, duration), use of NSAIDs on an empty stomach, self-reported gastrointestinal side effects (burning sensation, acidity, black stools or vomiting), knowledge of NSAIDs-related problems, and future intentions to self-medicate. Several questions that were tested during the development phase were excluded from the final analysis because their responses were inconsistent.

To maintain anonymity, personal information (such as names or registration numbers) of students was

not collected. In hostels where hard copies were distributed, questionnaires were placed in sealed envelopes. Since up to three students shared a room, individual responses could not be traced back to a specific student, which ensured complete confidentiality.

Statistical Analysis

Data were exported from Google Forms and analyzed using statistical packages for social sciences (SPSS) version 27. Descriptive statistics including frequencies and percentages were calculated for all variables. Association between categorical variables was assessed using the Pearson chi-square test of independence. For comparisons involving small expected cell frequencies (less than 5), the Fisher-Freeman-Halton Exact Test was applied. Statistical significance was set at $p < 0.05$.

RESULTS

A total of 202 hostel students participated in this study. Of these, 80 (39.6%) were male and 122 (60.4%) were female. The majority of participants were medical students ($n=172$, 85.1%), while 30 (14.9%) were from non-medical fields. Overall, 132 students (65.3%) reported taking at least one medication without a prescription during the one month preceding the survey. Of those using medication ($n=132$), NSAIDs were the most regularly used with 118 (89.4%) students reporting their use. Sleep medications were used only by 14 students (10.6% of the medication users). These results revealed that NSAIDs were the most prevalent medication in this cohort. Table 1 shows participant demographic characteristics and medication use prevalence.

Table 1. Participant demographic characteristics and medication use prevalence

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	80	39.6
	Female	122	60.4
Field of Study	Medical	172	85.1
	Non-Medical	30	14.9
Medication Use	Using Medications	132	65.3
	Not Using Medications	70	34.7
Total		202	100.0

Values are expressed as frequency (n) and percentage (%)

Among 132 self-medicated students, the use of sleep medication was infrequent. Only 14 medication users reported using sleep medications. Among these, 57.1% ($n=8$) used them once, 28.6% ($n=4$) used them 2–3 times, and 14.3% ($n=2$) used them weekly or more frequently. The majority $n=116$ (87.9% of self-medicated students) reported no sleep medication use. This pattern indicates that use of sleep medication is less common in this student population, and mostly they are used occasionally not regularly.

The patterns of painkiller use varied. Among the 132 self-medicating students, 50 (37.9%) used NSAIDs 2–3 times per month, 48 (36.4%) used them once, 14 (10.6%) used them weekly or more, and 4 (3.0%) used them daily. Sixteen students (12.1%) reported no NSAIDs use. Overall, 83.1% of NSAIDs users (98/118) were taking them on an occasional basis (once to 2–3 times per month), which shows episodic use of these medications rather than chronic pain management.

Regarding duration, most students (n=82, 62.1%) used NSAIDs for 1–2 days, which suggests self-management of acute pain. A smaller proportion

used them for 3–5 days (n=14, 10.6%) or more than 5 days (n=20, 15.2%). Table 2 shows patterns of medication use by their types and frequency.

Table 2. Patterns of medication use - types and frequency

Medication Use Pattern	Category	Frequency (n)	Percentage (%)
Medication Type	NSAID*	118	89.4
	Sleep Medications	14	10.6
Sleep Medication Frequency	Once	8	6.06
	2-3 times	4	3.03
	Weekly or more	2	1.5
	No sleep medication use	118	89.39
NSAID Usage Frequency	Once	48	36.4
	2-3 times	50	37.9
	Weekly or more	14	10.6
	Daily	4	3.0
	No NSAID use	16	12.1
Duration of NSAID Use	1-2 days	82	62.1
	3-5 days	14	10.6
	More than 5 days	20	15.2
	No painkiller use	16	12.1

NSAIDs*= non-steroidal anti-inflammatory drug, N = 132 (self-medicated students)

A chi-square test revealed a statistically significant association between gender and the type of medication used ($\chi^2 = 6.726$, $df = 2$, $p = 0.035$). Use of sleep medications among male participants were nearly four times more than females (12.5% vs. 3.3%). Among the 14 sleep medication users, 10

(71.4%) were male and 4 (28.6%) were female. NSAIDs use was reported by 52.5% of males and 62.3% of females. The proportion of students reporting no medication use was similar between males (35.0%) and females (34.4%). Table 3 shows gender distribution by medication type.

