



# A Cross-Sectional Study to Investigate the Prevalence of Self-Medication of Non-Opioid Analgesics Among Medical Students at Qassim University, Saudi Arabia

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**Purpose:** Self-medication (SM) using non-opioid analgesics (NOA) is contentious and increasingly recognized as a major public health concern with severe consequences, including masking of malignant and fatal diseases, risk of misdiagnosis, problems relating to over- and under-dosing, drug interactions, incorrect dosage, and choice of therapy. Herein, we aim to determine the prevalence of SM with NOA among pharmacy and medical students at Unaizah College, Qassim University, Saudi Arabia.

**Patients and Methods:** A cross-sectional study using a validated self-administered questionnaire was conducted on 709 pharmacy and medicine students belonging to an age group of 21–24 years from Unaizah Colleges. Data were statistically analyzed using SPSS version 21.

**Results:** Of 709 participants, 635 responded to the questionnaire. Our results showed a prevalence percentage of 89.6% using self-medicated NOA for pain management. The most common factor leading to SM in NOA was the mild nature of the illness (50.6%), and headache/migraine (66.8%) was the dominant health problem. Paracetamol (acetaminophen, 73.7%) was the most commonly used analgesic, followed by ibuprofen (16.5%). The most common and reliable sources of drug information were pharmacists (51.5%).

**Conclusion:** We observed a high rate of SM for NOA among undergraduate students. We believe that the adverse consequences of SM could be controlled through educational, regulatory, and administrative strategies by providing appropriate awareness sessions, and the role of pharmacists should be highlighted in preventing SM from NOA.

**Keywords:** paracetamol, pharmacy and medical students, pharmacists, analgesics, questionnaire, Drug Safety

## Introduction

Self-medication (SM) is a global concern affecting patient care and is caused by using any drug not prescribed by a licensed practitioner to self-alter prescribed doses.<sup>1</sup> The World Health Organization (WHO) defines SM as “the selection and use of medicines by individuals to treat self-recognized illnesses or symptoms”.<sup>2</sup> SM is an element of self-care where people take the lead to prevent illness and maintain health using medicines. Self-care includes health-related actions and choices by people providing first aid in daily life, drug-free self-care, social support during illness, and SM.<sup>3</sup> SM may take different forms, including buying over-the-counter (OTC) drugs, the use of leftover prescription drugs, and the sharing of prescriptions with others.<sup>4</sup> They also include family and friends to repurpose outdated medicines, adjusting the dosage of prescribed medications.

Responsible SM requires medicines with proven safety and efficacy for approved conditions within prescribed doses.<sup>5,6</sup> SM may be beneficial for patients with minor illnesses, helping to reduce treatment costs, travel time to healthcare centers, patient waiting time, and physician consultation time.<sup>7,8</sup> However, even if used responsibly, SM poses



several risks, including inaccurate self-diagnosis, delays in seeking medical advice, infrequent but severe adverse reactions, dangerous drug interactions, incorrect administration, dosage, and choice of therapy, and polypharmacy.<sup>9</sup> Furthermore, the active ingredient of SM products at the intended dose should have low toxicity (for example, no reproductive toxicity or genotoxic or carcinogenic properties) unless such hazards are appropriately addressed.<sup>3</sup>

Non-opioid analgesics (NOA) are widely used for treating different types of pain. NOA has several benefits over opioid analgesics and shows reduced side effects such as nausea, vomiting, constipation, urinary retention, respiratory depression, and sedation, and therefore has better outcomes and less dependence.<sup>10</sup> The most commonly used NOA includes acetaminophen (paracetamol), anticonvulsants (gabapentin and pregabalin), antidepressants (amitriptyline and duloxetine), aspirin (acetylsalicylic acid), other non-steroidal anti-inflammatory drugs (NSAIDs; ibuprofen, diclofenac, naproxen, and COX-2 inhibitors), and topical agents (lidocaine and capsaicin).<sup>11</sup>

