Society of Medical Education & Research

2021, Volume 1, Page No: 98-111
ISSN: 3108-4850

Annals of Pharmacy Education, Safety, and Public Health Advocacy

Assessing Pharmacy Students' Preparedness and Perceptions on Deprescribing and Polypharmacy in Northwest Ethiopia

Matthew A. Reed[1], Olivia S. Turner[1]*, Emily K. Johnson[1]

[1]Department of Pharmacy Practice and Administration, College of Pharmacy, Ohio State University, Columbus, United States

***E-mail** ✉ olivia.turner@gmail.com

Abstract

Polypharmacy, which involves the use of multiple medications at the same time—commonly five or more drugs for general cases and over two for psychotropic treatments—can lead to complications such as adverse drug reactions if not properly managed. Deprescribing has emerged as a strategy to address these risks. Ensuring that pharmacy students are well-prepared for deprescribing requires a structured curriculum that provides both knowledge and practical training. Understanding students' attitudes and perceptions regarding polypharmacy and deprescribing is essential for refining educational approaches and tailoring the curriculum effectively. This study, therefore, sought to explore the perspectives of graduating pharmacy students on polypharmacy and deprescribing in colleges and universities across northwest Ethiopia. This study employed a cross-sectional survey design targeting final-year pharmacy students from both public and private accredited institutions between May 15 and November 30, 2024. Participants were invited to complete structured questionnaires, available in both online and paper formats. A total of 205 students provided data. Statistical analysis was performed using SPSS version 24, with comparisons made using ANOVA, Post Hoc, and t-tests. Results with a p-value below 0.05 were considered statistically significant. A majority of students (58%) reported limited familiarity with the concept of deprescribing, whereas awareness of polypharmacy was relatively high (85.9%). Less than half could accurately define deprescribing (42.9%), and only 45.4% and 18.5% correctly recognized the minimum drug counts for general and psychotropic polypharmacy, respectively. Curriculum-based training on deprescribing was reported by just 17.1% of students, compared to 64.4% for polypharmacy. Nearly three-quarters felt their education in both deprescribing (74.2%) and polypharmacy (75.2%) was insufficient. Students from governmental institutions reported better preparation and confidence in deprescribing medications compared to those from private institutions (2.86 ± 0.12 vs. 1.15 ± 0.03, $p < 0.001$). Government institution students also demonstrated more positive attitudes and higher self-assessed competency ($p < 0.001$). Barriers to effective deprescribing were primarily linked to inadequate curriculum coverage, insufficient student preparedness, and patient-related factors. The study reveals significant gaps in knowledge, confidence, and practical skills regarding deprescribing and polypharmacy among graduating pharmacy students in northwest Ethiopia. Addressing these deficiencies requires comprehensive curriculum reform, including standardized content across institutions, integration of active learning methods, and enhanced focus on practical training to ensure students are adequately prepared for clinical decision-making in medication management.

Keywords: Polypharmacy, Deprescribing, Attitude, Knowledge

Introduction

Polypharmacy, defined as the simultaneous use of multiple medications—typically five or more—remains a prevalent issue, especially among older adults and individuals with chronic illnesses [1]. While the use of multiple drugs may sometimes be necessary, treatment regimens often include medications that are not strictly needed, which can increase the risk of adverse effects. This phenomenon has become a significant global health concern due to its links with complications such as drug interactions, poor adherence, and higher healthcare costs

Access this article online https://smerpub.com/

Received: 11 March 2021; **Accepted:** 09 May 2021

How to cite this article: Reed MA, Turner OS, Johnson EK. Assessing Pharmacy Students' Preparedness and Perceptions on Deprescribing and Polypharmacy in Northwest Ethiopia. Ann Pharm Educ Saf Public Health Advocacy. 2021;1:98-111. ttps://doi.org/10.51847/uPdNt2G1u2

[1–3]. In low-resource countries like Ethiopia, the growing burden of chronic diseases has further amplified the occurrence of polypharmacy [4].

To address these risks, healthcare professionals have increasingly turned to deprescribing, a process aimed at reducing or discontinuing medications to improve patient outcomes [5]. Deprescribing has been described as "a systematic process of identifying and discontinuing medications in instances in which existing potential harms outweigh potential benefits within the context of an individual patient's care goals, the current level of functioning, life expectancy, values, and preferences" [5, 6]. This approach not only decreases medication burden but also enhances safety and quality of life for patients [7]. Effective deprescribing requires collaboration among healthcare providers, particularly pharmacists and physicians, to ensure ongoing assessment and adjustment of therapies. Pharmacists, with their expertise in pharmacotherapy, are positioned to lead deprescribing initiatives by identifying therapy-related problems and guiding patients in understanding their medications [8].

