


RESEARCH ARTICLE

Knowledge and attitude of pharmacy students towards HIV treatment and prophylaxis in Davao City, Philippines

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Keywords

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Abstract

Background: Pharmacy students significantly contribute to HIV management as future registered pharmacists. To contribute meaningfully, pharmacy students must be knowledgeable and have positive attitudes towards HIV treatment and prophylaxis. The aim is to investigate the levels of knowledge and attitude of undergraduate pharmacy students towards HIV treatment and education to identify key areas of improvement. **Methods:** The study used a quantitative research design with a structured survey based on published studies. Undergraduate pharmacy students from various schools in Davao City were invited to participate and provide informed consent. Descriptive and inferential statistics were used after obtaining data. **Results:** Pharmacy students in Davao City were found to have high overall knowledge (mean = 64.29%) and a high overall attitude (mean = 3.88). Knowledge about HIV treatment and prophylaxis did not correlate with the respondents' attitudes towards it. Furthermore, it was found that there is a significant difference in knowledge and attitude based on year level and school (< 0.000). **Conclusion:** The knowledge and attitude of undergraduate pharmacy students toward HIV treatment and prevention were high, indicating favourable results. However, improvements and training must continue to enhance their knowledge and attitude and reduce misconceptions and stigma. Collaboration with key stakeholders is essential to ensure the implementation of intervention programmes.

Introduction

Pharmacy students' attitudes and knowledge towards HIV prevention and treatment are critical to be evaluated. As future healthcare professionals, they must be sufficiently prepared and trained to provide pharmaceutical care to their patients. Furthermore, literature shows the prevalence of knowledge gaps and misconceptions in HIV/AIDS treatment among medical and health-related students (Sannathimmappa & Nambiar, 2019; Bunting *et al.*, 2021; McKeirnan *et al.*, 2022; Sianturi *et al.*, 2022). Given that pharmacy students study the treatment and prevention of numerous diseases and illnesses to eventually become licensed pharmacists, their level of knowledge and attitude will impact their capability to provide

medication-related services and the extent to which they offer such services.

Moreover, as future healthcare professionals, pharmacy students have a special opportunity to make a big difference in the battle against HIV/AIDS. Pharmacists are the first healthcare providers that patients seek in the community. This means they are in a unique position to educate and rectify misconceptions in the public (Marwitz, 2021). Furthermore, pharmacy students are well-aware of the pharmacists' role in various fields especially as a dispenser and health-care provider (Noyen *et al.*, 2023).

Pharmacists can provide a variety of healthcare services for HIV/AIDS, including screening, dispensing

of medications, and counselling (McCree *et al.*, 2020). This can be particularly advantageous in the Philippines, as this country is notorious for having the fastest-growing HIV epidemic in the Western Pacific Region (Gangcuangco & Eustaquio, 2023). Furthermore, the Davao Region has been considered one of the country's regions with the highest incidence (Mendoza, 2023). As such, their training and education will have an impact on their level of confidence and competence when handling HIV-related problems and, ultimately, in providing appropriate and optimal HIV-related pharmacy services.

In the Philippines, treatment and prophylaxis are in the form of combination pill medications. National treatment guidelines for people living with HIV in the Philippines utilise Highly Active Antiretroviral Therapy (HAART) combination of Tenofovir Disoproxil Fumarate (TDF), lamivudine, and dolutegravir (Gangcuangco & Eustaquio, 2023). Pre-Exposure Prophylaxis (PrEP) is also available in the form of a combination of TDF and emtricitabine. Both of these interventions can be accessed in dedicated HIV-treatment hubs and in accredited primary care facilities (Gangcuangco & Eustaquio, 2023). These interventions have been proven safe and effective but are relatively new in the country.