In Saudi Arabia, analgesics are the most commonly used drug class, particularly NSAIDs, according to a study that examined drug use patterns in the country between 2010 and 2015.<sup>12</sup> NOA is the most consumed OTC drug with the highest frequency of SM in many developing countries.<sup>13–15</sup> In Kuwait, the prevalence of SM among high-school students is 92%,<sup>16</sup> whereas, in Yemen, SM with antibiotics accounts for 60%.<sup>17</sup> In Saudi Arabia, NOA such as paracetamol (acetaminophen), aspirin, ibuprofen, naproxen, and diclofenac are readily available;<sup>18</sup> however, OTC medications are not free from side effects, and their overuse can be harmful.<sup>19</sup> Paracetamol (ie acetaminophen) is the most common agent employed in self-poisoning among adults; however, it is unclear whether adolescents understand the severe complications associated with its misuse.<sup>20</sup> Similarly, overuse of diclofenac has been associated with an increased risk of cardiovascular disease when used in large doses for extended periods.<sup>21</sup> Even though the prevalence of SM may vary among people with different sociodemographic backgrounds, it is prevalent among students because of its easy accessibility, low cost, and lack of time to seek medical consultations.<sup>8</sup> The most prominent age group involved in SM behaviors ranges from 20 to 29 years.<sup>22</sup> Moreover, SM among students with medical backgrounds is reported to be higher than that of the general population, perhaps because of a better understanding of medicines and their side effects.<sup>23–25</sup> However, the misuse of NOA may lead to overdosing and interactions with other prescription medications. Therefore, evaluating student knowledge and practices regarding NOA SM is necessary. Reviewing the available literature, this issue has not been thoroughly investigated among students in Unaizah campus, Qassim University, Saudi Arabia.

This study aimed to identify the prevalence of SM of NOA among medical students, factors associated with SM of NOA, sources of information, and adverse drug reactions (ADRs).

## Materials and Methods

### Study Design, Location, and Duration

This cross-sectional study was conducted among students in the pharmacy and medicine colleges at Unaizah College of Pharmacy and Medicine, Qassim University, located in Unaizah, Qassim Province, Saudi Arabia. The Qassim is a densely populated region of Saudi Arabia, with an area of 58,046 km<sup>2</sup> and an approximate population of 1,370,727.<sup>26</sup> Situated at the heart of the province, Qassim University is the center of many colleges, including medical and pharmacy schools. Data were collected between January and March 2019.

### Study Tool

A structured self-administered questionnaire was designed following extensive literature.<sup>27–29</sup> English is the teaching medium for the study participants and was chosen as the language for the study. The questionnaire was divided into two sections: the first section concerned the participants' sociodemographic data, whereas the second section focused on SM of NOA, discussing, in particular, the frequency of SM of NOA, the factors and disease conditions that lead to SM, the most reliable source for drug information, the types of ADRs caused by SM of NOA, if any, and, finally, the general concepts concerning SM of NOA. The first page of the questionnaire contained comprehensive survey data. All the participants provided informed consent before completing the questionnaire.

As SM with prescription-only medications is not recommended, and strict regulations exist in the Saudi market for these products requiring valid prescriptions,<sup>8</sup> analgesics such as opioids were excluded. The pilot and validation of the

questionnaire were conducted in several phases. First, it was presented to a panel of experts, including clinical pharmacy academicians, clinical pharmacists from hospitals, community pharmacists, and general physicians (GPs). The questionnaire was then modified following the feedback from the experts and piloted by ten medical and ten pharmacy students. The questionnaire was statistically validated using reliability testing, which revealed a Cronbach's alpha of 0.71.

## Study Participants and Eligibility Criteria

This study was directed to undergraduate students, including pharmacy and medicine student interns at Unaizah Colleges, who had used NOA by themselves without a medical prescription. Students other than pharmacy and medicine colleges, and those who had used analgesics via medical prescriptions, were excluded from the study. Students who refused to participate were excluded from the study. Data from incomplete questionnaires were excluded from the final analysis.