Table 3. Gender distribution by medication type (N=202)

Medication Type	Male n (%)	Female n (%)	p-value	Total n (%)
NSAID	42 (52.5)	76 (62.3)	0.035	118 (58.4)
Sleep	10 (12.5)	4 (3.3)		14 (6.9)
No Medication	28 (35.0)	42 (34.4)		70 (34.7)
Total	80 (39.6)	122 (60.4)		202 (100.0)

Among the 132 self-medicating students, 84 (63.6%) reported never taking NSAIDs on an empty stomach. However, 18 (13.6%) students reported that sometimes they did so. Sixteen students (12.1%) reported that they often take NSAIDs on empty stomach. Overall, 28.8% (n=34/118) of NSAIDs users engaged in this risky behavior.

Two cross-tabulation analyses examined the relationships between field of study, knowledge of NSAIDs related problems, and intentions for future self-medication. Medical students showed significantly higher awareness of NSAIDs-related problems compared to non-medical students (60.9% vs. 30.8%, $p = 0.008$). However, this knowledge did not ensure safer medication practices. Paradoxically, medical students

possessing more knowledge about the risks of NSAIDs showed high intentions of self-medication in future. About 48% of them said yes, compared to only 14% of those without that knowledge (47.6% vs. 13.6%, $p < 0.001$), which is a big difference of 34 percentage points. The effect size was medium ($\phi = 0.32$). Table 4 shows the full breakdown.

This paradoxical finding shows that knowledge alone is not sufficient to change health behavior. We also need to address its root causes such as, overconfidence bias among medical students, which feel them capable of diagnosing themselves. Barriers in easy access to healthcare system may push students to use their own knowledge rather than seeking professional help.

Table 4. Knowledge of NSAIDs problems and future self-medication intentions: analysis summary and effect sizes

Analysis Type	Statistical Test	Result	p-value
Field of Study vs. Knowledge of NSAID Problems	Fisher-Freeman-Halton Exact Test	Medical: 60.9% (78/128), non-medical: 30.8% (8/26)	0.008
Knowledge of NSAID Problems vs. Future Self-Medication Intentions	Pearson Chi-Square test	With Knowledge: 47.6% (40/84), Without Knowledge: 13.6% (6/44)	<0.001

Note. N=154 valid cases (Field vs. Knowledge), N=152 valid cases (Knowledge vs. Self-Medication). Fisher-Freeman-Halton Exact Test is appropriate due to expected cell frequencies < 5 . ϕ = Phi coefficient (effect size for categorical variables).

DISCUSSION

Our initial hypothesis that greater pharmacological knowledge among medical students would be associated with higher rates of intended self-medication rather than safer practices was supported by the data. Medical students showed significantly higher awareness of NSAIDs-related risks (60.9% vs. 30.8% in non-medical students, $p = 0.008$). Despite higher knowledge, they showed 3.5 times greater intentions to self-medicate in the future (47.6% vs. 13.6%, $p < 0.001$).

The 65.3% prevalence of self-medication documented in this study is backed by previous Pakistani research. A previous study conducted among University Students in Lahore, documented a 64.9% prevalence of self-medication among medical and non-medical students [6, 12, 13], while the global prevalence among university students is approximately 70.1% [4]. These consistent figures show that self-medication is a common habit among students throughout the world. Similar findings have been reported in other Pakistani studies. A study conducted among pharmacy students in Karachi by Anjum et al. found high self-medication rates, suggesting that this behavior is not limited to medical institutions [14]. A recent systematic review covering Pakistani studies confirmed that analgesics are consistently the most self-administered drug class across student populations [15]. Rehman et al. similarly noted that overconfidence in self-diagnosis is a major driver among medical students, which aligns with the knowledge-behaviour discrepancy we observed [16].

However, in our study, the use of NSAIDs was 89.4% (among those who self-medicated) that is much higher than the 68.5% reported in a study conducted at Superior University [6]. This difference might be because our study specifically focuses on hostel students, which are more vulnerable, as they have limited access to timely medical care. Similar high rates of self-medication with analgesics have been reported in other international studies, such as 95.4% among university students in Nepal [7] and 40.8% in

Portugal [8].

A notable finding of this study was a significant gender disparity in sleep medication use. Prevalence of self-medication was four times higher in males than females (12.5% vs. 3.3%, $p = 0.035$). Male participants comprised 71.4% of all sleep medication users. This finding is particularly interesting if we look at the overall prevalence of sleep medication use in our study (10.6% among medication users), which is comparable to the global average of 13.1% reported among university students [9]. Several factors may explain this gender disparity. First, cultural norms around masculinity and mental health may make male students less likely to seek professional help for sleep difficulties. Second, female students often have stronger social support and coping strategies, which may reduce their reliance on sleep medication. Third, it is also possible that male students experience higher academic or social stress, though this needs more research. It is important to note that gender differences in self-medication vary depending on the institution and culture. For example, a study among nursing students found that self-medication was most common among female nursing students than males because they felt it was harder to see a doctor [10].

