



(RESEARCH ARTICLE)



Assessment of the knowledge, attitude, and practice of proper medication disposal of pharmacy students in Centro Escolar University - Manila

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Abstract

Several nations, including the Philippines, have neglected the proper disposal of medications. Since pharmacists are involved in every step of the drug process, they are the best people to ask for information on this subject. This study aims to evaluate the bachelor of science pharmacy students enrolled at Centro Escolar University-Manila (CEU-Manila) for the school year 2021–2022 in terms of their knowledge, attitudes, and practices regarding the correct disposal of unused and expired pharmaceuticals. A descriptive and correlational study utilizing mixed methodologies was done among 709 randomly selected pharmacy students from CEU-Manila. The data were gathered using a Google Forms survey. Frequency, percentage distribution, and multiple linear regression were the three statistical approaches utilized in this study. The study showed that most students generally had good knowledge and attitude but not good practice towards proper medication disposal, likely due to factors such as the respondents' demographic profiles. It is likely due to factors such as the respondents' demographic profiles. Not having taken dispensing subjects 1 and 2 and not having families with comorbidities have shown to influence the respondents' attitudes and practices as dispensing subjects played a role in their practices. Take-back programs should be implemented as law and promoted in each pharmacy to give knowledge to consumers about improper medication disposal. Continuing education and training for BS Pharmacy programs regarding proper ways of disposing of medication should be required to promote correct medication disposal and apply it in their continuing profession.

Keywords: Medication Disposal; Pharmacy Students; Knowledge; Attitude; Practice

1. Introduction

Safe and responsible disposal of medications is an important public health initiative for it concerns the environment, patients, and the pharmaceutical industry [1]. The pharmacy profession takes part in medication disposal; graduate and undergraduate pharmacists are in a quality position in preventing the potential risk of increased medication-related problems [2]. Education on proper disposal of medication promotes safer medicine disposal practices, an important aspect of public health as preventive services that should be carried out by community pharmacists due to their accessibility and proximity to the public and health seekers within the community. With that in mind, community pharmacies are in the proper position to dispense, collect, sort, and dispose of drugs; they have been trained and taught on the proper medication disposal practices [3]. Assessing the knowledge, attitude, and practice of proper medication disposal through this study will be a great opportunity for the researchers to focus on learning and sharing important

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information with fellow student pharmacists who will take, are currently taking, and have already taken the course regarding dispensing. This research will help promote awareness on the issue of proper medication disposal which may also affect the pharmacy profession if left unnoticed. It will also promote safety precautions regarding drug disposal to prevent drug non-compliance of patients, and medication-related problems such as collecting prescription drugs and risking the environment and public health due to unsafe disposal methods.

2. Material and methods

2.1. Study design

The study will use mixed methods or the use of both qualitative and quantitative data in one study. Using only one method, quantitative or qualitative, is not adequate to complete some research projects. Thus, both methods are necessary as their main goal is to expand and reinforce a study's conclusions and validity [4].

2.2. Setting of the study

To provide convenience and facilitate data gathering, the researchers decided to conduct the study at Centro Escolar University, Manila campus. Other campuses, specifically Malolos and Makati, are not part of the study. This study will take place exclusively at the university, as the target demographic, the pharmacy students, are currently enrolled, thus qualifying them as respondents in the study, making them suitable as the population the researchers need for the study.

2.3. Sampling Technique

The researchers will utilize a stratified random sampling technique, a type of probability sampling technique. This type of sampling involves the division of a whole population into homogeneous strata or subgroups based on a demographic factor. The specific groups in the study are different year levels, specifically 1st-year to 4th-year pharmacy students. Since there are variations within the population of each year level, stratified random sampling will allow the researchers to acquire the appropriate sample from each group separately and under-represented groups [5]. The sample size from each year level will be calculated based on Slovin's Formula with a standard error of 5%. This is so that selected samples are unbiased [6].