## Sample Size and Data Collection

The study targeted 878 undergraduate students and interns from the Unaizah College of Pharmacy and Medicine. A referral to student affairs at the Unaizah College of Pharmacy and Medicine stated that, during the data collection period, the total number of pharmacy and medical students was 429 (246 female and 183 male) and 449 (232 female and 217 male), respectively, including intern students. Participants were selected via convenience sampling technique. Questionnaires were distributed to each class leader and distributed among the students. After one week, the completed questionnaires were collected and returned to the researchers by the student class leaders. An additional week was added to the study period to maximize the number of responses obtained from the participants. The obtained data were imported into Excel 2016, coded, and statistically analyzed using SPSS version 21.

## Data Analysis

The results were analyzed using version 21, SPSS (Statistical Package for Social Sciences) (IBM Corp., Armonk, NY, USA). Descriptive data are presented as frequencies and percentages. Spearman correlation was used to detect correlations between sex, academic year, and self-medication using analgesics, as well as between self-medication using analgesics and ADRs ( $p < 0.05$ , considered to indicate a statistically significant difference).

## Ethical Approval

This study complies with Declaration of Helsinki and the ethical approval was obtained from Committee of Research Ethics at Qassim University, Saudi Arabia (reference number 04-04-2018).

## Results

### Sociodemographic Characteristics of Participants

Out of 878 target population, 709 participants were responded completely to the study questionnaire, representing a cumulative response rate (RR) of 80.75%. The response rates for Unaizah College of Pharmacy (UCP) and Unaizah College of Medicine (UCM) were 82% and 79.5%, respectively.

The demographic characteristics of the participants ( $N = 709$ ) are detailed in [Table 1](#). Of 709 participants, 451 (63.6%) were females, and 532 (75%) belonged to the age group of 21–24. Approximately one-quarter of the participants were second-year students (161, 22.7%), followed by third-year students (142, 20%). The number of UCP and UCM participants included was 352 (49.6%) and 357 (50.4%), respectively.

### Prevalence of SM of NOA

As shown in [Table 1](#), most participants (635 out of 709 total participants, 89.6%) were self-medication analgesic users. The prevalence of analgesic self-medication in the UCP was close to that in the UCM (90.1% and 88.8%, respectively). Self-medication using NOA was more prevalent among females (92.2%) than males (84.5%), with a significant statistical correlation (Spearman correlation test,  $p$ -value 0.001). The highest rate of SM using NOA was observed in the >24 years

**Table 1** Demographic Characteristics of the Participants with Respect to SM of NOA (N = 709)

Characteristics	No. (%)	Self-Medication		p-value*
		User No. (%)	Non-User No. (%)	
Gender				0.001
Female	451 (63.6%)	417 (92.4%)	34 (7.6%)	
Male	258 (36.4%)	218 (84.5%)	40 (15.5%)	
Age group in years				0.000
18–20	163 (23%)	144 (88.3%)	18 (11.7%)	
21–24	532 (75%)	478 (89.8%)	54 (10.2%)	
Older than 24	14 (2%)	13 (92.9%)	1 (7.1%)	
College				0.43
UCP	352 (49.6%)	318 (90.3%)	34 (9.7%)	
UCM	357 (50.4)	317 (88.8%)	39 (11.2%)	
Academic level				0.67
Preparatory year	96 (13.5%)	90 (93.7%)	6 (6.3.3%)	
First year of medicine	71 (10%)	67 (94.4%)	4 (5.6%)	
Second year	161 (22.7%)	137 (85.1%)	24 (14.9%)	
Third year	142 (20%)	119 (83.8%)	23 (16.2%)	
Fourth year	111 (15.7%)	99 (89.2%)	12 (10.8%)	
Fifth year	92 (13%)	88 (95.7%)	4 (4.3%)	
Internship year	36 (5.1%)	36 (100%)	0 (0.0%)	
<b>Total</b>	<b>709 (100%)</b>	<b>635 (89.6%)</b>	<b>74 (10.4%)</b>	

Notes: \*Spearman correlation test,  $p < 0.05$  was considered significant.

age group (13, 92.9%), followed by the 21–24-year-old age group (478, 89.8%), with a significant correlation between age and SM use (Spearman correlation test, p-value 0.000).