Becoming a licensed pharmacist in the Philippines requires an applicant to have completed an undergraduate Bachelor of Science (BSc) in pharmacy degree as a minimum. This is a four-year degree approved by the Philippine Commission on Higher Education (CHED) and is designed to provide students with a thorough education in the practice of pharmacy, including essential information, theories, and skills deemed important for the health system (Gutierrez *et al.*, 2024). Furthermore, other universities also offer a five-year BSc in Clinical Pharmacy and a six-year Doctor of Pharmacy degree (Tan & Faller, 2022). Graduates of the four-year BSc degree can choose to continue to either the BSc in Clinical Pharmacy or Doctor of Pharmacy for an additional one- and two-year additional academic coursework considered as a post-baccalaureate degree. Regardless, the four-year undergraduate pharmacy degree is considered an important requirement for someone to become a pharmacist in the Philippines.

It is noteworthy to point out that there are few to no published studies related to the knowledge and attitude of students, particularly pharmacy students, about HIV treatment and prophylaxis. Hence, the purpose of this study is to evaluate pharmacy students' current levels of knowledge and attitudes on HIV treatment and prophylaxis and the associations between these variables. By being aware of these

factors, pharmacy education and training programmes may identify areas for development and make sure that new generations of pharmacists are prepared to assist HIV patients efficiently.

Furthermore, this research can determine areas in which educational changes are required to ensure future pharmacists are adequately equipped to contribute to HIV prevention and treatment initiatives by evaluating the understanding and attitudes of pharmacy students, especially in Davao City, which is still prevalent in HIV/AIDS. A wide range of stakeholders profit from this study: educators receive data to improve curricula, pharmacy students receive targeted education, healthcare providers gain a better-prepared workforce, and ultimately, the community benefits from improved public health outcomes and more efficient management of HIV/AIDS.

Methods

Research design

This study utilised a quantitative, observational, descriptive research design based on the classification scheme by Ranganathan & Aggarwal (2018). This research design involves the utilisation of structured research instruments to generate numerical data that would describe the knowledge and attitude towards HIV treatment and prophylaxis of the intended target population and relate these constructs with each other. The research instrument utilised was a survey questionnaire.

Research locale and participants

This study was conducted in Davao City, Philippines, which is one of the largest cities in the country and the capital city of Region XI of the Philippines. The target population were undergraduate pharmacy students from the different pharmacy schools and universities in Davao City, Philippines. Davao City currently has ten pharmacy schools. Inclusion criteria included that the respondents were undergraduate pharmacy students officially enrolled in the academic year and were the first to pursue a Bachelor of Science (BSc) degree. Exclusion criteria included respondents pursuing post-baccalaureate (BSc in Pharmacy major in Clinical Pharmacy & PharmD) and graduate studies (master's & PhD). The BSc Pharmacy major in Clinical Pharmacy in Davao City is a post-baccalaureate degree that is pursued by BSc Pharmacy graduates who are either already licensed pharmacists or are eligible for a license as a form of specialisation and is an additional one- to two-year academic coursework. Additionally, there are some

universities that offer a straight 5-year BSc Clinical Pharmacy degree, but these universities are outside of Davao City. For these reasons, the BSc in Clinical Pharmacy students were excluded from the study. Furthermore, students who were dropouts, those having gap years, or those not officially enrolled in the current academic year were also excluded. After obtaining the total pharmacy student population in the city, a representative sample was calculated using Slovin's formula. Then, stratified random sampling was implemented to get a representative sample across all schools of pharmacy in the city.

Research instrument

The survey instrument developed was based on previously published research. In assessing the knowledge and attitude of the respondents towards HIV treatment, the researchers adapted from the works of Van Nguyen *et al.* (2021) and Kasumu and Balogun (2014), respectively. In assessing the knowledge and attitude of respondents towards HIV prophylaxis, the researchers adapted the questionnaires from the work of Gabucan and Brieta (2023). The developed questionnaire was segmented into three sections – demographics, knowledge items, and attitude items.

The demographics section collected the sex, current pharmacy year level, previous senior high school strand taken, and school of pharmacy or university enrolled. Aside from the core curriculum in senior high school, students can also choose an additional track that will prepare them for tertiary education. These tracks include (1) Accountancy, Business and Management (ABM) Strand, (2) Science, Technology, Engineering, and Mathematics (STEM) Strand, (3) Humanities and Social Science (HUMSS) Strand, (4) General Academic Strand (GAS), (5) Technical-Vocational-Livelihood (TVL) Track. These data were collected to determine whether their chosen strand in senior high school has an effect on their knowledge and attitude towards HIV treatment and prophylaxis. Year level includes first-year (freshmen), second-year (sophomores), third-year (juniors) and fourth-year (seniors) pharmacy students.

