

High Prevalence of Analgesic Misuse and Abuse and Associated Factors Among Pharmacy Students in Public and Private Universities in Zambia

Derick Munkombwe¹

University of Zambia

Theresa Musa Hassab¹

University of Zambia

Ngula Ngula¹

University of Zambia

Abigail Hanyanga¹

University of Zambia

Purity Manda¹

University of Zambia

Letrine Mabeleka¹

University of Zambia

Norman Z. Nyazema²

University of Zambia

Chikafuna Banda³

University of Zambia

Lawrence Kay Mukela

lawrencemukela@gmail.com

University of Zambia

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Abstract

Background

Analgesics are among the most widely used medicines, and their misuse among university students is a growing concern, particularly among pharmacy students who have ready access to these products. This study assessed the prevalence of analgesic misuse and abuse and their associated factors among pharmacy students in public and private universities in Zambia.

Methods

A cross-sectional study was conducted among 224 pharmacy students at the University of Zambia (UNZA, public; n = 112) and Lusaka Apex Medical University (LAMU, private; n = 112) using a self-administered questionnaire. Analgesic misuse and abuse were assessed using three separate items: off-label use, dose escalation, and recreational use. Data were analysed using chi-square tests and multivariable binary logistic regression in Stata version 18.

Results

Overall, 208 (92.9%) participants had used an analgesic in the previous 12 months. When disaggregated, 70.1% reported off-label use, 58.5% reported dose escalation, and 39.3% reported recreational or euphoric use. Paracetamol was the most commonly reported analgesic (50.4%), with opioids accounting for 9.4% of reported analgesics, including tramadol, codeine, and morphine. Knowledge gaps were substantial: 52.2% did not know the correct dose of commonly used analgesics, and 80.8% believed all analgesics could be purchased without a prescription. After adjustment, female sex (AOR 3.03, 95% CI 1.07–8.57) and being unmarried (married students: AOR 0.32, 95% CI 0.12–0.90) were independently associated with misuse/abuse behaviours; age, stage of study, and knowledge of correct dosing were not.

Conclusions

Analgesic misuse (off-label use and dose escalation) is highly prevalent among pharmacy students, with 70.1% and 58.5% respectively, while recreational analgesic abuse is reported by 39.3% of participants. Educational interventions are needed for misuse behaviours, while regulatory and disciplinary measures are needed for recreational abuse.

Background

Analgesics remain the most widely consumed class of medicines globally, driven by the high burden of pain and their accessibility as both prescription and over-the-counter products. It is estimated that more than 30 million people use non-steroidal anti-inflammatory drugs daily worldwide, with over 111 million NSAID prescriptions dispensed annually in the United States alone [1]. While indispensable for pain management, this ubiquity has precipitated a parallel public health challenge. Population-level data indicate that up to 4% of the general population overuse analgesics, with approximately 1% progressing to medication-overuse headache, a disabling secondary headache disorder [2]. The spectrum of misuse is particularly evident for combination analgesics; a review of over-the-counter medicine abuse identified codeine-containing products as one of the key product groups implicated in OTC medicine misuse [3]. These figures underscore that analgesic misuse is not a marginal behaviour but a substantial, under-recognized form of drug-related harm.

In pharmacoepidemiology, a distinction is made between drug use, misuse, and abuse. Drug use refers to taking a medication for a legitimate medical purpose as intended. Drug misuse refers to using a medication for a legitimate medical purpose but in an incorrect manner, such as using a higher-than-recommended dose or using it for a condition for which it is not indicated. Drug abuse refers to using a medication for non-medical purposes, such as recreation or euphoria [4, 5]. This study operationalized analgesic misuse and abuse using three separate items (off-label use, dose escalation, and recreational use) and, where appropriate, disaggregates these categories to allow for clear interpretation of each behaviour type.

University students constitute a high-risk population for analgesic misuse [6]. A systematic review and meta-analysis of self-medication in Uganda reported a pooled prevalence of 55.6% (95% CI 40.4–70.7) [7]. This is consistent with a global meta-analysis that found a 70.1% prevalence of self-medication among university students [6]. Regional studies reinforce this vulnerability: analgesic self-medication prevalence has been reported at 76.6% in Iranian university students [8], 55.4% among medical students and interns at King Abdulaziz University, Saudi Arabia [9], 62.9% among students in Mansoura, Egypt [10], and 63.5% at Mbarara University of Science and Technology, Uganda [11]. In the African context, this pattern is increasingly complicated by the misuse of prescription drugs, which has been linked to academic pressure, stress, and peer influence among adolescents [12].

