 ISBN: 978-86-87043-83-1

Knowledge, Attitudes, and Practices Concerning Self-Medication with Antibiotics Among the Undergraduates of Medical Technology, Pharmacy, and Biochemistry from A University in Manila, Philippines

Jaryl Christia Aceveda, Jannele Victoria Cañares, Paula Jane Crisostomo, Yazmeen Karmela Faustino, Jheyannie Camil Ko, Kristine Frances Mallillin
University of Santo Tomas, Faculty of Pharmacy, Department of Medical Technology
España Blvd., Sampaloc, Manila, Philippines
kristinefrances.mallillin.pharma@ust.edu.ph

Prof. Edilberto Manahan
University of Santo Tomas, The Graduate School
España Blvd., Sampaloc, Manila, Philippines
epmanahan@ust.edu.ph

ABSTRACT

Self-medication is a public health risk resulting in increased drug resistance as well as the development of adverse effects among drugs, wherein students in the health sciences field are more prone to self-medicating than the general population. The study aimed to assess the knowledge, attitudes, and practices concerning self-medication with antibiotics among the undergraduates of Medical Technology, Pharmacy, and Biochemistry from a University in Manila, Philippines. The study utilized a quantitative, cross-sectional descriptive research design. It garnered 536 respondents selected through stratified sampling, and data gathering was conducted through an online questionnaire. Frequency and percentage, weighted mean, Likert scale, Kruskal-Wallis H test, and Pairwise comparison was used to analyze the data acquired. The mean score for knowledge was 6.10 out of a maximum score of 7, indicating that most respondents have a superior level of knowledge. The majority also had favorable attitudes and good practices regarding self-medication with antibiotics. Moreover, a significant difference was found in the level of knowledge ($p=0.007$), attitudes ($p=0.001$), and practices ($p<0.001$) regarding self-medication with antibiotics among the target population. Further analysis revealed that Pharmacy and Medical Technology undergraduates resulted with higher levels of knowledge and proper attitudes than Biochemistry undergraduates. Pharmacy students were the most familiar among the three programs regarding antibiotics practices. At the same time, no significant difference was observed among the Biochemistry and Medical Technology undergraduates. Despite superior knowledge, favorable attitudes, and good practices, the respondents also exhibited common misconceptions and malpractices regarding antibiotic intake, implying that self-medicating is prevalent among these allied health students and should be addressed urgently.

KEYWORDS: Self-medication, Pharmacy, Medical Technology, Biochemistry, undergraduates, knowledge, attitudes, practices, antibiotics

 ISBN: 978-86-87043-83-1

1 INTRODUCTION

The World Health Organization (2020) announced that COVID-19 has become an international public health emergency last January 2020. The pandemic has created fear, panic, and anxiety, eventually resulting in many people self-medicating to relieve the stress (Chopra et al., 2021). Self-medication is defined as using pharmaceutical drugs to treat diseases or symptoms that are self-diagnosed without the need of any prescription or doctor's advice (World Health Organization, 2020). Karimy et al. (2017) stated that self-medication has different forms, such as taking the medication without a physician's prescription, based on previous experiences, and taking medication at home without any doctor's advice.

Antibiotics are the specific remedy appropriate for bacterial infections among animals. Specifically, urinary tract infection (UTI) and strep throat are some examples of bacterial infections, while viral infections include common colds, flu, and bronchitis (Center for Disease Control, 2021). Unlike bacteria, viruses are more specific in targeting the cells because a host is essential for their survival. This results in most pathogenic viruses, thereby deeming viral infections more challenging to treat (Ansorge, 2011).

A study from China by Wang et al. (2018) conducted among local university students reported that most had antibiotics in their homes, either leftover from previous prescriptions or bought over-the-counter. Another study conducted by Patil, S.B. et al. (2014) showed that 88.18% of undergraduate medical students of a university in India practiced self-medication for common colds. Only 37.1% of the students completed the antibiotic doses and procedures. Moreover, over-prescription of antibiotics also contributes in the same manner wherein 28% of the annual antibiotic prescriptions in the U.S. were deemed unnecessary (CDC, 2020).