The most striking finding of this study was the knowledge-behaviour discrepancy: medical students understood NSAIDs risks far better than non-medical students (60.9% vs. 30.8%), yet that knowledge didn't lead to safer practices. On the contrary, they were 3.5 times more likely to plan future self-medication than those without knowledge (47.6% vs. 13.6%). This paradoxical finding directly challenges the assumption that health education alone is enough to promote rational medication use. Similarly, another study also reported a high prevalence of self-medication among medical students (65.3%) compared to non-medical students (35.9%) [11]. This suggests that rather than preventing, pharmacological knowledge may increase self-medication. Similarly, a study found that 83% of medical and pharmacy students self-medicated during the COVID-19 pandemic,

which is a remarkably high rate despite their advanced training [12]. This discrepancy can be explained through several ways. First, overconfidence bias may lead medical students to overestimate their diagnostic abilities, which makes them feel qualified enough to treat themselves without professional consultation [17]. Second, students may know the risks but barriers like lack of time, financial constraints or just finding it a hassle make them treat themselves instead of seeing a doctor [18]. Third, past success with self-medication may be associated with a higher likelihood of repeating the behavior. Over time, knowledge may become associated with justification of self-medication rather than safer practices. These findings have important implications for medical education, such as simply teaching the drug side effects to students is not enough, instead curricula should also address the cognitive biases, that may lead students to believe that they are immune to those same risks. Training should emphasize the importance of seeking professional help despite one's own knowledge.

A concerning finding was that 28.8% of NSAIDs users reported taking these medications on an empty stomach. This practice can significantly increase the risk of gastrointestinal irritation, bleeding, and ulceration [19]. This finding is consistent with Ahmad et al., who reported that despite very high awareness of drug side effects among nursing students (97.8%), unsafe medication practices still persisted [10]. A similar pattern was also noted by Yasmin et al., where medical and pharmacy students showed high self-medication rates despite their clinical training [20]. This knowledge-practice gap reinforces the knowledge-behavior discrepancy observed in this study. It suggests that awareness of risks and giving information about risks isn't enough. Interventions are also needed to address the behaviors and circumstances that drive unsafe practices.

Our study has several strengths. First, it specifically focused on hostel students which is a unique vulnerable subgroup that has received limited attention in Pakistan's self-medication research.

Second, the study not only examined the prevalence of self-medication but also examined risky behaviors (like taking NSAIDs on an empty stomach) and the relation of knowledge to future intentions. That's how we uncovered the knowledge paradox. Third, the inclusion of both medical and non-medical students enabled direct comparison of knowledge and behavior between these groups.

Several limitations must be acknowledged. First, the final sample size was smaller than the calculated target due to lower-than-expected participation. This limits the statistical power and generalizability of the findings. Second, the cross-sectional design precludes causal inferences; we can identify associations but cannot determine causality. Third, data were self-reported, which introduces the possibility of recall bias (students may not accurately remember their medication use) and social desirability bias (students may underreport behaviors they know are unsafe). Fourth, most of our participants were medical students (85.1%), which simply reflects the fact that Gomal University hostels have more medical students. However, this limits the generalizability of our findings to non-medical student populations. Fifth, since the study was conducted at a single university, so its findings may not be representative of hostel students at other institutions in Pakistan. Finally, another study found that pharmacy students who knew more about drug risks were less likely to self-medicate, which opposes our knowledge paradox finding [13]. This difference highlights that the association between knowledge and self-medication is not uniform across healthcare programs and warrants further investigation.

The findings of this study have several implications for policy and practice. Universities should make on-campus health services which are affordable and easy to access. They should also focus on sleep and stress related issues especially for male students, since they're more likely to self-medicate with sleep aids. For medical schools, simply teaching about drug risks isn't enough. They also need to tackle the overconfidence that pushes students to treat themselves. Finally, pharmacies should reconsider

how easily NSAIDs and sleep medications are sold without a prescription. These drugs may seem harmless, but taking them without medical guidance such as on an empty stomach can cause serious side effects.

CONCLUSION

This study found a high prevalence of self-medication among hostel students at Gomal University, with NSAIDs being the most commonly used drugs. A significant gender disparity was observed, showing that male students took sleep medications nearly four times more often than female students. Most importantly, we found a knowledge-behaviour discrepancy about medical students having greater awareness of NSAIDs risks, yet they were showing more intentions of self-medication in the future. This finding suggests that health education alone is insufficient to promote safe medication practices. Interventions must address overconfidence bias, improve healthcare access, and target the unique vulnerabilities of hostel-dwelling students. Without such measures, the gap between knowledge and safe practice will likely continue.

Conflict of Interests: The authors do not report any conflict of interests

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Authors' Contribution:

MA, RW: Substantial contributions to the conception of the work; and the acquisition of data for the work;

WUK: Substantial contributions to the conception of the work; and the acquisition of data for the work;

agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

KB, HK: Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

SSZ, NUR: Analysis and interpretation of data for the work; drafting the work and revising it critically for important intellectual content; final approval of the version to be published

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