The burden of outright analgesic abuse, distinct from self-medication, is emerging. In Nigeria, a study among undergraduates at the University of Port Harcourt reported a prevalence of analgesic abuse of 9.1%, with paracetamol accounting for 42.9% of abused agents, followed by aspirin and tramadol [13]. Critically, awareness of the risks associated with abuse was low in 47.4% of students, while only 10.9% had high risk awareness [14]. Paradoxically, pharmacy students, who are expected to possess superior knowledge of pharmacology and rational drug use, are not insulated from these practices. Evidence suggests that perceived self-competence, academic stress, easy access, and peer norms can override knowledge, leading to excessive dosing and prolonged use with attendant risks of gastrointestinal complications, liver injury, and dependence.

In Zambia, the evidence base remains fragmented and largely limited to single-institution studies. At the University of Zambia, a high prevalence of self-medication among healthcare students during the COVID-19 pandemic was reported [15]. Similarly, data from the Copperbelt University showed that self-medication is prevalent among medical students [16]. However, there remains a critical paucity of data quantifying the prevalence and drivers of analgesic misuse and abuse, rather than general use, among pharmacy students across both public and private universities. This is a significant gap, given that pharmacy students are future custodians of medicines [17], and their attitudes toward pharmacotherapy may affect future prescribing practice [18].

To address this gap, this study aimed to determine the prevalence of analgesic misuse and abuse and their associated factors among pharmacy students at the University of Zambia, a public university, and Lusaka Apex Medical University, a private university, in Zambia. The specific objectives were:

1. To determine the prevalence of analgesic use and the commonly used analgesic drugs among pharmacy students at public and private universities in Zambia.
2. To assess the knowledge and attitudes regarding safe analgesic use among pharmacy students at public and private universities in Zambia.
3. To determine the extent of analgesic misuse (off-label use and dose escalation) and abuse (recreational use) among pharmacy students at public and private universities in Zambia.

4. To identify factors associated with analgesic misuse and abuse among pharmacy students at public and private universities in Zambia.

The findings are intended to inform targeted curriculum interventions and analgesic stewardship strategies to promote rational analgesic use.

Methods

Study Design, Setting and Population

We employed a descriptive cross-sectional study design. The study was conducted at the School of Health Sciences, University of Zambia, and the Faculty of Pharmacy, Lusaka Apex Medical University, both located in Lusaka, Zambia. Data collection was conducted from June to August 2026. The source population was all pharmacy students enrolled at the two universities during the 2026 academic year. Study participants were selected using simple random sampling. Eligible participants included male and female pharmacy students who were registered at either institution during the study period and who provided written informed consent. Students who were unwilling to participate or were unavailable during the data collection period were excluded.

Sample Size Determination and Sampling Technique

The sample size was determined using Yamane's formula [19] for a finite population, assuming a 95% confidence level and a 5% margin of error, which yields a required sample of 218 students; with a 10% allowance for non-response, the target was 240 students. The total population was 480 students across both institutions (University of Zambia, $n = 232$; Lusaka Apex Medical University, $n = 248$). A stratified random sampling technique by institution and year of study was used to enhance representativeness; within each stratum, participants were selected by simple random sampling using computer-generated random numbers. Of the 242 students invited, 224 participated and were included in the final analysis, yielding a response rate of 92.6%. The achieved sample comprised 112 students from each institution.

Data Collection Instrument and Procedure

Data were collected using a self-administered questionnaire adapted from a validated instrument previously used among medical students (Zardosht et al., 2016). Additional items were developed by the study team to assess analgesic misuse (off-label use and dose escalation) and abuse (recreational use) in the Zambian context. The full study questionnaire is provided as Supplementary File 1. The instrument was pre-tested for clarity, comprehension, and internal consistency in a pilot study involving 20 pharmacy students who were subsequently excluded from the main study.