Investigating the perspectives of graduating pharmacy students on polypharmacy and deprescribing is critical because these students will soon become active participants in healthcare delivery. Understanding their knowledge, attitudes, and confidence levels provides insight into their preparedness to engage in deprescribing practices and highlights areas where pharmacy education may need improvement. Previous research indicates that while pharmacy students are generally aware of the potential harms of polypharmacy and the advantages of deprescribing, many feel inadequately prepared to make deprescribing decisions due to limited clinical exposure, lack of formal training, patient resistance, and resource constraints [9, 10].

In Ethiopia, where healthcare resources are constrained, deprescribing offers added value by lowering treatment costs, improving therapeutic outcomes, reducing complications and mortality, and minimizing hospital stays and readmissions [8, 11]. However, little is known about Ethiopian pharmacy students' readiness, perceptions, and attitudes toward deprescribing and polypharmacy. Given the increasing role of pharmacists in medication management, assessing these factors is essential to ensure that graduates are capable of contributing effectively to patient care. This cross-sectional study aims to evaluate and compare the attitudes and perceptions of graduating pharmacy students in Ethiopia regarding polypharmacy and deprescribing, providing insights that can inform future pharmacy education and practice.

Materials and Methods

Participants, study design, and period

A cross-sectional survey was carried out between 15 May and 30 November 2024 among final-year pharmacy students pursuing a bachelor's degree at both public and private higher education institutions. Data were collected using structured questionnaires in both paper and online formats. Printed copies were distributed to participants in person, while the online survey link was shared via email through representatives of the institutions. Surveys that were incomplete were excluded from the analysis. Participation was voluntary, and informed consent was obtained from all students. To ensure confidentiality, no personal identifiers were collected in the questionnaire.

Questionnaire development

The study employed a structured self-administered questionnaire delivered in both paper format and electronically using Google Forms. The instrument was developed by modifying questions from previously published literature. Before implementation, the questionnaire underwent expert review to assess its clarity, readability, and content validity. A pilot test was then carried out with 20 participants to evaluate the tool's comprehensibility, relevance, acceptability, reliability, and validity. Individuals who participated in the pilot phase were not included in the final study sample. After refinement, the finalized questionnaire was distributed to the eligible participants. The instrument consisted of three main components: (1) participants' socio-demographic characteristics, (2) items exploring students' knowledge, perceptions, competencies, barriers, attitudes, and confidence related to deprescribing practices, and (3) questions assessing students' understanding of and attitudes toward polypharmacy.

Sample size

The survey targeted all graduating students from the selected institutions. A total of 205 final-year pharmacy students participated in the study, of whom 96 were enrolled in government institutions and 109 were from private institutions.

Inclusion criteria

Eligibility was limited to final-year pharmacy students who had successfully completed all required clinical internship or rotation requirements of their academic curriculum.

Exclusion criteria

Students who had not completed their clinical training or who declined to provide informed consent were excluded from participation.

Data analysis

Collected data were entered and analyzed using the Statistical Package for the Social Sciences (SPSS), version 24. Descriptive statistics, including frequencies and percentages, were used to summarize participant responses. Inferential statistical analyses, such as independent t-tests, analysis of variance (ANOVA), and post hoc comparisons, were conducted to identify differences between groups.

Results and Discussion

Sociodemographic characteristics of respondents

Among the study participants, slightly more than half were male (111, 54.1%). Students from private institutions constituted 53.2% (109) of the sample, while those from governmental institutions accounted for 46.8% (96), as shown in **Table 1**. The majority of respondents (53.7%) reported intentions to pursue vertical career advancement, whereas a smaller proportion (14.6%) indicated interest in acquiring additional education outside the health sciences. Additionally, 67 participants (32.7%) reported having experience in both community and hospital pharmacy settings.

Table 1. Sociodemographic characteristics of the study participants

Characteristic	Category	Count (Percentage)
Gender	Male	111 (54.1%)
	Female	94 (45.9%)
Age Group	20–24 years	116 (56.6%)
	25–64 years	89 (43.4%)
Specific Institution	Government Institution 1	31 (15.1%)
	Government Institution 2	30 (14.6%)
	Government Institution 3	35 (17.1%)
	Private Institution	109 (53.2%)
Type of Institution	Government	96 (46.8%)
	Private	109 (53.2%)
Prior Experience in Pharmacy	Community pharmacy	40 (19.5%)
	Hospital pharmacy	22 (10.7%)
	Clinic-based pharmacy	20 (9.8%)
	Academic setting	9 (4.4%)
	Clinical pharmacy services	47 (22.9%)
	Both community and hospital pharmacy	67 (32.7%)
	Total	**205 (100%)**
Plans for Postgraduate Education	Pursuing vertical advancement	110 (53.7%)
	Additional degree in related health fields	30 (14.6%)
	Additional degree in non-health fields	26 (12.7%)
	No further education planned	39 (19%)
	Total	**205 (100%)**

Knowledge on deprescribing

Less than half of the respondents (88, 42.9%) correctly identified the definition of deprescribing. Only a small proportion of students (35, 17.1%) reported receiving formal instruction on deprescribing, whereas the majority (163, 79.5%) indicated that they had not been formally educated on the topic. Approximately 44.9% of participants perceived their training in deprescribing to be highly insufficient. In addition, most students (123, 60%) expressed a preference for receiving deprescribing education through traditional lecture-based teaching methods, as presented in **Table 2**.