Knowledge items were comprised of 15 multiple-choice items, while attitude items were composed of 14 items that rated respondent agreement using a 5-point Likert scale. Pilot testing revealed that the knowledge questions possess good reliability (test-retest coefficient = 0.713, p -value < 0.01), and the attitude questionnaires show high reliability (α = 0.917). A copy of the survey questionnaire can be found in Appendix A.

Data collection procedure

Prior to the administration of the survey, a letter of intent was sent to the college deans or programme heads of the different schools of pharmacy in Davao City, formally asking for permission to conduct the survey among their respective students. Furthermore, the current study was submitted to the Research Ethics Committee (REC) of the University of the Immaculate Conception for ethical review and clearance. The survey was only administered to students when (1) an ethical clearance was given by the REC and (2) whose respective programme heads approved and signed the letter of intent. Prior to the actual survey, informed consent was obtained from the actual participants through the presentation and signing of the informed consent form. Those who did not sign and chose not to participate were not given the survey. Surveying lasted for two months (March 2023 to May 2023) to obtain the target sample.

Data analysis

Analysis of the data included both descriptive and inferential statistics. Descriptive statistics included mean, percentage, and standard deviation. Inferential statistics included Pearson's correlation to correlate knowledge and attitude, while ANOVA was used to identify if there is a significant difference in the knowledge and attitude of pharmacy students when grouped according to demographics. Significant relationships and differences were set at a p -value of less than 0.05. JASP v0.18.3 was used as the statistical software.

Results

A total of 325 pharmacy students of the calculated 338 respondents participated in the survey, which led to a participation rate of 96.15 percent. These pharmacy students are from different schools of pharmacy in Davao City. Table I below shows the demographic characteristics of the respondents, which were undergraduate pharmacy students from different schools in Davao City. From this sample, a majority were females (81.23%). Junior pharmacy students constitute the highest (39.08%) when grouped according to the year level. Most respondents (75.39%) were previously enrolled in STEM track during their senior high school.

Table I: Demographic profile of pharmacy students in the survey (N=325)

Demographic characteristic	Frequency (n)	Percentage (%)
Sex		
Female	264	81.23
Male	61	18.77
Year level of pharmacy students		
Freshmen	80	24.62
Sophomore	90	27.69
Juniors	127	39.08
Seniors	28	8.62
Previous senior high school strand		
STEM	245	75.39
HUMSS	38	11.69
ABM	18	5.54
TVL	8	2.46
GAS	13	4.00
None	3	0.92
School		
School A	128	39.39
School B	3	0.92
School C	17	5.23
School D	37	11.39
School E	41	12.62
School F	45	13.85
School G	54	16.62

Note: ABM=Accountancy, Business and Management Strand; STEM=Science, Technology, Engineering, and Mathematics Strand; HUMSS=Humanities and Social Science Strand; GAS=General Academic Strand; TVL=Technical-Vocational-Livelihood Track.

Table II shows the knowledge of the respondent pharmacy students towards HIV treatment and prophylaxis. Generally, the average total knowledge score was found to be 64.29% give or take 13.731. When segmented into their respective domains, it was found that the average knowledge score for HIV treatment and prophylaxis was 74.87% and 48.41%, respectively.

For the attitude, Table III presents the overall mean score, the mean score for treatment and prophylaxis, and the mean score per item. Generally, the attitude of pharmacy students towards HIV treatment and prophylaxis was found to be 3.88, with a standard deviation of 0.655. When closely examined, the mean attitude score to HIV treatment was found to be 3.75. Furthermore, the mean attitude score to HIV prophylaxis was 4.15.