2.4. Research Instrument

To assess the knowledge, practice, and attitudes of Proper Medication Disposal of Selected Pharmacy Students Enrolled in Centro Escolar University - Manila, a survey method will gather the data. The survey aims to collect information provided by the selected respondents based on their knowledge, practice, and attitudes in choosing the answers to the given choices.

2.5. Data Collection

To complete this study, the researchers will be surveying using online questionnaires to the respondents. The researchers will be asking professionals, including psychometricians, licensed pharmacists, and a biostatistician to validate the questionnaires. The researchers will finalize the questionnaires first before distributing them to the respondents. The researchers will be using online questionnaires via google forms as a medium for data gathering.

2.6. Data Analysis

The requisite data will be evaluated, characterized, tallied, and interpreted using different statistical tools. Content analysis will assess the information using datasets, and the following data will be analyzed through documented information and answers. Frequency and percentage distribution will be used to assess the respondents' knowledge, attitude, and practices regarding proper medication disposal. Furthermore, a Likert scale with a 4-point agreement scale will be used to measure the respondent's attitudes toward proper medication disposal. Furthermore, to interpret data and explain the relationships between the respondent's demographic profile, knowledge, attitude, and practice of the respondents on proper medication disposal, multiple linear regression will be used.

3. Results and discussion

Table 1 Frequency and Percentage Distribution Respondents' Demographic Profile

Demographic Profile	Frequency (n= 709)	Percentage (%)
Age		
18-25	700	98.7%
26-33	7	1.0%
34-41	2	0.3%
Year Level		
1	198	27.9%
2	179	25.2%
3	182	25.7%
4	150	21.2%
Location		
Rural	281	39.6%
Suburban	98	13.8%
Urban	330	46.5%

Table 1 showed that most of the enrolled pharmacy students were aged 18-25 (98.7%), which is 700 out of 709 respondents. Most respondents are from the 1st year level (27.9%), 198 out of the 709 respondents, followed by the 3rd year level (25.7%), 182 out of the 709 respondents. Both of these year levels have accomplished dispensing 1. It can contribute that most students possibly have better knowledge, attitude, and practice on proper medication disposal. Most of the respondents live in an Urban area (46.5%), and there are only a few respondents who live in a Suburban area (13.8%). In conclusion, pharmacy students live in urban areas where more pharmacies could help manage proper medication disposal.

Table 2 Frequency and Percentage Distribution Respondents' Demographic Profile

Demographic Profile	Frequency (n= 709)	Percentage (%)
Taken Dispensing 1		
Yes	516	72.8%
No	193	27.2%
Taken Dispensing 2		
Yes	349	49.2%
No	360	50.8%

Table 2 shows the data of the students who have taken and have not taken both dispensing 1 and 2. Results showed that 516 respondents (72.8%) have taken dispensing 1 and 193 (27.2%) have not taken dispensing 1. Most of the respondents are already knowledgeable about proper medication disposal, and they are already aware of the effects of improper medication disposal. The majority of the respondents are not well informed about counseling; it includes the use of drugs, their interactions, and drug disposal and take-back programs.