Table 2. Knowledge of deprescribing among graduating students

Characteristic	Category	Count (Percentage)
Level of familiarity with deprescribing	Not familiar	119 (58.0%)
	Slightly familiar	36 (17.6%)
	Moderately familiar	35 (17.1%)
	Very familiar	12 (5.9%)
	Extremely familiar	3 (1.5%)
Have heard the term "deprescribing" before	Yes	88 (42.9%)
	No	117 (57.1%)
Received formal education on deprescribing within the curriculum	Yes	35 (17.1%)
	No	163 (79.5%)
	I do not know	7 (3.4%)
Correctly identified the definition of deprescribing in a multiple-choice question	Yes	88 (42.9%)
	No	117 (57.1%)
Perceived adequacy of education on deprescribing	Very inadequate	92 (44.9%)
	Inadequate	60 (29.3%)
	Neutral	40 (19.5%)
	Adequate	13 (6.3%)
Preferred method(s) for delivering deprescribing education	Lecturing	123 (60.0%)
	Patient-centered case discussions/attachments	42 (20.5%)
	Clinical simulations	28 (13.7%)
	Community projects/service learning	12 (5.9%)
Preferred approach to including deprescribing in the curriculum	Required coursework	39 (19.0%)
	Elective course	28 (13.7%)
	Both required and elective coursework	7 (3.4%)
	Self-directed reading	131 (63.9%)

Perceptions and barriers of graduating students regarding deprescribing

Approximately three-quarters of the respondents (153, 74.6%) expressed strong agreement that pharmacists possess the expertise needed to recognize medications that may be unnecessary or potentially harmful. Furthermore, an overwhelming majority (192, 93.7%) strongly supported the view that deprescribing should be undertaken through collaborative efforts involving pharmacists, physicians, and patients. In contrast, only a very small number of participants (3, 1.5%) strongly felt that their academic curriculum had adequately equipped them with the skills required to deprescribe potentially inappropriate medications in real-world clinical settings, as summarized in **Table 3**.

Table 3. Graduating students' perceived barriers and attitudes toward deprescribing

Characteristic	Response Category	Count (Percentage)
There are no or only minimal barriers to implementing deprescribing in clinical practice	Strongly disagree	137 (66.8%)
	Disagree	46 (22.4%)
	Agree	10 (4.9%)
	Neutral	9 (4.4%)
	Strongly agree	3 (1.5%)
My pharmacy curriculum adequately prepared me to deprescribe potentially inappropriate medications in practice	Strongly disagree	110 (53.7%)
	Disagree	31 (15.1%)
	Agree	30 (14.6%)
	Neutral	31 (15.1%)
	Strongly agree	3 (1.5%)
Patients are generally willing to have their medications deprescribed	Strongly disagree	11 (5.4%)
	Disagree	17 (8.3%)
	Agree	63 (30.7%)
	Neutral	45 (22.0%)
	Strongly agree	69 (33.6%)
Graduating pharmacy students from my institution are sufficiently prepared to participate in deprescribing decisions	Strongly disagree	97 (47.3%)
	Disagree	41 (20.0%)
	Agree	38 (18.5%)
	Neutral	22 (10.7%)
	Strongly agree	7 (3.4%)
Pharmacists should collaborate with physicians and patients in deprescribing decisions	Strongly disagree	0 (0.0%)
	Disagree	0 (0.0%)
	Agree	13 (6.3%)
	Neutral	0 (0.0%)
	Strongly agree	192 (93.7%)
Perceived barriers preventing pharmacists from engaging in deprescribing (multiple selections possible)	Insufficient knowledge	55 (26.8%)
	Resistance from other healthcare providers	15 (7.3%)
	Lack of sufficient manpower	23 (11.2%)
	Legally undefined role of pharmacists in deprescribing	33 (16.1%)
	Both insufficient knowledge and resistance from other providers	79 (38.5%)
Pharmacists are experts in identifying unnecessary or potentially harmful medications	Strongly disagree	4 (2.0%)
	Disagree	4 (2.0%)
	Agree	38 (18.5%)
	Neutral	6 (2.9%)

	Strongly agree	153 (74.6%)