Table II: Knowledge of respondent pharmacy students to HIV treatment and prophylaxis

Item	Frequency who answered correctly (%)	Description
Knowledge towards HIV treatment		
1. What are antiretroviral drugs?	307 (94.46)	Very high
2. How many types of drugs are in the ARV combinations?	233 (71.69)	High
3. How long does treatment last?	209 (64.31)	High
4. How does one take ARVs correctly?	247 (76.00)	High
5. What are the side-effects of taking ARVs?	204 (62.77)	High
6. What are the ways to manage the side-effects of taking ARVs?	320 (98.46)	Very high
7. What are the ways to manage missing medication?	251 (77.23)	High
Knowledge towards HIV prophylaxis		
1. According to current guidance, HIV antibody testing is suggested prior to initiating PrEP in a patient who is not experiencing any symptoms.	288 (88.62)	Very high
2. How many antiretroviral medications are in the regimen that is FDA-approved for PrEP?	131 (40.31)	Poor
3. Which antiretroviral medication are FDA-approved for PrEP?	102 (31.39)	Poor
4. What is the FDA-approved dosing frequency for the antiretrovirals used for PrEP?	103 (31.69)	Poor
5. Which of the following is a relative contraindication to prescribing PrEP?	195 (60.00)	Adequate
6. How often should individuals be tested for HIV while taking PrEP?	125 (38.46)	Poor
Mean treatment knowledge score in % \pm SD	74.87 \pm 14.721	High
Mean prophylaxis knowledge score in % \pm SD	48.41 \pm 23.168	Adequate
Mean knowledge score in % \pm SD	64.29 \pm 13.731	High

Note: SD = Standard Deviation

Table III: Attitude of respondent pharmacy students to HIV treatment and prophylaxis

Item	Mean	SD	Description
Attitude towards HIV treatment			
1. I am optimistic that HAART has positive effect on health	4.11	0.935	High
2. I am convinced that HAART causes less financial difficulties	3.26	1.055	High
3. I am convinced that HAART enhances quality of life	4.04	0.950	High
4. I am convinced that HAART do not make one feel forced to take medications	3.64	0.944	High
5. I am convinced that HAART gives more benefits than harm	3.92	0.951	High
6. I am optimistic that HAART has less side effects that can lead to organ damage	3.40	0.906	High
7. I am happy that HAART prolongs life	4.03	0.931	High
8. I am optimistic that HAART assists in fulfilling family obligations	3.78	0.921	High
9. I am convinced that HAART helps one to gain more weight/energy	3.63	0.943	High
10. I am convinced that HAART reduces frequent sickness	3.66	0.977	High
Attitude towards HIV prophylaxis			
1. I am convinced that PrEP is an important element of HIV prevention strategies.	4.34	0.866	Very high
2. I am convinced that PrEP is reliable in protecting oneself from HIV	4.25	0.910	Very high
3. I am optimistic that PrEP is a method to protect oneself from HIV that has few side effects	4.02	0.939	High
4. I am convinced that PrEP is necessary compared to other alternatives to protect oneself from HIV	4.04	0.912	High
5. I am optimistic that PrEP should be paid for by statutory health insurance.	4.10	0.920	High
Mean attitude for HIV treatment	3.75	0.681	High
Mean attitude for HIV prophylaxis	4.15	0.761	High
Mean attitude score	3.88	0.655	High

Note: SD = Standard Deviation.

Table IV shows the relationship between knowledge and attitude. Using Pearson's correlation coefficient, it was found to have a weak positive ($r = 0.068$). However, this relationship was found to be not significant when comparing the p -value.