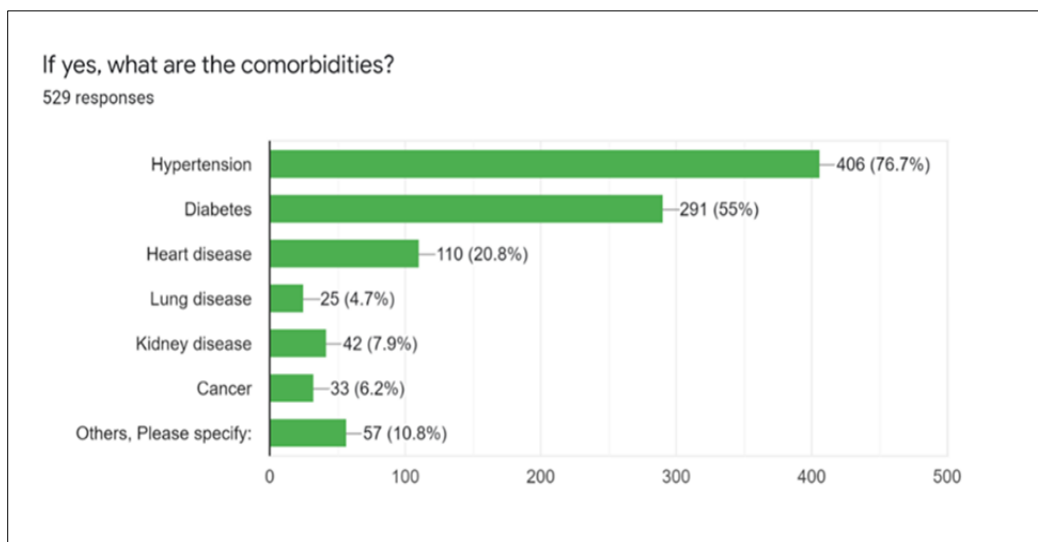


Figure 1 Frequency and Percentage Distribution of Respondents' Demographic Profile

Figure 1 shows the data of the respondents' responses regarding when was the last time their family visited a hospital or clinic. In less than a year, most respondents (30.5%) have seen or had a family member visit a hospital/clinic (216 out of 709). The least of the respondents (14.7%) visited a hospital/clinic a few days ago (104 out of 709). Respondents have fewer medications stored within their households since they have seen a hospital/clinic for less than a year. Family members of nearly half of the respondents' experience comorbidities, such as hypertension with 42.3%, followed by diabetes with 30.2%, and heart disease with 11.3%. According to studies, patients with comorbidities were likelier to have adverse drug reactions than those without comorbidity. Which often leads to changes in medication by the prescriber or stopping the use of medicine due to adverse effects [7]. Concluding, the unused medicine may be stored or thrown away in the garbage by most respondents. Finally, other comorbidities such as kidney disease, cancer, lung disease, and others were only 16.2% of the total population.

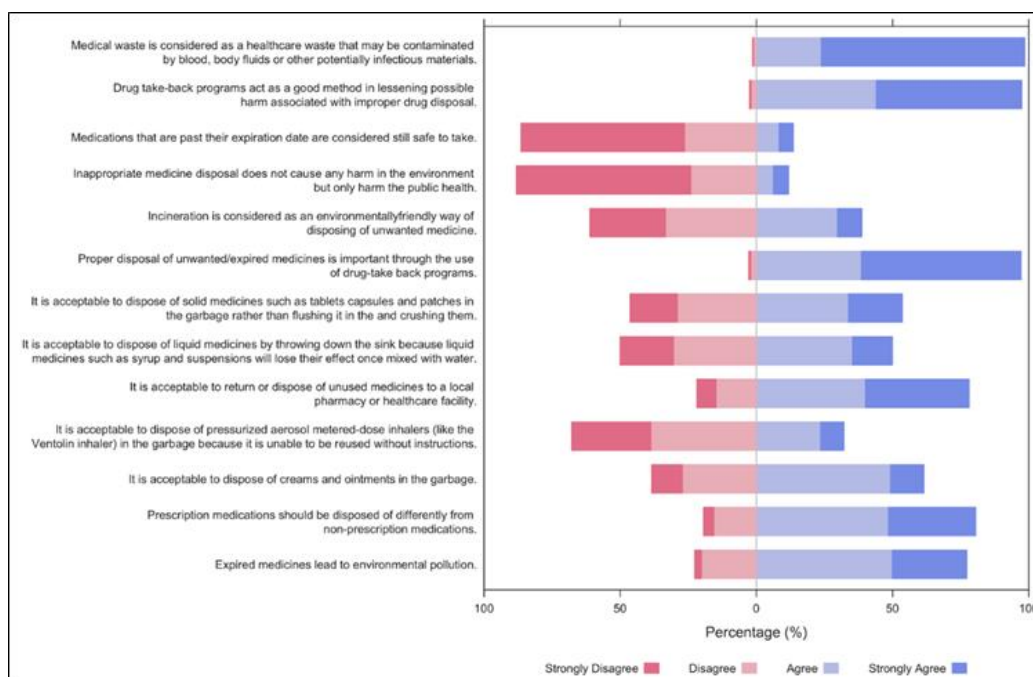


Figure 2 Summary of Results of Respondents' Knowledge of Proper Medication Disposal