Antimicrobial Resistance Surveillance Program (ARSP) and released a report annually regarding this matter. The country also has its own Antimicrobial Resistance Surveillance Reference Laboratory (ARSRL) which is managed by Department of Health and is located at the Research Institute for Tropical Medicine (RITM). Based on their most recent report in 2020, 61,527 isolates were analyzed, and a 38.68% resistance decrease was observed compared to the previous year's report. However, it should be noted that the COVID-19 pandemic had significantly decreased the number of isolates submitted (2020 ASRP Data, 2021). The study aimed to assess the level of knowledge, attitudes, and practices concerning self-medication with antibiotics among the undergraduates of Medical Technology, Pharmacy, and Biochemistry from a University in Manila, Philippines. Furthermore, this study can be beneficial to the Filipino youth, health policymakers, professionals, and future researchers to raise awareness of antibiotic self-medication's possible risks and dangers, formulate and review drug licensing policies, and the basis for thoroughly exploring this area and developing appropriate strategies to identify and educate their patients on the dangers of practicing self–medication and to gather valuable information needed for future research related to the study.

2 METHODOLOGY

The target population of the study was from a University in Manila, Philippines. The researchers predetermined a sample size from the target population by means of stratified sampling, which was used as the margin for data pool gathering. An online questionnaire was created using Google Forms wherein the questions were adapted from two different studies per the permission of the respective original authors. The researchers modified the original questionnaires to one that was appropriate for the study by revising the question type to True or False and incorporating the Likert scale. A publication material announcing the study's

 ISBN: 978-86-87043-83-1

call for respondents was posted on social media to kick start the data collection and the questionnaire was disseminated by means of social media platforms – Gmail, Facebook, and Facebook Messenger – wherein the researchers garnered a total of 536 responses. Data was automatically stored in a linked Google Sheet that the researchers had open access to once they submitted their responses. The researchers removed all identity-specific data that was recorded prior to handing the collected data over to the statistician for data analysis. Microsoft Excel and SPSS were used to generate the frequency, percentage, standard deviation, weighted means, Likert scale, Kruskal-Wallis H test, and the Pairwise Comparison Post Hoc test with Bonferroni Correlation for data analysis. Furthermore, the researchers provided verbal interpretations to correlate the numerical values of the weighted means that served as a basis for the discussion of results.

3 RESULTS AND DISCUSSION

Table 1 Demographic Profile of the Respondents

Variables		Frequency
Department	Biochemistry	35
	Medical Technology	280
	Pharmacy	221
Year Level	First Year	144
	Second Year	116
	Third Year	104
	Fourth Year	172
Age	18-19	190
	20-21	218
	22-23	128
Gender	Male	131
	Female	405
Family's Monthly Income	50,000 below	96
	51,000-70,000	106
	71,000-90,000	83
	90,000 above	251
Total		**536**

Table 1 depicts the demographic profile of the respondents. A total of 536 respondents were included in the study, wherein the Department of Medical Technology and Fourth Year level students dominated the group with 52% and 32% respectively. Among the age groups stated, most of the respondents were 19 years old (26%) and female (76%). Furthermore, most of the respondents have a family's monthly income of 90,000 above (47%).

Table 2 Statements and Corresponding Answers in the Knowledge Part of the Questionnaire

Statement	Answer
Antibiotics are effective for the treatment of bacterial infections	TRUE
Antibiotics are effective for the treatment of viral infections	FALSE
Antibiotics are effective for the treatment of both bacterial and viral infections	FALSE
Antibiotic resistance is the loss of activity of an antibiotic	TRUE

 ISBN: 978-86-87043-83-1

Missing an antibiotic dose contributes to antibiotic resistance	TRUE
Antibiotic resistance can be caused by the overuse of antibiotics	TRUE
Consumption of antibiotics without physician's prescription can contribute to antibiotic resistance	TRUE
Total Score	**7**

Table 2 contains the statements and their corresponding answer key that was utilized as the basis for analyzing the knowledge part of the questionnaire. Each statement answered correctly is equivalent to one point. A total score of seven points will be obtained if the respondents answered all the statements correctly.

Table 2.1 Statements and Corresponding Answers in the Knowledge Part of the Questionnaire

Knowledge Scores	Frequency	Percentage
2	1	0
3	16	3
4	30	6
5	97	18
6	130	24
7	262	49
Total	**536**	**100**

Table 2.1 demonstrates the frequency and percentage distribution of the knowledge scores of the respondents. Scores were obtained based on Table 2. Out of the 536 total respondents, 262 obtained a perfect score of 7, while 1 obtained a score of 2. In the percentage column, 49% of the respondents have superior knowledge about antibiotics, whereas 0% do not know. This representation means that most respondents know about self-medication with antibiotics since the range of scores they acquired is between 5 and 7 out of a possible maximum score of 7. Most of the respondents' sufficient level of knowledge may be related to the series of didactic lectures they received on antibiotics (Lv et al., 2014). Since the respondents have clinical subjects such as Pharmacology and other drug-related courses, their level of knowledge becomes more profound and comprehensive. Thus, medical classes or lessons play an essential role in the students' knowledge concerning self-medication with antibiotics. In accordance, Aljaouni et al. (2015) identified study textbooks and learning experiences as the medical students' primary source of information towards self-medication decisions. Furthermore, Marzan et al. (2021) revealed that the low knowledge level regarding antibiotics in their data or results could be due to most of their respondents being non-medical students. Hence, students studying clinical and drug-related courses have deep and extensive knowledge about antibiotics.