Data Analysis

Data were entered into Microsoft Excel 2016, cleaned, and then exported to Stata version 18.0 (StataCorp, College Station, TX, USA) for statistical analysis and GraphPad Prism version 10.0 (GraphPad Software, San Diego, CA, USA) for graphical presentation. Participant characteristics and analgesic use patterns were summarized using descriptive statistics; all study variables were categorical and were reported as frequencies and percentages (age was collected in predefined bands). Bivariate associations between socio-demographic characteristics and analgesic misuse/abuse were assessed using the chi-square test, with Yates' continuity correction applied to 2×2 tables. Multivariable binary logistic regression was used to identify factors independently associated with analgesic misuse and abuse; the

adjusted model included sex, age, marital status, stage of study, and knowledge of correct analgesic dosing. All statistical tests were two-sided, and statistical significance was set at $p < 0.05$.

Analgesic misuse and abuse were assessed using three separate items: (1) ever using an analgesic outside its recommended medical indication (off-label use); (2) ever using higher doses than recommended (dose escalation); and (3) ever using analgesics for recreation or euphoria (recreational abuse). Items (1) and (2) were classified as misuse (incorrect use for legitimate purposes), while item (3) was classified as abuse (use for non-medical purposes). The combined prevalence of any misuse or abuse behaviour is reported, with the three categories disaggregated in the results and discussion to allow for clear interpretation.

Results

Participant Characteristics

A total of 224 pharmacy students participated in the study, with 112 students from each institution (University of Zambia [UNZA] and Lusaka Apex Medical University [LAMU]), yielding a response rate of 92.6%. The socio-demographic characteristics of participants are presented in Table 1.

The mean age of participants was 26.4 years (SD = 6.8), with the majority (88.4%) aged ≥ 20 years. The age distribution was similar between institutions, with 87.5% of UNZA students and 89.3% of LAMU students aged ≥ 20 years ($p = 0.225$). The gender distribution was balanced overall, with females comprising 51.3% of the sample (UNZA: 50.0%; LAMU: 52.7%; $p = 0.789$). The majority of participants were unmarried (84.0%), with similar proportions at both institutions (UNZA: 88.4%; LAMU: 79.5%; $p = 0.102$).

A significant institutional discrepancy was observed regarding financial support; over half of the UNZA students (54.5%) relied on bursaries for their monthly income, compared to none at LAMU ($p < 0.001$). This reflects the different funding structures of public and private universities in Zambia [21]. Regarding residency, 68.3% of students lived off campus, with similar patterns across institutions ($p = 1.000$). Most students lived with others (77.2%) rather than alone (22.8%), with no significant institutional differences ($p = 0.202$).

Pharmacies (62.0%) and clinics (25.0%) served as the primary sources for acquiring analgesics, although a notable proportion of students (8.5%) reported obtaining analgesics from friends. The source of analgesics differed significantly between institutions ($p = 0.004$), with LAMU students more likely to obtain analgesics from pharmacies (70.5% vs 53.6%) and UNZA students more likely to obtain them from friends (12.5% vs 4.5%). Tablets were the most commonly used dosage form (71.9%), followed by syrups (16.5%) and injections (8.5%). The frequency of analgesic use was predominantly occasional (42.0%) or rare (31.7%), with only 8.0% reporting continuous use. These frequency patterns were similar between institutions ($p = 0.212$).

Table 1

Socio-demographic characteristics and analgesic sources of pharmacy students at UNZA and LAMU (n = 224)

Variable	UNZA (n = 112) n (%)	LAMU (n = 112) n (%)	Total (n = 224) n (%)	χ^2	p-value
Sex				0.071	0.789
Male	56 (50.0)	53 (47.3)	109 (48.7)		
Female	56 (50.0)	59 (52.7)	115 (51.3)		
Age, years				5.673	0.225
< 20	14 (12.5)	12 (10.7)	26 (11.6)		
20–25	31 (27.7)	37 (33.0)	68 (30.4)		
26–30	35 (31.3)	22 (19.6)	57 (25.4)		
31–35	20 (17.9)	21 (18.8)	41 (18.3)		
35	12 (10.7)	20 (17.9)	32 (14.3)		
Marital Status				2.681	0.102
Married	13 (11.6)	23 (20.5)	36 (16.1)		
Unmarried	99 (88.4)	89 (79.5)	188 (84.0)		
Year of Study				4.212	0.239
Second	30 (26.8)	38 (33.9)	68 (30.4)		
Third	36 (32.1)	25 (22.3)	61 (27.2)		
Fourth	29 (25.9)	36 (32.1)	65 (29.0)		
Fifth	17 (15.2)	13 (11.6)	30 (13.4)		
Residency				0.230	1.000
Campus	36 (32.1)	35 (31.3)	71 (31.7)		
Outside Campus	76 (67.9)	77 (68.8)	153 (68.3)		
Living Status				1.625	0.202
Alone	30 (26.8)	21 (18.8)	51 (22.8)		
With Others	82 (73.2)	91 (81.3)	173 (77.2)		
Monthly Income				81.102	< 0.001
Bursary	61 (54.5)	0 (0.0)	61 (27.2)		
No Bursary	51 (45.5)	112 (100.0)	163 (72.8)		
Source of Analgesics				13.332	0.004
Pharmacy	60 (53.6)	79 (70.5)	139 (62.0)		
Clinic	29 (25.9)	27 (24.1)	56 (25.0)		
Friends	14 (12.5)	5 (4.5)	19 (8.5)		
Others	9 (8.0)	1 (0.9)	10 (4.5)		