Figure 2 summarizes the respondent's knowledge of proper medication disposal. The majority are knowledgeable and aware. Five hundred thirty respondents (74.80%) strongly agree that medical waste is considered healthcare waste, and blood, body fluids, or other potentially infectious materials contaminates healthcare wastes. For the drug take-back

programs that act as a suitable method in lessening possible harm associated with improper drug disposal, 379 respondents (53.50%) responded that they strongly agree. Furthermore, 416 respondents (58.70%) strongly agree that properly disposing of unwanted/expired medicines is important through drug-take-back programs. Then 426 respondents (60.10%) strongly disagreed that medications past their expiration date are safe to take. And 454 respondents (64%) believed that inappropriate medicine disposal does not cause any harm to the environment but only harms public health. This result means that most of the respondents are knowledgeable about the risk associated with improper disposal of medical waste in terms of environment and health. Most respondents have taken dispensing one since it teaches them to demonstrate the proper steps in dispensing medication and conduct appropriate patient counselling.

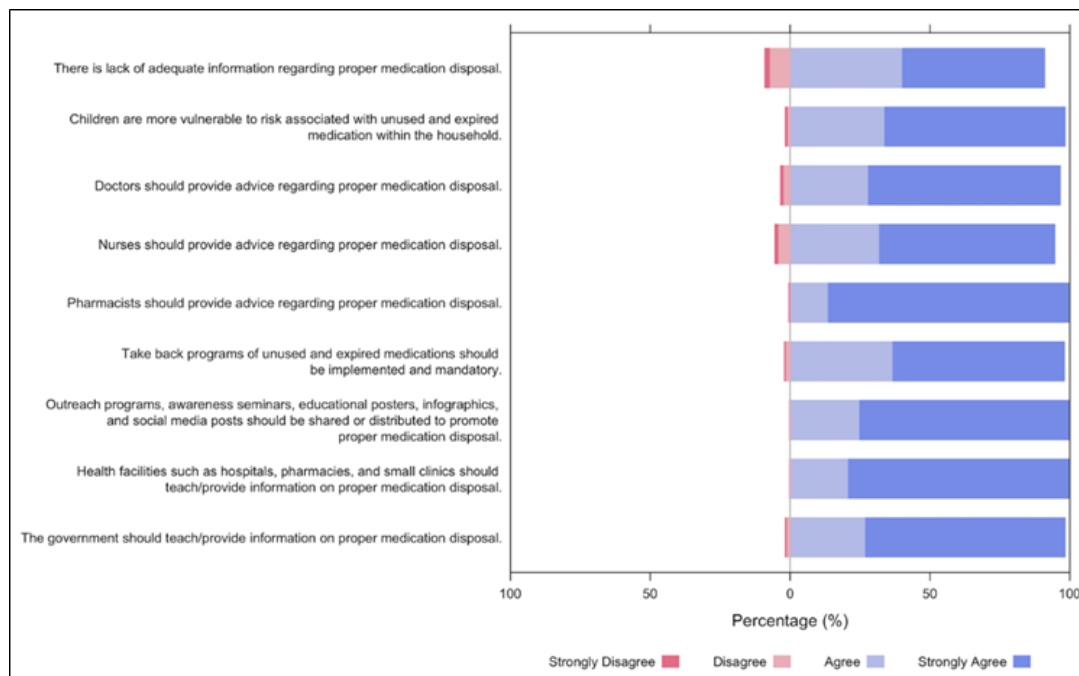


Figure 3 Summary of Results of Respondents' Attitude to Proper Medication Disposal