Table IV: Relationship between knowledge and attitude of respondents towards HIV treatment and prophylaxis

Variables	r	p -value	Remarks
Knowledge and attitude	0.068	.225	Not significant

Table V presents the variation in knowledge and attitude of the pharmacy students when grouped according to demographics. The same table also shows

if these variations between and inside groups are significant. From this table, only year level and school were found to have a significant difference in knowledge and attitude. The respondents' knowledge score was found to be significantly different across year levels ($F = 20.202$; $p < .000$) and school ($F = 4.577$; $p < .000$). Attitude was also found to be significantly different across year levels ($F = 3.616$; $p = .014$) and school ($F = 4.951$; $p < .000$). Post hoc analysis using Tukey's test shows that for knowledge towards HIV treatment and prophylaxis was significantly different between juniors and freshmen ($p < .000$) and between juniors and sophomore pharmacy students ($p < .000$). However, there was no significant difference when juniors students were compared to fourth-year senior students. For attitude, post hoc analysis revealed that seniors had a significantly different attitude score than freshmen ($p = .020$)

Table V: Difference in knowledge and attitude when grouped according to demographics (ANOVA)

Variable	Demographic	Mean	F	p-value
Knowledge	Sex		2.152	.143
	Female	64.82		
	Male	61.97		
	Year level of pharmacy students		20.202	<.000*
	Freshmen	61.25		Freshmen vs Juniors (<.000)
	Sophomore	57.85		Sophomores vs Juniors (<.000)
	Juniors	70.71		
	Seniors	64.52		
	Previous high school strand		1.435	.211
	STEM	64.25		
	HUMSS	62.45		
	ABM	64.82		
	TVL	72.50		
	GAS	67.69		
	None	51.11		
	School			
	School A	63.07		
School B	75.55			
School C	61.96			
School D	65.59			
School E	67.48			
School F	70.82			
School G	58.52			
Attitude	Sex		0.000	0.984
	Female	3.88		
	Male	3.88		
	Year level of pharmacy students		3.616	.014*
	Freshmen	3.72		
	Sophomore	3.85		
	Juniors	3.95		
	Seniors	4.14		
	Previous high school strand		1.162	.328
	STEM	3.89		
	HUMSS	3.76		
	ABM	3.74		
	TVL	4.10		
	GAS	4.18		
	None	3.87		
	School		4.951	<.000*
	School A	4.03		
School B	3.49			
School C	4.31			
School D	3.58			
School E	3.69			
School F	3.78			
School G	3.85			

Note. * indicates significance against p -value = .05; ABM=Accountancy, Business and Management Strand; STEM=Science, Technology, Engineering, and Mathematics Strand; HUMSS=Humanities and Social Science Strand; GAS=General Academic Strand; TVL=Technical-Vocational-Livelihood Track.

Discussion

This research provides insights into the knowledge and attitude of pharmacy students in Davao City about HIV

treatment and prophylaxis. As future pharmacists, pharmacy students must be well educated and possess the appropriate attitudes that would allow them to provide the most appropriate pharmaceutical care to the

students in all aspects, including HIV/AIDS. To the best of the study team's knowledge, this is the first study in Davao City that investigated the knowledge and attitude of student pharmacists regarding HIV treatment and prophylaxis.

In general, the average percent score for knowledge was found to be 64.29% which can be interpreted as the level of knowledge of pharmacy students in Davao City towards HIV treatment and prophylaxis is evidently great. This finding corroborates with a study concluding that the pharmacy students' HIV knowledge was competently demonstrated (Crutchley *et al.*, 2023). This finding also echoes the study conducted on medical and pharmacy students in the United States of America, where they reported a great overall mean knowledge (79.6%) towards HIV (Bunting *et al.*, 2021). However, this finding disagrees with the results of a study conducted in the Philippines, where there were more college students in Pampanga, Philippines, who did not know about the treatment of HIV (James *et al.*, 2022). This wasn't the case in the current study because the respondents are student pharmacists. Additionally, a study conducted on college students at a university in Davao City showed that more than half of the medical and non-medical college students who responded to the survey know about treatment for HIV like antiretroviral drugs (Galindo, 2014), indicating that the variations in literature may have a geographic factor of disparity.

When a closer inspection, the average knowledge score of pharmacy students about HIV treatment and HIV prophylaxis was found to be 74.87% (SD = 14.721) and 48.41% (SD = 23.168), respectively. These findings can be interpreted as having a high level of knowledge towards HIV treatment and an adequate level of knowledge in HIV prophylaxis. Despite descriptive interpretation being an adequate level, further training is warranted to increase the knowledge of students towards HIV treatment and prevention.