Students' perceptions of barriers to deprescribing

Respondents from governmental institutions reported higher mean agreement scores indicating that their academic programs sufficiently prepared them to deprescribe potentially inappropriate medications in clinical settings (2.86 ± 0.123) compared with their counterparts from private institutions (1.15 ± 0.03). Similarly, governmental institution students assigned higher scores to the statement that there are few or no obstacles to deprescribing in routine clinical practice (1.74 ± 0.102), whereas lower scores were observed among students from private institutions (1.32 ± 0.07). In addition, participants enrolled in governmental institutions demonstrated greater confidence in the preparedness of graduating pharmacy students to contribute to deprescribing decisions, with a mean perception score of 3.14 ± 0.123, compared to a considerably lower score among students from private institutions (1.20 ± 0.04). These findings are summarized in **Table 4**.

Table 4. Students' perceptions of barriers to deprescribing measured using a 5-point likert scale

Perception Statement	Governmental Institutions (Mean ± SE)	Private Institutions (Mean ± SE)
Barriers to performing deprescribing in clinical settings are absent or negligible	1.74 ± 0.10[2]	1.32 ± 0.07
The curriculum at my pharmacy school effectively equipped me to deprescribe potentially inappropriate medications during clinical practice	2.86 ± 0.12[3]	1.15 ± 0.03
Pharmacists possess the expertise to detect medications that are no longer needed or could be harmful	4.81 ± 0.05[2]	4.45 ± 0.09
Patients are typically open to having their medications reduced or stopped	3.97 ± 0.11[1]	3.62 ± 0.11
Pharmacists ought to partner with doctors and patients in the process of deprescribing medications	4.96 ± 0.02	4.92 ± 0.03
Pharmacy graduates from my institution are well-prepared to contribute to deprescribing decisions	3.14 ± 0.12[3]	1.20 ± 0.04

All values are presented as mean ± standard error of the mean (SEM). Statistical significance was defined as $p \leq 0.05$, $p \leq 0.01$, and $p \leq 0.001$, respectively. Higher mean scores reflect more favorable student perceptions toward deprescribing.

Students' perceptions of barriers to deprescribing across institutions

As summarized in **Table 5**, students from the second governmental institution reported significantly higher agreement with the statement that graduating pharmacy students at their university or college are sufficiently prepared to participate in deprescribing decisions compared with students from private institutions ($p < 0.001$). No statistically significant differences were observed among the governmental institutions across any of the perception-related measures. However, significant differences were identified when comparisons were made between governmental and private institutions overall. The primary obstacles to effective deprescribing identified by participants included limitations within the curriculum, insufficient readiness of graduating pharmacy students, and challenges related to patient willingness. These results are detailed in **Table 5**.

Table 5. Students' perceptions of barriers to deprescribing across institutions using a 5-point Likert scale

Perception Statement	Private Institution (Mean ± SE)	Governmental Institution 1 (Mean ± SE)	Governmental Institution 2 (Mean ± SE)	Governmental Institution 3 (Mean ± SE)

Barriers to performing deprescribing in clinical settings are absent or negligible	1.32 ± 0.07	1.94 ± 0.19[d2]	1.90 ± 0.23[d2]	1.43 ± 0.09
The curriculum at my pharmacy school effectively equipped me to deprescribe potentially inappropriate medications during clinical practice	1.15 ± 0.03[c3]	2.90 ± 0.19[d3]	3.00 ± 0.22[d3]	2.70 ± 0.19
Pharmacists ought to partner with doctors and patients in the process of deprescribing medications	4.92 ± 0.03	4.87 ± 0.06	5.00 ± 0.00	5.00 ± 0.00
Patients are typically open to having their medications reduced or stopped	3.63 ± 0.12	4.10 ± 0.16	3.87 ± 0.22	3.94 ± 0.19
Pharmacy graduates from my institution are well-prepared to contribute to deprescribing decisions	1.20 ± 0.04[a3]	3.29 ± 0.16	3.33 ± 0.20[d3]	2.83 ± 0.23[d3]
Pharmacists possess the expertise to detect medications that are no longer needed or could be harmful	4.45 ± 0.09b2	4.58 ± 0.09	5.00 ± 0.00	4.86 ± 0.09[d1]

Data are reported as mean ± standard error of the mean (SEM). Superscripts indicate comparison groups: [a]denotes comparison with governmental institution 1, [b]with governmental institution 2, [c]with governmental institution 3, and [d]with private institutions. Levels of statistical significance are indicated as $p \leq 0.05$, $p \leq 0.01$, and $p \leq 0.001$. Higher mean scores represent more positive perceptions toward deprescribing.