Figure 3 summarizes the respondents' responses to the questions regarding their attitudes towards the proper disposal of medication. Approximately 90% of the population has a good attitude regarding appropriate medication disposal. In comparison, 10% have a bad attitude regarding proper medication disposal. The following statements support this: 90% of the population knows adequate information regarding medication disposal is lacking. And strongly agree that children are at high risk and associated with unused and expired medication within the household. Children are at increased risk of unintentional or accidental poisoning and overdosing due to improper medication disposal [8]. Most of the population strongly agree that pharmacists should be the topmost provider when advising on medication disposal, followed by doctors and nurses. Healthcare professionals are not just providers; they should also teach how to promote proper medication disposal. As pharmacists, they serve as drug-information resources for proper medication disposal. In collaboration with drug-disposal programs, pharmaceutical collection events, outreach programs, awareness seminars, and educational posters regarding appropriate medication disposal, they can be part of the solution to the problem of medication waste. Lastly, most of the population agrees and strongly agrees that outreach programs, awareness seminars, and educational posters regarding proper medication disposal should be promoted, specifically in health facilities (hospitals, pharmacies, and small clinics). Finally, the respondents have a great attitude because approximately 90% strongly agreed that the government should provide information on proper medication disposal. As the government can help promote proper disposal of medications, they could share it with most of the population. The government could do this if community pharmacies and hospitals implemented take-back programs.

Although that the majority of respondents are knowledgeable and have a good attitude toward proper drug disposal, the majority of them still do not have good practices for the respondents. Only 78 (11%) of respondents chose "Return to pharmacy" or "take-back" programs when asked how they dispose of unused/expired prescriptions in their homes. According to FDA and EPA standards, return to pharmacy or drug take-back programs are the most appropriate manner of proper medication disposal [9]. Despite being aware of drug take-back programs and having a good attitude toward them, only a minority of respondents implement proper medication disposal. Other responses included "Place in a zip lock/resealable plastic container" (42.5 percent), "Crushed before discarding" (15.1%), "I don't know what to do"

(12.7%), "Flushed in the toilet/sink" (12.1%), and "Dilute with water" (6.6%). These are all ineffective drug disposal techniques, indicating that the majority of respondents have a bad practice.