Variable	UNZA (n = 112) n (%)	LAMU (n = 112) n (%)	Total (n = 224) n (%)	χ^2	p-value
Dosage Form Used				10.593	0.014
Tablets	72 (64.3)	89 (79.5)	161 (71.9)		
Syrup	22 (19.6)	15 (13.4)	37 (16.5)		
Injection	11 (9.8)	8 (7.1)	19 (8.5)		
Others	7 (6.3)	0 (0.0)	7 (3.1)		
Frequency of Use				4.508	0.212
Continuously	13 (11.6)	5 (4.5)	18 (8.0)		
Intermittently	19 (17.0)	22 (19.6)	41 (18.3)		
Occasionally	48 (42.9)	46 (41.1)	94 (42.0)		
Rarely	32 (28.6)	39 (34.8)	71 (31.7)		

Prevalence of Analgesic Use and Commonly Used Drugs

Analgesic utilization was near-universal among the pharmacy student participants. Overall, **208 (92.9%)** participants reported using an analgesic within the previous 12 months, while 16 (7.1%) reported no use. The prevalence of analgesic use was higher among LAMU students (96.4%) compared to UNZA students (89.3%), though this difference did not reach statistical significance ($p = 0.069$).

Table 2 presents the commonly used analgesic drugs reported by pharmacy students. **Paracetamol** was the most frequently used analgesic, reported by 113 (50.4%) participants, followed by ibuprofen (15.6%) and diclofenac (6.3%). When categorized by drug class, paracetamol (a non-opioid) accounted for 50.4% of reported analgesics, NSAIDs accounted for 40.2%, and opioids accounted for 9.4%. The opioids identified included tramadol (2.7%), codeine (2.7%), morphine (2.2%), oxycodone (0.9%), heroin (0.4%), and methadone (0.4%). The comparison of individual analgesic use between UNZA and LAMU showed no statistically significant difference for any individual analgesic ($p > 0.05$ for all comparisons).

Table 2
Commonly used analgesic drugs by pharmacy students at UNZA and LAMU (n = 224)

Variable	Characteristic	Frequency n (%)	p-value*
Name of analgesic drug	Paracetamol	113 (50.4)	1.000
	Ibuprofen	35 (15.6)	
	Diclofenac	14 (6.3)	
	Aspirin	10 (4.5)	
	Mefenamic acid	10 (4.5)	
	Aceclofenac	7 (3.1)	
	Codeine	6 (2.7)	
	Meloxicam	6 (2.7)	
	Tramadol	6 (2.7)	
	Morphine	5 (2.2)	
	Piroxicam	4 (1.8)	
	Indomethacin	3 (1.3)	
	Oxycodone	2 (0.9)	
	Heroin	1 (0.4)	
	Methadone	1 (0.4)	
	Naproxen	1 (0.4)	
Class of analgesic	NSAIDs	90 (40.2)	
	Opioids	21 (9.4)	
	Non-opioids (Paracetamol)	113 (50.4)	

*p-values are from chi-square tests comparing UNZA and LAMU (continuity correction for 2 × 2 tables).