All internship students were analgesic SMs (36, 100%); 88 were fifth-year students (95.7%), followed by 67 (94.4%) first-year medicine students who were more likely to self-medicate than students in other year groups, with a non significant statistical correlation between academic levels (Spearman correlation test, p-value 0.67).

## Factors and Health Problems That Lead to NOA SM

The most common factors that led to SM in the NOA group were the mild nature of the illness (321, 50.6%) and prior recommendation by a physician (121, 19.1%), as described in Table 2. The most common health problem that prompted students to engage in SM of NOA was having a headache/migraine (424, 66.8%) followed by a cough, cold, and fever (72, 11.3%).

## Analgesic SM Administration and Reporting of ADRs

For analgesic SM, paracetamol/acetaminophen was the primary choice for most participants (468, 73.7%), followed by ibuprofen (105, 16.5%). Most participants used analgesics only during pain (573, 90.2%), while in 36 (5.7%) cases,

**Table 2** Factors and Health Problems That Lead to SM of NOA

		No. (%)
<b>Factors</b>	Prior Recommendation by a Physician	121 (19.1%)
	Mild nature of illness	321 (50.36%)
	Advice from friend/family member	109 (17.2%)
	Lack of time for consultation	70 (11%)
	High cost of consultation	14 (2.2%)
<b>Health problems</b>	Headache/migraine	424 (66.8%)
	Cough/cold/fever	72 (11.3%)
	Abdominal pain	36 (5.7%)
	Sports injury	14 (2.2%)
	Muscle fatigue	9 (1.4%)
	Back pain	26 (4.1%)
	Menstruation pain	47 (7.4%)
	Others	7 (1.1%)
<b>Total</b>		<b>635 (100%)</b>

analgesics were used before pain. Most participants (425, 66.9%) administered analgesics unrelated to meals, whereas 114 (18%) administered them two hours after meals.

Most participants (612, 96.4%) did not report any ADRs; however, a few participants reported gastritis (23, 3.6%), epigastric pain (8, 1.3%), rash (3, 0.47%), constipation (3, 0.47%), sleepiness (2, 0.3%), bronchoconstriction for asthmatic case (1, 0.15%), headache (1, 0.15%), fever (1, 0.15%), and hepatotoxicity (4, 0.63%). A non significant association was observed between self-medication using analgesics and the occurrence of side effects (Pearson's chi-squared test, p-value = 0.074).

### Reliable Source(s) of Information Regarding SM of NOA

Our data showed that the decision to use SM was prevalent with pharmacists (327, 51.5%). A doctor's previous prescription was the next leading source (119, 18.7%), and social media was the least reliable source (11, 1.7%).

### Concepts Regarding SM of NOA

Approximately half of the participants (316, 49.8%) believed to possess a comprehensive knowledge of the drug being consumed. Only 104 (16.4%) participants understood the importance of consulting a doctor before consuming a new medicine, whereas 47 (7.4%) prescribed drugs to others. The participants concepts concerning SM of NOA are summarized in Table 3.

### Discussion

We observed a high prevalence (89.6%) of SM in NOA practice among pharmacy and medical students from Unaizah colleges, which is higher than that previously reported in Saudi Arabia (75.2%),<sup>28</sup> the Emirates (65%),<sup>6</sup> Pakistan (78%),<sup>30</sup> and India (63.6%).<sup>31</sup> The significant statistical association between participant age and SM of NOA reflects considerable self-confidence in SM with an increase in age. Even though the study participants were university students, the association between increased age and SM is of great significance and has been widely studied. A systematic review of SM among older people reported that SM ranges from 20% to 60% and identified analgesics as the most commonly

**Table 3** Concepts Regarding SM of NOA

Concept	No.	%
I have all the knowledge about the drug I am taking	316	49.8
I also prescribe self-medication to others	47	7.4
I believe that the greater the pain, the more drugs should be taken	52	8.2
I prefer using a famous brand for the treatment	51	8
I prefer the oral route for drug administration instead of intravenous and topical treatments	65	10.2
It is necessary to consult a doctor before taking a new medicine	104	16.4
<b>Total</b>	<b>635</b>	<b>100</b>

consumed non-prescription drugs.<sup>32</sup> Several factors are associated with an increased incidence of SM among advanced age groups, including increased morbidities and healthcare costs, leading to a tendency to self-medicate for minor health ailments. Therefore, awareness of the harmful effects of SM should be addressed to all age groups, and such behaviors should be evaluated and counseled early.