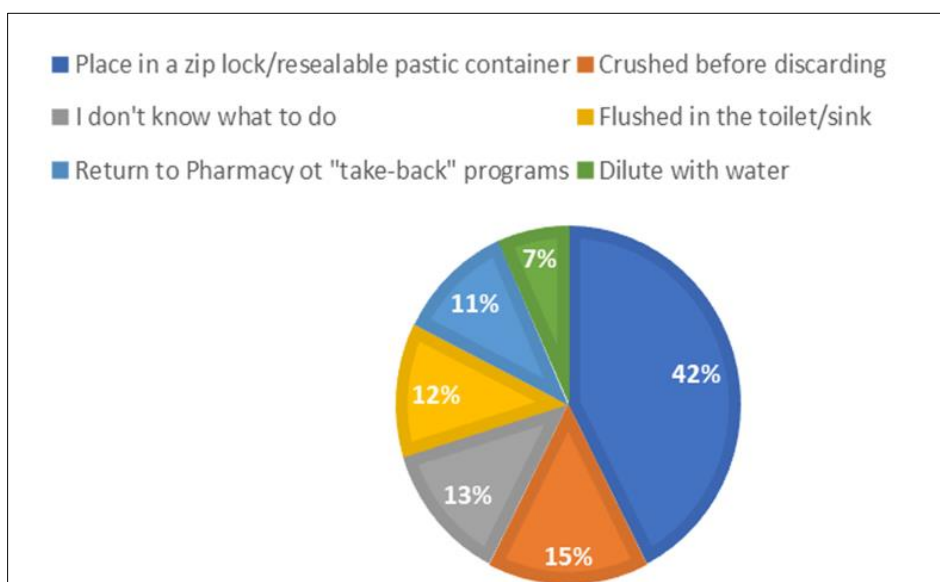


Figure 4 Summary of Respondents' Way of Discarding Unused and Expired Medicines

Table 2 shows whether the respondents' demographic profile affects the respondents' knowledge, attitude, and practice on proper medication disposal. This table uses odds ratio (OR), confidence interval (CI), and p-value. Based on the results, their age group, location, taking of dispensing one, and visiting a hospital or clinic showed no significance in influencing the respondents' knowledge, attitude, and practice. On the other hand, only the absence of a family member with comorbidities significantly affected respondents' attitudes towards proper medication disposal. Appendix C shows that not having a family member with comorbidities has a 4.2% lower likelihood of having a good attitude. Moreover, the year level and completing the subjects dispensing one and two showed significance regarding the respondents' proper practice on medication disposal. 3rd-year and 4th-year students have a higher likelihood of having good practice with 44.5% and 50.7%, respectively, compared to 1st-year students (Appendix C). Students who have taken dispensing one and two have a 27.1% higher likelihood of having good practice than students who have not taken dispensing one and two (Appendix C). Thus, the results show that the respondents' demographics do not significantly affect their knowledge; however, it affects their attitude and practice toward proper medication disposal.

Table 3 shows whether the respondents' knowledge influences the respondents' attitude towards proper medication disposal. Based on the results, their knowledge showed no significance, indicating that they did not affect the respondents' perspectives on the following: the lack of adequate information on proper medication disposal, the vulnerability of children to risk associated with unused and expired medication within the household, medical professionals' advice regarding appropriate medication disposal, implementation of take-back programs, and the sources and distribution of pertinent information regarding medication disposal.

Table 4 Shows whether the respondents' knowledge and attitude link to the respondents' practice of proper medication disposal. Based on the table above, the way of properly disposing of either unwanted prescription or non-prescription medication is significantly affected by the respondents' knowledge, with a p-value of 0.0028 and 0.0066, respectively, and a 24.1% and 22.5%, respectively, higher likelihood of influence than (Appendix E). However, the respondents' knowledge did not influence their reason for having unused medication and discarding unused and expired medicines. Furthermore, their attitudes did not significantly affect the respondents' practice. Thus, the results show that only the respondents' Knowledge.

Table 3 Summary of Results in Identifying Whether the Respondents' Demographic Profile Affects the Respondents' Knowledge, Attitude, and Practice on Proper Medication Disposal

Demographic	Knowledge			Attitude			Practice		
	OR	CI	P-value	OR	CI	P-value	OR	CI	P-value
Age									
18-25	Reference								
26-33	HL	Significant	Significant	HL	Not significant	Not significant	LL	Not significant	Not significant
34-41	LL	Not significant	Not significant	LL	Not significant	Not significant	LL	Not significant	Not significant
Year Level									
1st	Reference								
2nd	LL	Not significant	Not significant	LL	Not significant	Not significant	HL	Not significant	Not significant
3rd	LL	Not significant	Not significant	LL	Not significant	Not significant	HL	Significant	Significant
4th	LL	Not significant	Not significant	LL	Not significant	Not significant	HL	Significant	Significant
Location									
Rural	Reference								
Suburban	LL	Not significant	Not significant	HL	Not significant	Not significant	LL	Not significant	Not significant
Urban	HL	Not significant	Not significant	HL	Not significant	Not significant	LL	Not significant	Not significant
Taken dispensing 1									
Yes	Reference								
No	LL	Not significant	Not significant	HL	Not significant	Not significant	HL	Not significant	Not significant
Taken dispensing 2									
Yes	Reference								
No	HL	Not significant	Not significant	HL	Not significant	Not significant	HL	Significant	Significant
The last time you/family member visited a hospital/clinic									
A few days ago,	Reference								
A month ago,	LL	Not significant	Not significant	HL	Not significant	Not significant	LL	Not significant	Not significant
Less than a year	LL	Not significant	Not significant	HL	Not significant	Not significant	LL	Not significant	Not significant
For more than a year	LL	Not significant	Not significant	LL	Not significant	Not significant	LL	Not significant	Not significant
Do you have a family member that has comorbidities?									
Yes	Reference								
No	LL	Not significant	Not significant	LL	Significant	Significant	HL	Not significant	Not significant