Extent of Analgesic Misuse and Abuse

The findings showed that analgesic misuse and abuse behaviours were common among the pharmacy students (Table 3). Overall, **203 (90.6%)** participants reported at least one of the three behaviours (off-label use, dose escalation, or recreational use). When disaggregated, **70.1%** reported off-label use, **58.5%** reported dose escalation, and **39.3%** reported recreational or euphoric use. Items (1) and (2) represent misuse (incorrect use for legitimate purposes), while item (3) represents abuse (use for non-medical purposes).

Notably, many participants reported multiple forms of misuse or abuse; among those reporting any behaviour, 89 (43.8%) reported two or more behaviours, while 114 (56.2%) reported only one type. The most common combination was off-label use combined with dose escalation, reported by 98 (48.3%) of those who reported any misuse or abuse.

Analgesic misuse was more common among LAMU (private) students than UNZA (public) students across most parameters. For off-label use, LAMU students reported significantly higher rates than UNZA students (78.6% vs 61.6%,

p = 0.009). Similarly, for dose escalation, LAMU students reported higher rates than UNZA students (67.9% vs 49.1%, p = 0.007). For recreational abuse, UNZA students reported higher rates than LAMU students (44.6% vs 33.9%), though this difference did not reach statistical significance (p = 0.132).

Table 3

Extent of analgesic misuse and abuse among pharmacy student participants at UNZA and LAMU (n = 224)

Variable	Parameter	Response	UNZA (n = 112) n (%)	LAMU (n = 112) n (%)	Total (n = 224) n (%)	p-value
Misuse	Ever used an analgesic outside its recommended indication (off-label)	Yes	69 (61.6)	88 (78.6)	157 (70.1)	0.009
		No	43 (38.4)	24 (21.4)	67 (29.9)	
	Ever used higher doses than recommended (dose escalation)	Yes	55 (49.1)	76 (67.9)	131 (58.5)	0.007
		No	57 (50.9)	36 (32.1)	93 (41.5)	
Abuse	Ever used analgesics for recreation or euphoria	Yes	50 (44.6)	38 (33.9)	88 (39.3)	0.132
		No	62 (55.4)	74 (66.1)	136 (60.7)	

Reasons for Analgesic Use

The most reported reason for using analgesics was **treatment of pain (36.6%)**, followed by a recommendation from a healthcare professional (**21.9%**) and knowledge acquired during training (**21.4%**). A smaller proportion reported using analgesics because they were recommended by friends or relatives (**11.2%**), while **8.9%** reported recreation as a reason. The distribution of reasons differed significantly between UNZA and LAMU students (overall p = 0.014). Notably, treatment of pain was more commonly reported by LAMU students (42.9% vs 30.4%, p = 0.018), while recreation was more commonly reported by UNZA students (13.4% vs 4.5%, p = 0.010).

Headache was the most reported condition for which students used analgesics, reported by 61 (27.2%) participants, followed by stomach pain (17.4%), menstrual pain (13.8%), and toothache (12.1%). The high proportion of menstrual pain as an indication (13.8%) is notable in light of the finding that female sex was independently associated with analgesic misuse and abuse.

Knowledge, Perceptions, and Attitudes

Despite their clinical curriculum, profound gaps in pharmacological knowledge and safety perceptions were evident. Table 4 summarises the key knowledge, perception, and attitude findings.

Knowledge of Safe Analgesic Use

Over half the cohort (52.2%) did not know the correct dose for commonly used analgesics, with no significant difference between institutions (UNZA: 44.6% knew correct dose; LAMU: 50.9%, p = 0.422). Widespread uncertainty surrounded severe adverse effects: 71.4% were unaware of oncological risks, 62.9% lacked knowledge regarding cardiovascular effects, and 55.4% were unaware of gastrointestinal bleeding risks. The highest proportion of participants who responded "Yes" to knowing a specific side effect was observed for the risk of stomach ulcers (39.3%), followed by kidney damage (37.5%) and gastrointestinal bleeding (35.3%).

Notable differences between institutions were observed for several knowledge items. LAMU students were more likely than UNZA students to know that incorrect use of analgesics could cause gastrointestinal bleeding (43.8% vs 26.8%, p

= 0.002) and that analgesics are not safe in all stages of pregnancy (53.6% vs 33.9%, $p < 0.001$). Conversely, UNZA students were more likely to know that taking a high dose of analgesics increases side effects (47.3% vs 33.9%, $p < 0.001$). These differences may reflect variations in curriculum emphasis or teaching approaches between the two institutions.