Table 2.1.1 Descriptive Statistics of the Knowledge Scores Concerning Self-Medication with Antibiotics of the Respondents

Variable	Minimum	Maximum	Mean	Standard Deviation
Knowledge Score	2	7	6.10	1.09

Table 2.1.1 presents the descriptive statistics of the knowledge scores of the respondents. Scores were obtained based on Table 2.1. Out of the seven questions on the knowledge part of the questionnaire, the minimum score a respondent obtained was 2. In contrast, the maximum score a respondent received was a perfect score of 7. Furthermore, the

 ISBN: 978-86-87043-83-1

mean knowledge scores were 6.10, with a range of 5 to 7 out of a possible maximum score of 7, representing approximately 87.14% of the respondents who achieved an ideal score of 7 points.

On the other hand, the raw scores had a standard deviation of 1.09, denoting that the data is more concentrated or tightly clustered around the mean. Essentially, this representation means that the variation of the respondents' knowledge scores is slight. Therefore, the respondents have a superior level of knowledge. This level of knowledge may be attributable to the allied health courses taken by the respondents, making them knowledgeable about antibiotics. In a study by Marzan et al. (2021), medical students obtained higher overall knowledge scores regarding antibiotics than students not part of the medical field. Moreover, medical students used fewer antibiotics for self-treatment. Several studies also deliberated that individuals who harbor thorough understanding of legitimate concepts of antibiotic self-medication would culminate to more responsible actions (Sontakke et al., 2011) (Mehta, R.K., and Sharma, S., 2015). These studies support the adequate level of knowledge of the respondents. Hence, students taking allied health courses are more knowledgeable about antibiotics than non-medical students because they are exposed more to in-depth discussions regarding antibiotics.

Table 2.2 Attitudes Concerning Self-Medication with Antibiotics of the Respondents

Questions	Weighted Mean	Verbal Interpretation
I agree that it is necessary to get further information regarding judicious antibiotic use	3.90	Agree
I agree that the effectiveness of treatment would be reduced if the full course of antibiotic treatment was not completed	3.72	Agree
I agree that limiting the inappropriate use of antibiotics play an important role in preventing the emergence of antibiotic resistance	3.89	Agree
I agree that patients could ask the physician to prescribe an antibiotic during the visit	2.31	Disagree
I agree that one can self-medicate with antibiotics rather than to see a doctor when he/she got minor illness	3.71	Agree
I agree that one can cease treatment one or two days after recovery	3.47	Agree
I agree that expensive antibiotics are more effective and have a more negligible side effect	3.29	Neither Agree nor Disagree
Total Score	**3.47**	**Agree**

Table 2.2 shows that the respondents showed a favorable attitude as they agreed (with a weighted mean of 3.90) that it is necessary to get further information regarding judicious antibiotic use. This result is consistent with a study by Lv et al. (2014), wherein 95% (697/731) of their student respondents agreed with the statement. Dagan published an article in 2014. He stated that antibiotics are not to be used generally as their effect on antibiotic resistance differs per organism. In line with this, he enhanced that there are significant points needed to be considered for judicious use of antibiotics to be achieved; some of these include a) solely for bacterial infections, b) diagnosis and disease severity assessment made to personalize and maximize antibiotic treatment, and c) the application of pharmacokinetics and pharmacodynamics for effective dosage.

The respondents showed a favorable attitude as they agreed (with a weighted mean of 3.75) that the effectiveness of treatment would be reduced if the full course of antibiotic treatment was not completed. The study by Lv et al. (2014) also included this statement in

 ISBN: 978-86-87043-83-1

their questionnaire, wherein 60% (440/731) of their target population agreed with the statement. Correspondingly, the US FDA (2019) advised people to strictly abide by the physician's prescription to receive maximum treatment efficacy; hence, they recommend not skipping dosage, not saving antibiotics for future use, and not taking other people's prescriptions.

Based on the results, the respondents were still able to show a favorable attitude as they agreed (with a weighted mean of 3.89) that limiting inappropriate use of antibiotics plays a vital role in preventing the emergence of antibiotic resistance, which is in accordance with the respondents gathered from Lv et al. (2014) study wherein 79% (578/731) of the respondents likewise agreed to this statement. Comparatively, with WHO (2020) and per the study's RRL, the consistent misuse and abuse of antibiotics is a significant contributor that hastens the development of antibiotic resistance among various bacteria.