Regarding the student pharmacists' knowledge towards HIV treatment, it is interesting to have found out that some of the respondents do not know the side effects of HIV treatment therapy. This is peculiar since pharmacy students have spent more time than any other undergraduate students studying the pharmacology and toxicology of drugs. When given a list of antiretroviral medications, only a small percentage (31.69%) of pharmacy students can correctly identify which is used for HIV prophylaxis. This echoes the findings of a study where community pharmacists in Davao City also lack the knowledge to identify which antiretrovirals are used for HIV PrEP (Gabucan & Brieta, 2023). This suggests that the lack of knowledge towards medications used for HIV prophylaxis can be traced back to the undergraduate level. Incorrectly knowing which antivirals are used for

HIV treatment among pharmacy students has been noted in another study, and this may be a result of limited coverage of HIV/AIDS management and treatment in pharmacotherapy courses (Alzahrani *et al.*, 2024). Thus, it is important that these topics are reinforced or tackled more in lectures and course works during college.

The overall attitude of the pharmacy students towards HIV treatment and prophylaxis can be interpreted as high level, indicating that a positive attitude is oftentimes evident. Even when separately examined, both attitudes on treatment and attitudes on prophylaxis can still be interpreted as having a high level. The findings on attitude to prophylaxis corroborate the study conducted by Przybyla *et al.* (2019), showing that pharmacy students in their study generally have favourable attitudes towards HIV PrEP.

Despite the favourable findings in attitude, there are some gaps that need to be addressed when inspected in more detail. For instance, some pharmacy students have reservations that highly active antiretroviral therapy, as an HIV treatment, causes fewer financial difficulties. This perception needs to be addressed since, in the Philippines, access to HIV programs, including treatment, is considered free, while laboratory tests and consultations aren't but can be covered by national health insurance (Gangcuangco & Eustaquio, 2023). Furthermore, some pharmacy students are not optimistic that HIV pre-exposure prophylaxis is a prevention method with few side effects.

Pearson's correlation analysis revealed no significant relationship between knowledge and attitude. This means that knowledge and attitude are not correlated with each other, which is in contrast with the findings of Galindo (2014), showing a moderate correlation between knowledge and attitude on HIV/AIDS among college students at a university in Davao City. This would indicate that knowledge of treatment and prophylaxis may not be a factor affecting the attitude to HIV treatment and prophylaxis among pharmacy students. Upon literature review, knowledge about HIV stigma and prejudice is a positive factor that affects the attitude of medical students (Platten *et al.*, 2014). This implies that students who know about HIV stigma and discrimination, rather than knowing about HIV treatment and prophylaxis, tend to have a more positive attitude. Incorporating HIV-related training will contribute to decreasing stigma and increasing attitude (McKeirnan *et al.*, 2022).

ANOVA analysis revealed that the knowledge and attitude of pharmacy students regarding HIV treatment and prophylaxis were significantly different when grouped according to year level. For knowledge of HIV treatment and prophylaxis, it would make sense that

junior pharmacy students have more knowledge since they have been studying far more than the freshmen and sophomores and may have been exposed to more lectures and topics related to HIV/AIDS therapy. Additionally, the first and second years of the BSc Pharmacy curriculum are intended for foundational pharmaceutical concepts, while the third year involves many clinical and practice-oriented courses (Commission on Higher Education, 2021). This may explain why third-year pharmacy students have more knowledge than lower-year levels.

Although not significant, senior pharmacy students have a lower average knowledge score compared to junior pharmacy students. Loss of knowledge may have happened due to the fourth year being dedicated only to internships in various pharmacy practices. This may suggest a corroboration to a study indicating retention in knowledge is a product of the perceived relevance of a subject matter (Malau-Aduli *et al.*, 2013). Very few hospital pharmacies and community pharmacies, if none, provide HIV-related healthcare services, and because of limited exposure, senior pharmacy students undergoing internships may perceive HAART and PrEP knowledge as of low relevance, leading to them forgetting about it. This finding warrants further investigation to identify the factors affecting knowledge loss in seniors or graduating pharmacy students in the country.