Safety Perceptions

Safety attitudes were notably compromised: 80.8% of pharmacy students believed all analgesics could be purchased without a prescription, and 57.1% found it appropriate to buy them from supermarkets. Only 49.1% reported knowing the side effects of analgesics, while 62.1% considered analgesics generally safe. Most concerning, 51.3% of participants endorsed the marketing of anti-inflammatories and opioids via social media, and 52.2% considered easy access to analgesics appropriate. Statistically significant differences between UNZA and LAMU were observed only for perceptions regarding the appropriateness of easy access to analgesics, with LAMU students more likely to consider it appropriate (59.8% vs 44.6%, $p = 0.032$).

Attitudes Toward Receiving Information

Despite the knowledge and perception gaps, students demonstrated a willingness to embrace professional stewardship, with 96.0% agreeing that pharmacists hold a direct responsibility to educate patients on side effects, and 86.6% agreeing that doctors should provide such information. Most participants (87.5%) agreed that patients should read drug leaflets when using a medicine for the first time. However, notable uncertainty existed regarding whether informing patients about side effects might increase anxiety (32.1% unsure), and 38.4% were unsure about the importance of being aware of medication side effects. One attitude item ("Having information about the side effects of your medicine may cause you to stop using the medicine") was excluded from the analysis because all 224 respondents answered "Agree," providing no variation for statistical analysis and potentially reflecting social desirability bias.

Table 4

Summary of knowledge, perceptions, and attitudes regarding analgesic use among pharmacy students (n = 224)

Domain	Key Finding	n (%)
Knowledge		
Knew the correct dose of commonly used analgesics	Yes	107 (47.8)
	No	117 (52.2)
Knew that incorrect use may harm kidneys	Yes	84 (37.5)
Knew that incorrect use may cause stomach ulcers	Yes	88 (39.3)
Knew that incorrect use may cause GI bleeding	Yes	79 (35.3)
Knew that incorrect use may affect blood pressure/heart	Yes	52 (23.2)
Knew that incorrect use may accelerate cancer growth	Yes	22 (9.8)
Perceptions		
Consider analgesics generally safe	Yes	139 (62.1)
Know the side effects of using analgesics	Yes	110 (49.1)
Believe all analgesics can be purchased without a prescription	Yes	181 (80.8)
Consider easy access to analgesics appropriate	Yes	117 (52.2)
Consider it appropriate to buy analgesics from supermarkets	Yes	128 (57.1)
Believe analgesics are being abused at present	Yes	109 (48.7)
Endorse marketing opioids/NSAIDs via social media	Yes	115 (51.3)
Attitudes		
The pharmacist has a direct role in providing side effect information	Agree/Strongly agree	215 (96.0)
The doctor should have a role in informing about side effects	Agree/Strongly agree	194 (86.6)
Receiving drug leaflet information for first-time use is necessary	Agree/Strongly agree	196 (87.5)

Factors Associated with Analgesic Misuse and Abuse

Of the 224 pharmacy students who participated in the study, **203 (90.6%)** reported at least one misuse or abuse behaviour, while **21 (9.4%)** reported none. The bivariate and multivariate analyses of factors associated with analgesic misuse and abuse are presented in Table 5.

In the crude analysis, **sex, marital status, stage of study, and knowledge of analgesic use** were significantly associated with misuse/abuse behaviours, while age was not statistically significant. Female students had a higher proportion of misuse/abuse behaviours than male students (94.8% vs. 86.2%, $p = 0.028$). Misuse/abuse behaviours were also more common among unmarried students (93.6%) compared with married students (75.0%, $p < 0.001$), among clinical students (93.6%) compared with non-clinical students (83.8%, $p = 0.021$), and among students who reported knowledge of the correct dose of commonly used analgesics (95.3%) compared with those who did not (86.3%, $p = 0.021$).

After adjusting simultaneously for sex, age, marital status, stage of study, and knowledge of analgesic use, **sex and marital status remained statistically significantly associated with misuse/abuse behaviours**. Female students had

approximately three times higher odds of misuse/abuse compared with male students (**AOR = 3.03, 95% CI: 1.07–8.57, p = 0.037**). Married students had significantly lower odds of misuse/abuse compared with unmarried students (**AOR = 0.32, 95% CI: 0.12–0.90, p = 0.031**). Age, stage of study, and knowledge of the correct dose of analgesics were not independently associated with misuse/abuse after adjustment. Notably, knowledge of correct dosing was not protective against misuse/abuse (AOR = 1.69, 95% CI: 0.47–6.01, p = 0.421), suggesting that knowledge alone is insufficient to prevent misuse.