Perceived deprescribing competence among graduating pharmacy students from governmental and private institutions

Across all indicators used to assess deprescribing competence, statistically significant differences were observed between students from governmental and private institutions ($p < 0.001$). Overall, participants from private institutions consistently demonstrated lower mean scores. The lowest rating among private institution students was observed for the statement regarding their preparedness to develop tapering schedules for medications associated with withdrawal symptoms when abruptly discontinued, as shown in **Table 6**.

Table 6. Students' perceptions of barriers to deprescribing across institutions using a 5-point likert scale

Self-Perceived Deprescribing Ability Statement	Private Institution (Mean ± SE)	Governmental Institutions (Mean ± SE)
I am confident in developing a tapering schedule for medications that may cause withdrawal symptoms if stopped abruptly	1.57 ± 0.07	3.59 ± 0.77[3]
I can effectively evaluate medications for potential risks versus expected benefits in older adults	2.63 ± 0.12	4.36 ± 0.07[3]
I am capable of recommending suitable alternative medications or non-pharmacological options for inappropriate medications in older adults	2.89 ± 0.13	4.23 ± 0.09[3]
I can adequately counsel older patients about the potential harms associated with potentially inappropriate medications	2.78 ± 0.14	4.33 ± 0.08[3]
I am skilled at recognizing potentially inappropriate medications during clinical practice	2.87 ± 0.13	4.22 ± 0.09[3]

Data are reported as mean ± standard error of the mean (SEM). Levels of statistical significance are indicated as: [1]$p \leq 0.05$, [2]$p \leq 0.01$, [3]$p \leq 0.001$. Elevated scores correspond to stronger self-assessed competence in deprescribing.

Self-reported deprescribing competence among final-year pharmacy students in various institutions

Evaluation of the scale items measuring deprescribing competence showed that students enrolled in all three

governmental institutions exhibited highly significant differences when compared with those in the private institution ($p < 0.001$). Furthermore, a moderate significant difference ($p < 0.05$) was found between Governmental Institution 1 and Governmental Institution 3 regarding the item assessing the ability to recognize potentially inappropriate medications in clinical settings **(Table 7)**.

Table 7. Self-evaluated deprescribing competence of final-year pharmacy students across institutions (measured on a 5-point likert scale)

Statement	Private Institution (Mean ± SE)	Governmental Institution 1 (Mean ± SE)	Governmental Institution 2 (Mean ± SE)	Governmental Institution 3 (Mean ± SE)
I can choose suitable alternative medications or non-pharmacological therapies to replace inappropriate medications in elderly patients	2.89 ± 0.13[a3]	3.97 ± 0.06	4.17 ± 0.19[d3]	4.51 ± 0.16[d3]
I am capable of evaluating medications for their potential risks and anticipated benefits in elderly patients	2.63 ± 0.12[b3]	4.00 ± 0.07[d3]	4.63 ± 0.12	4.44 ± 0.13[d3]
I can recognize potentially inappropriate medications during routine clinical practice	2.87 ± 0.13	3.71 ± 0.17[d2,c1]	4.33 ± 0.14[d3]	4.57 ± 0.10[d3]
I am able to inform elderly patients about the potential harms associated with potentially inappropriate medications	2.78 ± 0.14	4.03 ± 0.07[d3,c1]	4.10 ± 0.22[d3]	4.80 ± 0.41[d3]
I possess the knowledge to develop a tapering schedule for medications that may lead to withdrawal symptoms if stopped abruptly	1.57 ± 0.07	3.71 ± 0.14[d3]	3.43 ± 0.09[d3]	3.63 ± 0.15[d3]

Results are presented as mean ± standard error of the mean (SEM). Pairwise comparisons are indicated by superscripts: [a]versus Governmental Institution 1, [b] versus Governmental Institution 2, [c] versus Governmental Institution 3, [d] versus the private institution. Significance thresholds: [1]$p \leq 0.05$, [2]$p \leq 0.01$, [3]$p \leq 0.001$. Greater scores signify more favorable student attitudes regarding deprescribing.

Attitudes of graduating pharmacy students toward deprescribing: comparison between governmental and private institutions

Graduating students attending governmental institutions exhibited substantially more positive views on deprescribing than those from the private institution. Notably, governmental institution students assigned a much higher rating to the view that pharmacists hold a crucial responsibility in recognizing and facilitating the discontinuation of potentially inappropriate medications (mean = 4.58 ± 0.063) compared to private institution students (mean = 3.41 ± 0.14) **(Table 8)**.