Similar to previous studies, our data showed females have a higher tendency to self-medicate than males,<sup>30,31</sup> and could be attributed to the fact that females experience pain, such as menstrual pain, more frequently than men, making them more likely to consume analgesics for pain relief. Conversely, another Saudi study revealed that analgesic SM was more frequently used in males than in females.<sup>14</sup> A study conducted among female Malaysian university students reported that more than half of the females self-medicated using leftover medicines shared by friends and relatives.<sup>33</sup> Among our study population, one of the possible factors for SM being common among females could be the lack of accessibility to healthcare facilities. Saudi Arabia recently lifted its ban on women driving in the kingdom; however, until now, most women have been dependent on their male family members to bring them to healthcare facilities.

Interestingly, all internship students engaged in the SM of the NOA, possibly due to the easy accessibility of drugs during their hospital training periods. Interns are significant among the student population and are required to complete their training in hospital settings. Therefore, interns' inclusion in this study was essential, considering their role as healthcare providers, immediately after completing the training phase. Owing to their daily exposure to patients in wards, we believe that their knowledge and practice of SM of NOA should be evaluated to ensure their views on SM practices. The non-significant statistical correlation between academic year and NOA SM indicates that SM may have occurred either because of a lack of awareness of SM health hazards and their naïve nature, in the case of preparatory-year students, or high self-confidence, in the case of fifth- and internship-year students.

Understanding the nature of an illness is crucial for SM. Our results showed the mild nature of illnesses being a critical factor affecting the SM practice and was consistent with most or nearly all studies previously conducted, including the studies on undergraduate medical students in India, the general Saudi population in Makkah, KSA, on medical students in India and the Emirates, in primary healthcare centers in Riyadh, KSA, and on medical, pharmacy, and health sciences students in Ethiopia.<sup>6,15,27,29,31,34</sup>

In this study, the most commonly reported health problems that led to SM in NOA were episodes of headache or migraine, which is consistent with observations in the majority of previous studies,<sup>28,30,31</sup> whereas other causes, such as fever, were identified in other studies.<sup>27,29,34</sup> SM for headaches is a global concern, and the overuse of headache medications may lead to several adverse effects. Furthermore, the SM of NOA for headaches may mask the actual cause, preventing a timely and accurate disease diagnosis. People with SM behaviors usually bypass physicians to save both cost and time. However, the medicines are bought at pharmacies, suggesting that community pharmacists are in an ideal position to monitor and counsel the patients regarding the rational and safe use of medicines.<sup>35</sup>

Consistent with the previous studies, our results showed that the NOA most commonly used by participants was paracetamol (acetaminophen).<sup>15,27-31,34</sup> When used above the prescribed limit of 4 g/day, paracetamol could be



hepatotoxic;<sup>36</sup> however, it remains the most extensively used analgesics sold OTC, and is regarded as safe by the scientific community. Contrastingly, it is the most common drug known to be overdosed, causing hepatic toxicity (excessive doses between 7.5 g and 10.0 g).<sup>37</sup> Paracetamol, and some other OTC analgesics, is also known to cause self-poisoning with the intention of suicide.<sup>38</sup> Easy access to these OTC drugs among young university adults is a concern. Therefore, awareness campaigns among young adults at the school, college, and university levels are essential to reduce the risks associated with excessive use of NOA, especially acetaminophen. Moreover, community pharmacists must ensure proper counseling before selling OTC drugs.