The findings of this study show that seniors have significantly higher attitudes to HIV treatment and prophylaxis than freshman pharmacy students. This observation can be attributed to seniors having undergone internships and more real-world experiences that may be comparable to pharmacists. In Indonesia, pharmacists not only have more HIV treatment knowledge but also more empathy than pharmacy students which may be attributed to pharmacists having more experience than students (Sianturi *et al.*, 2022). This would suggest experience in patient care, and practice settings may result in more positive attitudes towards HIV/AIDS care and management.

Furthermore, it has been revealed through the ANOVA analysis that knowledge and attitude differed significantly according to school. However, a limitation of this study was that the researchers were not able to survey pharmacy students from three schools in Davao City because of time constraints and no response after a permission letter was sent. Nonetheless, this finding implies the need to introduce the current curriculum, reinforce, or standardise HIV/AIDS care education among pharmacy students. Collaborations with each other or with other stakeholders like the Department of Health, City Health Office, Mindanao Alliance of Pharmacy Schools, and Philippine Association of Colleges

of Pharmacy can be highly considered to increase the level of knowledge and attitude of the students.

Limitations

Certain limitations were encountered and may have affected the conduct and results of this study. For one, there were supposedly ten schools targeted, and a letter of intent was sent to each of them. However, the researchers failed to comply with approval requirements from two schools in Davao City due to a loss of communication and time constraints. Furthermore, pharmacy students from one school did not partake in the survey. This would imply that the generalisation drawn from this study may not be totally reflective of the whole pharmacy student population in Davao City. Further research should anticipate differing institutional policies of different universities and schools to ensure all target participants can partake.

Another limitation is that there are some schools that have newly started their operations. Whatever findings and interactions that were found in relation to juniors and seniors cannot be generalised to some of these schools since they only have freshmen or sophomores. Despite that, the findings still provide valuable insights into the knowledge and attitude of pharmacy students towards HIV treatment and prophylaxis in Davao City that can be used to initiate collaboration, educational programs, and other initiatives.

Conclusion

As future pharmacists who have the potential to contribute meaningfully to HIV prevention and management programmes in the country, pharmacy students should possess the appropriate knowledge and attitude towards HIV treatment and prophylaxis. This study provides valuable information on the knowledge and attitude towards HIV treatment and prophylaxis among pharmacy students in Davao City. Generally, their level of knowledge and attitude is favourable, but improvements can be made to ensure that they are ready for practice. Schools of pharmacy in the city should consider introducing or reinforcing lessons, course works, and trainings towards HIV/AIDS, not only in treatment and prophylaxis but also in trainings related to reducing stigma and misconceptions.

Conflict of interest

The authors declare no conflict of interest.

Source of funding

The authors did not receive any funding.

Ethics Approval and Informed Consent

The current study was endorsed to the Research Ethics Committee of the University of the Immaculate Conception for full board review with the protocol code UG-0024-02-24. After review, the study was found to be responsible and ethically accountable and was granted ethical clearance on March 3, 2024.

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Appendix A: Survey questionnaire used in the study

Section I. Respondent demographics

This section will extract demographic information from you, our participants. Please answer the following questions honestly.

Demographic	Choices
Sex	a. Female b. Male
Year Level	a. Freshmen b. Sophomore c. Junior d. Senior
Previous SHS Strand	a. STEM b. HUMSS c. ABM d. TVL e. GAS f. Other: _____
Current School	

Section IIa: Respondents Knowledge towards HIV treatment (HAART)

This section of the survey will extract your knowledge of HIV treatment.

Direction: Please answer the following questions honestly. Encircle the letter of your choosing.