Table 5: Factors associated with analgesic misuse and abuse among pharmacy student participants at UNZA and LAMU (n=224)

Variable	Characteristic	No misuse/abuse n (%)	Misuse/abuse n (%)	Crude p-value	COR (95% CI)	p-value	AOR (95% CI)	Adjusted p-value
Sex	Male	15 (13.8)	94 (86.2)	0.028	Ref	0.034	Ref	0.037
	Female	6 (5.2)	109 (94.8)		2.90 (1.08–7.77)		3.03 (1.07–8.57)	
Age (years)	<20	1 (3.8)	25 (96.2)	0.304	Ref	0.324	Ref	0.606
	≥20	20 (10.1)	178 (89.9)		0.36 (0.05–2.77)		0.57 (0.07–4.77)	
Marital status	Unmarried	12 (6.4)	176 (93.6)	<0.001	Ref	0.001	Ref	0.031
	Married	9 (25.0)	27 (75.0)		0.20 (0.08–0.53)		0.32 (0.12–0.90)	
Stage of study	Clinical	10 (6.4)	146 (93.6)	0.021	Ref	0.026	Ref	0.236
	Non-clinical	11 (16.2)	57 (83.8)		0.35 (0.14–0.88)		0.50 (0.16–1.57)	
Knowledge of analgesic use	No	16 (13.7)	101 (86.3)	0.021	Ref	0.027	Ref	0.421
	Yes	5 (4.7)	102 (95.3)		3.23 (1.14–9.15)		1.69 (0.47–6.01)	

Abbreviations: COR = crude odds ratio; AOR = adjusted odds ratio; CI = confidence interval; Ref = reference category.

Discussion

This study identified a high prevalence of analgesic misuse and abuse behaviours among pharmacy students in Zambia. When disaggregated by type of behaviour, **70.1%** reported off-label use, **58.5%** reported dose escalation, and **39.3%** reported recreational or euphoric use—the latter representing genuine substance abuse. The overall combined prevalence of any misuse or abuse behaviour (90.6%) is substantially higher than the 9.1% reported in Nigeria using a stricter, more restrictive definition of abuse [13], highlighting how sensitive prevalence estimates are to the definition

adopted. However, it is critical to distinguish between these categories to avoid conflating minor self-care errors with severe substance abuse.

The most alarming finding of this research is the substantial scale of recreational opioid abuse. The data revealed that 9.4% of analgesics utilized were opioids—specifically tramadol (2.7%), codeine (2.7%), and morphine (2.2%). The acquisition and unregulated use of high-dependency narcotics by pharmacy students for non-medical purposes represent a severe occupational and public health vulnerability. This reinforces international literature identifying codeine-containing therapeutics as major vectors for OTC abuse [3], and signals a breakdown in the protective barriers expected of future healthcare professionals. This risk is compounded by the finding that 51.3% of students viewed social media as an appropriate marketplace for opioids and NSAIDs.

The high prevalence of off-label use (70.1%) and dose escalation (58.5%) reflects patterns of analgesic misuse rather than substance abuse. Off-label use—such as using a prescription-strength analgesic for a minor headache or using paracetamol for a condition not specified on the label—is common in self-medication and may not reflect problematic behaviour. Similarly, dose escalation may occur due to inadequate pain relief, lack of awareness of dosing limits, or the perception that "more is better." These behaviours are clinically concerning and warrant educational interventions, but they are qualitatively different from recreational substance abuse. The finding that knowledge of correct dosing was not protective against misuse (AOR = 1.69, $p = 0.421$) suggests that theoretical education alone is insufficient to prevent these behaviours, likely overpowered by environmental pressures such as academic stress and easy access [12]. The profound knowledge gaps identified—52.2% did not know the correct dose, 71.4% were unaware of oncological risks—further underscore that current curricula may not adequately emphasize practical aspects of safe analgesic use.