Table 3 Summary of Results on Whether the Respondents' Knowledge Influences the Respondents' Attitude Towards Proper Medication Disposal

Attitude	Knowledge		
	Odds Ratio	Confidence Interval	p-value
There is a lack of adequate information regarding proper medication disposal.	LL.	Not significant	Not significant
Children are more vulnerable to the risk associated with unused and expired medication within the household.	LL.	Not significant	Not significant
Doctors should provide advice regarding proper medication disposal.	HL.	Not significant	Not significant
Nurses should provide advice regarding proper medication disposal.	HL.	Not significant	Not significant
Pharmacists should provide advice regarding proper medication disposal.	HL.	Not significant	Not significant
Take-back programs for unused and Expired medications should be Implemented and mandatory.	HL.	Not significant	Not significant
Outreach programs, awareness seminars, educational posters, infographics, and social media posts should be shared or distributed to promote proper medication disposal.	HL.	Not significant	Not significant
Health facilities such as hospitals, pharmacies, and small clinics should teach/provide information on proper medication disposal.	HL.	Not significant	Not significant
The government should teach/provide information on proper medication disposal.	HL.	Not significant	Not significant

Table 4 Summary of Results on Whether the Respondents' Knowledge and Attitude Links to the Respondents' Practice on Proper Medication Disposal

Practice	Knowledge			Attitude		
	Odds Ratio	Confidence Interval	p-value	Odds Ratio	Confidence Interval	p-value
Reason for having unused medication	HL.	Not significant	Not significant	LL.	Not significant	Not significant
Way of discarding unused and expired medicines	HL.	Not significant	Not significant	LL.	Not significant	Not significant
Way to properly dispose of unwanted prescription medication	HL.	Significant	Significant	LL.	Not significant	Not significant
Way to properly dispose of unwanted non-prescription medication	HL.	Significant	Significant	HL.	Not significant	Not significant

4. Conclusion

The research results show that the pharmacy students of CEU-Manila generally have good knowledge and attitudes toward the proper disposal of medications. Demographic variables that influenced respondents' knowledge, attitude, and practice specifically focused on students who have taken dispensing 1 and dispensing 2. A better attitude and practice were seen in those who have completed dispensing subjects in comparison to those who only have taken dispensing 1. This proves that dispensing subjects play a role in the students' way of medication disposal. The absence

of family members with comorbidities results in less likely to have good attitudes towards proper medication disposal due to not needing to store numerous medications. In continuation, students who live in an urban area have been shown to affect their attitudes and practices but not their knowledge. Their knowledge showed no relevance to their attitudes because attitudes are more likely to be influenced by normative beliefs and behavioral beliefs, which are different for each individual and may be influenced by other factors like the absence of take-back programs in their location. Proper disposal of unwanted or expired medicine is not yet practiced in the Philippines because there is no law about this topic, pharmacists do not require the patient or consumer, and the lack of seminars on practicing proper medication disposal significantly affected the students' way of disposal. Not receiving information regarding proper medication disposal affects their practice of disposing of medication properly. Take-back programs should be implemented as law and promoted in each pharmacy to give knowledge to consumers about improper medication disposal. Raising awareness of hazards, continuing education and training for BS Pharmacy programs regarding proper ways of disposing of medication should be required to promote proper medication disposal and apply it in their continuing profession.

Compliance with ethical standards

Acknowledgments

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Disclosure of conflict of interest

As per our submission to Institutional Ethics Review Board (IERB), Form 13; a Review of management of conflict arising from financial, familial, or proprietary considerations of the PI, sponsor, or the study site is not available. There is no conflict of interest in this study.

Statement of ethical approval

The study's respondents are human. The endeavor to thoroughly examine and interpret such data issues is needed to secure the respondents' confidentiality and respect data boundaries. The researchers will recognize and consider the right to voluntary participation, confidentiality, anonymity, and scientific honesty in conducting the study.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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