Item	Choices
1. What are antiretroviral drugs?	a. Antivirals* b. Antibiotics c. Antifungals
2. How many types of drugs are in the ARV combinations?	a. Triple ARVs or more* b. Single drug c. Dual combination
3. How long does treatment last?	a. Lifetime* b. 6 months c. 3 months
4. How does one take ARVs correctly?	a. Once daily or twice daily* b. Four times a day c. Twice a week
5. What are the side-effects of taking ARVs?	a. Hepato-renal toxicity* b. Blurred vision c. Weight gain d. Hypertension
6. What are the ways to manage the side-effects of taking ARVs?	a. Consult with physicians* b. Self-medicate
7. What are the ways to manage missing medication?	a. Take it as soon as you remember* b. Skip the missed dose
8. How do you calculate the next doses?	a. Take the next dose 4 h after taking the missed dose (for the twice-daily regimen) b. 12 h (for the once-daily regimen) c. All of the above* d. None of the above
9. What is treatment adherence for ARV?	a. Take the right medicine, right dose, at the right time, in the right way, and re-examine on time* b. Take it anytime you want

Note. Correct answers are indicated with an asterisk (*).

Section IIb. Respondents Knowledge towards HIV prophylaxis (PrEP)

This section of the survey will extract your knowledge of HIV prophylaxis.

Direction: Please answer the following questions honestly. Encircle the letter of your choosing.

Item	Choices
1. According to current guidance, HIV antibody testing is suggested prior to initiating PrEP in a patient who is not experiencing any symptoms.	a. True* b. False
2. How many antiretroviral medications are in the regimen that is FDA-approved for PrEP?	a. 1 b. 2* c. 3 d. 4
3. Which antiretroviral medication are FDA-approved for PrEP?	a. Zidovudine (AZT) or Retrovir® b. Lamivudine (3TC) or Epivir® c. Abacavir or Ziagen® d. Tenofovir or Viread® e. Emtricitabine (FTC) or Emtriva® f. Lopinavir or Kaletra®

Item	Choices
4. What is the FDA-approved dosing frequency for the antiretrovirals used for PrEP?	g. Efavirenz or Sustiva® h. Emtricitabine + Tenofovir or Truvada®* a. Once weekly b. Once daily* c. Twice daily d. Three times per day e. Immediately prior to sexual activity f. Immediately following sexual activity
5. Which of the following is a relative contraindication to prescribing PrEP?	a. Reduced creatinine clearance (<50mL/min)* b. Previous myocardial infarction c. Hypertension d. Obesity e. Squamous cell carcinoma of the skin f. None of the above
6. How often should individuals be tested for HIV while taking PrEP?	a. Weekly b. Monthly c. Every 2-3 months* d. Every 6 months e. Annually

Note. Correct answers are indicated with an asterisk (*).

Section IIIa. Respondents Attitude towards HIV treatment (HAART)

Direction: Please indicate your degree of agreement and disagreement on the following statements that represent your attitude towards HIV HAART using the choices that follow:

- Strongly disagree - 1
- Disagree - 2
- Fairly Agree - 3
- Agree - 4
- Strongly Agree - 5

Item	5	4	3	2	1
1. I am optimistic that HAART has positive effect on health					
2. I am convinced that HAART causes less financial difficulties					
3. I am convinced that HAART enhances quality of life					
4. I am convinced that HAART do not make one feel forced to take medications					
5. I am convinced that HAART gives more benefits than harm					
6. I am optimistic that HAART has less side effects that can lead to organ damage					
7. I am happy that HAART prolongs life					
8. I am optimistic that HAART assists in fulfilling family obligations					
9. I am convinced that HAART helps one to gain more weight/energy					
10. I am convinced that HAART reduces frequent sickness					

Section IIIb. Respondents Attitude towards HIV prophylaxis (PrEP)

Direction: Please indicate your degree of agreement and disagreement on the following statements that represent your attitude towards HIV PrEP using the choices that follow:

- Strongly disagree - 1
- Disagree - 2
- Fairly agree - 3
- Agree - 4
- Strongly agree - 5

Item	5	4	3	2	1
1. I am convinced that PrEP is an important element of HIV prevention strategies.					
2. I am convinced that PrEP is reliable in protecting oneself from HIV.					
3. I am optimistic that PrEP is a method to protect oneself from HIV that has few side effects.					
4. I am convinced that PrEP is necessary compared to other alternatives to protect oneself from HIV.					
5. I am optimistic that PrEP should be paid for by statutory health insurance.					