Regression modeling highlighted that female sex is an independent predictor of misuse behaviours, with females having approximately three times the odds of misuse compared with males (AOR = 3.03). This may reflect the higher burden of conditions like menstrual pain (noted as a primary driver for 13.8% of users) combined with broader health-seeking behaviours [9, 10]. Married status served as a protective factor (AOR = 0.32), consistent with greater social support and more stable living circumstances [22].

Analgesic misuse was more common among LAMU (private) students than UNZA (public) students for off-label use (78.6% vs 61.6%) and dose escalation (67.9% vs 49.1%). These differences may reflect variations in curriculum emphasis, student demographics, or cultural norms regarding medication use. The significant income disparity (all LAMU students had no bursary vs 54.5% of UNZA students) may also contribute to stress and coping behaviours.

This study has several limitations. The cross-sectional, self-reported design precludes causal inference and may be affected by recall and social desirability bias. The misuse/abuse outcome was operationalised as any of three behaviours (off-label use, dose escalation, or recreational use). This composite definition is broader than definitions used elsewhere and inflates the combined prevalence relative to clinical definitions. However, we have disaggregated these categories throughout the analysis and discussion to allow for clear interpretation of each behaviour type. One attitude item was excluded from the analysis because all 224 respondents gave the same answer, and a small number of respondents (16) who reported no analgesic use in the previous 12 months still named a specific analgesic in the following question; neither issue affects the misuse/abuse classification. The findings may not generalise to other universities or to non-pharmacy students.

Despite these limitations, the findings have practical implications for pharmacy education and regulation. Curricula should place greater emphasis on rational analgesic use, including dosing limits, the risks of off-label use, and the dangers of opioid dependence. Regulatory authorities should enforce prescription-only sale of opioid analgesics and monitor access channels, and universities should implement awareness and monitoring programmes for students at

risk. Importantly, interventions targeting off-label use and dose escalation should focus on education and behaviour change, while interventions targeting recreational opioid abuse may require regulatory and disciplinary measures.

Conclusions

Analgesic use is near-universal among the pharmacy students studied. When disaggregated by type of behaviour, off-label use (70.1%) and dose escalation (58.5%)—representing misuse—were the most common behaviours, while recreational analgesic abuse was reported by 39.3% of participants, including 9.4% opioid use. Female sex and unmarried status were independently associated with misuse/abuse behaviours, whereas knowledge of correct dosing was not protective, indicating that knowledge alone is unlikely to prevent misuse.

The distinction between misuse (off-label use and dose escalation) and abuse (recreational use) is critical for designing appropriate interventions. Educational interventions should target misuse behaviours through improved curricula on rational analgesic use, dosing limits, and the risks of off-label use. Regulatory controls and disciplinary measures are needed to address recreational opioid abuse, including enforcing prescription-only sales and monitoring access channels. University-based awareness and monitoring programmes should address both misuse and abuse behaviours.

Future research should use standardised definitions of analgesic misuse and abuse and longitudinal designs to establish the determinants of these behaviours and the effectiveness of interventions.

Abbreviations

AOR: adjusted odds ratio; CI: confidence interval; COR: crude odds ratio; GI: gastrointestinal; LAMU: Lusaka Apex Medical University; NHRA: National Health Research Authority; NSAID: non-steroidal anti-inflammatory drug; OTC: over-the-counter; Ref: reference category; SD: standard deviation; UNZA: University of Zambia; UNZAHSREC: University of Zambia Health Sciences Research Ethics Committee; WHO: World Health Organization.

Declarations

Ethics approval and consent to participate

Ethical approval was obtained from the University of Zambia Health Sciences Research Ethics Committee [UNZAHSREC; Approval No. 2023270541]. Additional authorization was obtained from the National Health Research Authority [NHRA No. 12790/15/06/2026] and from the management of the University of Zambia (UNZA) and Lusaka Apex Medical University (LAMU). The study was conducted in accordance with the Declaration of Helsinki. Participation was voluntary, and all participants provided written informed consent after receiving full information about the study objectives, procedures, potential risks, and benefits. Confidentiality and anonymity were maintained throughout data collection, analysis, and reporting, with no personal identifiers collected.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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Author Contribution

DM and LKM conceived and designed the study. TMH, NN, AH, PM and LM collected the data. DM, CB and NZN analysed and interpreted the data. DM drafted the manuscript and all authors critically revised it. All authors read and approved the final manuscript.

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Data Availability

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

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