Table 8. Deprescribing attitudes among final-year pharmacy students from governmental and private institutions (evaluated using a 5-point likert scale)

Statement	Governmental Institutions (Mean ± SE)	Private Institution (Mean ± SE)
Pharmacists have a significant role in detecting and supporting the deprescribing of potentially inappropriate medications in clinical practice	4.58 ± 0.06[3]	3.41 ± 0.14
Deprescribing potentially inappropriate medications provides value to patients	4.92 ± 0.03	4.85 ± 0.03
Inappropriate prescribing can lead to adverse health outcomes in older adults	4.94 ± 0.03[1]	4.85 ± 0.03

Data are shown as mean ± standard error of the mean (SEM). Significance indicators: [1]$p \leq 0.05$, [2]$p \leq 0.01$, [3]$p \leq 0.001$. Increased scores represent more favorable attitudes toward deprescribing

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Deprescribing attitudes among final-year pharmacy students from different institutions

Table 9 illustrates that respondents from each of the governmental institutions expressed notably stronger support for the idea that pharmacists have a critical

responsibility in detecting and supporting the discontinuation of potentially inappropriate medications during clinical practice. Their average ratings fell within the range of 4.57 ± 0.11 to 4.60 ± 0.10. By comparison, respondents from the private institution recorded a considerably lower average of 3.41 ± 0.14, reflecting substantially weaker endorsement of this pharmacist role ($p < 0.001$).

Table 9. Attitudes of graduating pharmacy students toward deprescribing across institutions (based on a 5-point likert scale)

Statement	Governmental Institution 1 (Mean ± SE)	Governmental Institution 2 (Mean ± SE)	Governmental Institution 3 (Mean ± SE)	Private Institution (Mean ± SE)
Pharmacists play an important role in identifying and assisting with deprescribing of potentially inappropriate medications in clinical practice	4.58 ± 0.10[d3]	4.57 ± 0.11	4.60 ± 0.10	3.41 ± 0.14[b3c3]
Deprescribing potentially inappropriate medications is valuable to patients	4.77 ± 0.08	4.97 ± 0.03	5.00 ± 0.00[a1]	4.85 ± 0.03
Inappropriate prescribing may result in poor health outcomes for older adults	4.84 ± 0.07	4.97 ± 0.03	5.00 ± 0.00	4.85 ± 0.03

Values are presented as mean ± standard error of the mean (SEM). Superscripts indicate comparisons: [a] versus Governmental Institution 1, [b] versus Governmental Institution 2, [c] versus Governmental Institution 3, and [d] versus private institutions. Statistical significance is denoted as 1p ≤ 0.05, 2p ≤ 0.01, and 3p ≤ 0.001. Higher scores reflect more positive attitudes toward deprescribing.

In general, students enrolled in governmental institutions exhibited more favorable attitudes toward deprescribing compared with their counterparts from private institutions.

Deprescribing confidence among students from governmental and private institutions

As illustrated in **Table 10**, graduating pharmacy students from governmental institutions reported significantly greater confidence in deprescribing practices than those from private institutions ($p < 0.001$). These students expressed higher confidence in managing both therapeutic and preventive medications and demonstrated greater comfort in recommending deprescribing interventions.

Table 10. Deprescribing confidence of graduating pharmacy students from private and governmental institutions assessed using a 5-point Likert scale

Statement	Private Institution (Mean ± SE)	Governmental Institutions (Mean ± SE)
I am confident in recommending deprescribing of guideline-recommended therapeutic medications in elderly patients with limited life expectancy	2.24 ± 0.13	3.45 ± 0.12[3]
I am confident in my ability to suggest suitable deprescribing approaches for potentially inappropriate medications in clinical practice	2.29 ± 0.13	3.50 ± 0.12[3]
I feel comfortable suggesting deprescribing strategies for potentially inappropriate medications to a prescribing physician	2.21 ± 0.11	3.51 ± 0.14[3]
I am confident in recommending deprescribing of preventive medications in elderly patients when life expectancy no longer supports the potential benefits	2.29 ± 0.13	3.35 ± 0.12[3]

Results are presented as mean ± standard error of the mean (SEM). Statistical significance is indicated as: [1]p ≤ 0.05, [2]p ≤ 0.01, [3]p ≤ 0.001. Higher scores correspond to greater self-reported confidence in deprescribing.

Self-assessed confidence in deprescribing among final-year pharmacy students across Institutions

Table 11 provides a comparison of deprescribing confidence levels among graduating students from three governmental institutions and one private institution. Overall, students from the governmental institutions demonstrated markedly higher confidence across the evaluated aspects of deprescribing.