According to this study, the pharmacist is the most common and reliable source of drug information, as reported in Saudi Arabia, Pakistan, and the Emirates.<sup>6,29,30</sup> Prior experience with the same illness<sup>27</sup> and a previous doctor's prescription<sup>31</sup> are also considered the most reliable sources of drug information. Interestingly, approximately half of the UCM students chose pharmacists as a reliable source of drug information, indicating the high confidence levels of future doctors in the pharmacy sector. The most common concept that encouraged students to self-medicate was their comprehensive knowledge of the drug, reflecting a high self-confidence level, agreeing with the results of previous studies.<sup>6,30,31,34</sup> It has been hypothesized that establishing patient-physician-pharmacist partnerships to educate and inform the general public about SM and raise awareness of the risks and dangers associated with drug misuse and abuse could help encourage students and the general population towards safe SM practice.<sup>19</sup>

Even though SM can help treat minor conditions that do not require medical interventions reducing the burden on medical services, the availability of prescription drugs without prescriptions is a considerable concern. Recently, strict regulations have been imposed by the Saudi Ministry of Health (MOH) on community pharmacies, prohibiting pharmacists from dispensing drugs without a prescription issued by a licensed doctor to practice in the Kingdom. Through an awareness campaign promoted on its social media pages, the MOH stated that violators would face legal actions, which included a fine of up to 100,000 SAR, the abolition of their license, and imprisonment for up to six months. These moves by the MOH are to discourage the illegal use of medicines in the Kingdom.<sup>39</sup> Along with many other detrimental effects, SM poses a considerable risk of hospitalization. A French study exploring SM behavior reported that 84.4% of patients self-medicated before they were admitted to the hospital, with 60% using a drug that had been prescribed to them earlier; two out of three patients resorted to such behavior within two weeks of admission to the hospital.<sup>40</sup> Similarly, according to a study by the German National Institute for Occupational Health and Safety, SM led to hospitalization in 3.9% of 7000 patients hospitalized between January 2000 and December 2008.<sup>41</sup> Therefore, SM practices and behaviors should be closely monitored to safeguard consumers and minimize risks.

The principal strength of this study is its sample size, with an 80.75% response rate, and the survey was specific to the SM of NOA-targeting students at pharmacy and medicine colleges. The results are of significant importance, highlighting the views of participants from the pharmacy and medical backgrounds who are real stakeholders in patient care. Safe and reasonable SM behaviors of pharmacy and medicine students would benefit patients by providing proper counseling on the rational use of analgesics. However, this study had a few limitations. Our results are based on data collected using a self-administered questionnaire and could have led to the under or over-reporting of a problem, as social desirability bias is a recognized issue with this questionnaire. In addition, the generalizability of the results is limited to similar populations. Accessing internship-year students' responses was challenging as they were out of college most of the time during their training; however, significant efforts were made to ensure their participation by meeting them during their clinical visit days with college preceptors.

## Conclusion

Among Saudi medical students, SM with NOA was significantly more common (89.6%). Even though the SM practice was for minor illnesses and only OTC medications were used, the results suggest that interventions, such as drug education programs in schools and colleges, are essential to address the consequences of self-diagnosis and the use of NOA without medical consultation. Moreover, this study revealed that pharmacists are valuable sources of drug information, reflecting high confidence in pharmacists and increasing their responsibility as healthcare providers. It is highly recommended to raise awareness among pharmacists as drug consultants about the prudent and cautious use of

medications available for SM. Furthermore, we concur with recent proposals for greater regulation of prescription and OTC medicine supplies in the Saudi market.

## Abbreviations

NOA, non-opioid analgesics; SM, self-medication; OTC, over-the-counter.

## Data Sharing Statement

The datasets used in this study are available from the corresponding author upon reasonable request.

## Ethical Approval

This study complies with the Declaration of Helsinki. Ethical approval was obtained from the Subcommittee of Health Research Ethics at Qassim University (reference number: 2018-04-04). Each participant was asked to sign a written consent form attached to the questionnaire. Participation was voluntary, and researchers offered no incentives for participation.

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## Disclosure

The authors report no conflicts of interest in this work.

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