Table 11. Confidence in deprescribing among graduating pharmacy students from various institutions (evaluated on a 5-point likert scale)

Statement	Private Institution (Mean ± SE)	Governmental Institution 1 (Mean ± SE)	Governmental Institution 2 (Mean ± SE)	Governmental Institution 3 (Mean ± SE)
I am confident in recommending deprescribing of preventive medications in elderly patients when life expectancy no longer supports the potential benefits	2.29 ± 0.13[a3]	3.58 ± 0.12	3.27 ± 0.24[d3]	3.23 ± 0.23[d3]
I am confident in recommending the deprescribing of guideline-recommended therapeutic medications in elderly patients with limited life expectancy	2.24 ± 0.13[b3]	3.42 ± 0.18[d3]	3.70 ± 0.22	3.26 ± 0.22[d3]
I feel comfortable suggesting deprescribing strategies for potentially inappropriate medications to a prescribing physician	2.21 ± 0.11	3.48 ± 0.17[d3]	3.63 ± 0.27[d3]	3.43 ± 0.26[d3]
I am confident in my ability to suggest suitable deprescribing approaches for potentially inappropriate medications in clinical practice	2.29 ± 0.13[c3]	3.58 ± 0.15[d3]	3.43 ± 0.20[d3]	3.49 ± 0.23

Results are presented as mean ± standard error of the mean (SEM). Superscripts denote pairwise comparisons: [a] versus Governmental Institution 1, [b] versus Governmental Institution 2, [c] versus Governmental Institution 3, [d] versus the private institution. Significance levels: [1]$p \leq 0.05$, [2]$p \leq 0.01$, [3]$p \leq 0.001$. Higher scores reflect greater self-reported confidence in deprescribing. Students enrolled in governmental institutions exhibited substantially greater confidence in suggesting the discontinuation of both therapeutic and preventive medications. They also indicated stronger assurance in proposing suitable deprescribing approaches.

In contrast, final-year students from the private institution consistently recorded significantly lower scores across all assessed confidence items ($p < 0.001$).

Polypharmacy

Awareness and understanding of polypharmacy

Most participants (176, 85.9%) reported having heard the term polypharmacy, whereas a small portion (29, 14.1%) had not. However, fewer than half (45.4%) correctly identified the threshold number of medications that defines general polypharmacy, and only a notably smaller proportion (18.5%) accurately recognized the number of psychotropic medications required to define psychotropic polypharmacy **(Table 12)**.

Table 12. Understanding of polypharmacy

Parameter	Response	N (%)
Can you identify the number of medications that defines general polypharmacy?	Yes	93 (45.4)
	No	112 (54.6)
Can you identify the number of medications that defines psychotropic polypharmacy?	Yes	38 (18.5)
	No	167 (81.5)
How should polypharmacy be managed/taught in the curriculum?	Required coursework	150 (73.2)
	Both required and elective coursework	2 (1.0)
	Elective course	22 (10.7)
	I do not have an idea	31 (15.1)
Which teaching method would be most effective for learning about polypharmacy?	Lecturing	106 (51.7)

	Community projects/service learning	1 (0.5)
	Patient-centered case problems/attachments	74 (36.1)
	Clinical simulation	1 (0.5)
	Other	23 (11.2)
Did you receive formal education on polypharmacy as part of your curriculum?	Yes	132 (64.4)
	No	73 (35.6)
Polypharmacy is an important issue in patient care	Strongly disagree	0 (0)
	Neutral	12 (5.9)
	Disagree	3 (1.5)
	Agree	39 (19.0)
	Strongly agree	151 (73.7)
How adequate was your education on polypharmacy?	Very inadequate	94 (45.9)
	Neutral	22 (10.7)
	Inadequate	60 (29.3)
	Adequate	19 (9.3)
	Very adequate	10 (4.9)
What risks are associated with polypharmacy? (select all that apply; presented as primary responses)	Increased adverse drug reactions	8 (3.9)
	Increased probability of drug interactions	7 (3.4)
	Increased cost	5 (2.4)
	Decreased patient compliance	12 (5.9)
	All of the above (increased adverse drug reactions, drug interactions, cost, and decreased patient compliance)	173 (84.4)
Have you ever heard about polypharmacy?	Yes	176 (85.9)
	No	29 (14.1)

Regarding educational exposure to polypharmacy, a substantial portion of students (64.4%) indicated that the topic had been covered through formal curriculum-based instruction. When questioned about the optimal way to integrate polypharmacy into the curriculum, the majority (73.2%) advocated for it to be a mandatory required course, whereas only a minimal number (2, 1%) supported a combination of both elective and required coursework **(Table 12)**.

More than half of the participants (51.7%) expressed a preference for polypharmacy to be delivered primarily via traditional lectures, while 36.1% favored more interactive approaches such as patient-centered case discussions or clinical placements.

Although most respondents confirmed that polypharmacy had been addressed within their curriculum, a considerable number viewed the coverage as insufficient: 45.9% described it as very inadequate, and an additional 29.3% rated it as inadequate.

This study identified significant gaps in graduating pharmacy students' knowledge, attitudes, confidence, competencies, and perceived barriers regarding deprescribing and polypharmacy. The findings indicate an urgent need to revise pharmacy education in the country, particularly in private institutions, to better prepare future pharmacists.

Although a majority of students (62.9%) had practical exposure in hospital and/or community pharmacy, less than half (42.9%) correctly defined deprescribing, and only a small proportion (17.1%) reported receiving formal education on the topic as part of their curriculum. These observations align with prior studies indicating that deprescribing receives limited attention in pharmacy programs, with the issue more pronounced in developing countries [12, 13]. Nearly half of participants (44.9%)

described their education on deprescribing as "very inadequate," reflecting a clear gap in curriculum content. Students preferred interactive lectures (60%) as their primary mode of learning about deprescribing, followed by patient-focused case studies or clinical attachments (20.5%). These preferences highlight the value of incorporating experiential, interprofessional, and practical learning approaches to enhance students' competence and confidence in deprescribing [5]. Using teaching methods such as simulations, clinical rotations, and interdisciplinary discussions can improve not only knowledge but also communication and decision-making skills [14].

Most students recognized pharmacists as key professionals in deprescribing. A majority (74.6%) strongly agreed that pharmacists are well-positioned to identify unnecessary or potentially harmful medications, and 93.7% emphasized that deprescribing should be conducted collaboratively with physicians, patients, and other healthcare providers, highlighting its interdisciplinary nature. These findings are consistent with studies examining older adults with multiple chronic conditions and polypharmacy [15, 16]. Such perceptions are important for promoting pharmacists' involvement in clinical activities and expanding their role in deprescribing.

However, a notable discrepancy emerged between students' awareness of their professional responsibilities and the education provided by their institutions. Only a very small proportion (1.5%) strongly agreed that their curriculum had adequately prepared them for deprescribing, whereas more than half (53.7%) strongly disagreed. This pattern is consistent with findings from Australia and Canada, where pharmacy graduates demonstrated insufficient preparedness to perform deprescribing interventions [17, 18]. Although students showed motivation to engage in deprescribing, the lack of institutional support and training could have significant implications for their future practice.

Institutional and systemic barriers further complicate deprescribing efforts. Commonly reported obstacles included resistance from other healthcare professionals, limited clinical knowledge, insufficient staffing, and unclear legal regulations. These challenges are particularly pronounced in Low- and Middle-Income Countries (LMICs), where the role of pharmaceutical care is not fully recognized [19]. Addressing these issues will require clear guidelines defining pharmacists' scope of practice and appropriate workforce support.

The study also found differences between students from government and private institutions. Graduates from government institutions reported higher preparedness, knowledge, attitudes, and confidence in deprescribing. For example, government institution students scored significantly higher in knowledge about tapering medications and recommending deprescribing for elderly patients (mean = 3.59 vs. 1.57, $p < 0.001$), and demonstrated greater ability to suggest deprescribing to physicians (mean = 3.43–3.63 vs. 2.21). These differences likely reflect variations in curriculum quality, implementation, and access to clinical training opportunities. Similar observations have been made in other countries; for instance, in the UK, students with exposure to geriatric care and professional training reported higher confidence than those without such experiences [20].

Regarding polypharmacy, most students (85.9%) were familiar with the concept, but fewer than half (45.4%) could define it accurately. Only 18.5% could identify the threshold for psychotropic polypharmacy. While 35% reported receiving curriculum-based deprescribing education, just 13% considered it sufficient. This inadequacy may be due to limited active learning opportunities, poorly structured content, and lack of clinical relevance. Notably, 73.2% of students advocated for polypharmacy to be a mandatory course. Their preference for experiential and case-based learning aligns with prior studies emphasizing applied strategies to optimize medication use [21, 22].

Despite these gaps, students demonstrated awareness of the clinical significance of polypharmacy. A large majority (84.4%) acknowledged that polypharmacy increases the risk of adverse drug reactions, drug interactions, healthcare costs, and reduced patient adherence, particularly in older populations.

Conclusion

The findings highlight that graduating pharmacy students in Ethiopia possess insufficient knowledge and skills in deprescribing and polypharmacy, indicating an urgent need for curriculum reform. Revisions should ensure inclusion of deprescribing content, standardize curricula across institutions, and promote active and experiential learning methods. Without such interventions, future pharmacists may be ill-equipped to address irrational medication use in complex patient care scenarios—an issue of increasing importance as pharmacists in Ethiopia

take on greater responsibilities in patient safety and clinical decision-making.

Acknowledgments: None

Conflict of Interest: None

Financial Support: None

Ethics Statement: Ethical approval of the study was obtained from Institutional Review Board (IRB) of Debre Tabor University with approval number of MA07/2024. Written informed consent was asked to every study participant and only who were comfortable were included in the study. The data obtained from the study is kept confidential and used solely for this study. Our study is in compliance with the Helsinki Declaration.

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