With a weighted mean of 2.31, the respondents correctly disagreed with the statement that patients could ask the physician to prescribe an antibiotic during the visit. This result is supported by a study by Lv et al. (2014). Their results revealed that 16.3% (119/731) of the respondents incorrectly agreed with the statement. The respondents showed a favorable attitude as they correctly disagreed with that statement, which the respondents from Lv's study could not do. Patients are not encouraged to request the physician directly or indirectly for a prescription since it may not be necessary depending on their conditions. According to Stivers (2021), physicians usually experience pressure even in the subtlest forms from patients, especially parents, who expect a prescription after every consultation or diagnosis. In response, WHO (2020) advises individuals to refrain from demanding antibiotics when the professionals suggest it is unnecessary. This is also a factor for over-prescription that contributes to the development of antibiotic resistance (Stivers, 2021; WHO, 2020).

With a weighted mean of 3.71, the respondents incorrectly agreed that one can self-medicate with antibiotics rather than seeing a doctor when they got minor illnesses. Similarly, with a weighted mean of 3.29, the respondents also incorrectly agreed that one could cease treatment one or two days after recovery. In comparison, 65.06% of the respondents from Sirijoti et al. (2014) study and 77.6% of the respondents from Kim et al. (2011) study was also reported to execute said malpractice. In response to the attitude demonstrated by not only our respondents but also respondents from similar studies, this study repeatedly highlights the importance of seeking a physician and receiving proper prescriptions, even for minor illnesses, to provide patients with the best effective treatment and not to abuse the use of antibiotics with excessive doses resulting from unprofessional treatment plans. Nepal and Bhatta (2018) mentioned in a study that abruptly ceasing treatment after the symptoms subside is the most inappropriate practice that could feed the growing antibiotic resistance. Correspondingly, the US FDA (2019) advised people to strictly abide by the physician's prescription and not skip any dosage, while the American Lung Association (2021) stressed the importance of continuing the prescribed medication despite already feeling relieved in the process as ceasing treatment may pose a risk for the recurrence of the infection along with increased antibiotic resistance.

Meanwhile, the respondents neither agree nor disagree (with a weighted mean of 3.29) that expensive antibiotics are more effective and have more minor side effects. Although several studies have stated that generic medications produce increased rates of drug-related side effects, an article by Harvard Health Publishing (2021) compared branded and generic drugs. There is no hard proof that generic medications are less effective than the original or branded ones since these kinds of drugs are heavily regulated by the FDA, giving the patient assurance about the quality. However, although existing medications are considered effective yet inexpensive, it is still to note that antibiotics proven to be effective are naturally expected to be more expensive and more cost-efficient (Simoens, 2011).

 ISBN: 978-86-87043-83-1

Table 2.3 Level of Practices Concerning Self-Medication with Antibiotics of the Respondents

Questions	Weighted Mean	Verbal Interpretation
I take antibiotics through a physician's prescription	3.85	Agree
I take antibiotics as suggested by my friends or relatives	3.47	Agree
I take antibiotics as suggested by pharmacists	2.56	Disagree
I take antibiotics according to my previous prescription	3.13	Neither Agree nor Disagree
I take antibiotics via self-medication	3.71	Agree
I often switch antibiotics during the course of self-medication	3.72	Agree
I often change the dosage during the course of self-medication	3.78	Agree
I often read the instructions in the package insert carefully before taking antibiotics	3.40	Neither Agree nor Disagree
I take multiple antibiotics at the same time during the course of a single infectious disease	3.67	Agree
I stop taking antibiotics when I feel better	3.37	Neither Agree nor Disagree
I choose a more expensive or new antibiotics when I am sick	3.26	Neither Agree nor Disagree
Total Rating	**3.45**	**Agree**

In Table 2.3, the respondents agreed (with a weighted mean of 3.85) that they practice taking antibiotics from physician's prescriptions; however, they also agreed (with a weighted mean of 3.47) in taking antibiotics from their friends or relatives. Antibiotics should solely be taken with a valid prescription and proper counseling with a physician. Meanwhile, the respondents disagreed (with a weighted mean of 2.56) that they do not practice taking antibiotics suggested by pharmacists. Per Section 33 of Article IV of the Republic Act No. 10918, physicians provide the prescriptions required for duly registered and licensed pharmacists to be eligible to dispense the drugs. In line with the pandemic and per the FDA Circular No. 2020-007, electronic prescriptions are deemed equivalent to written prescriptions. A licensed physician validly issues them. They are likewise required for duly registered and licensed pharmacists to be eligible to dispense the drugs.

It should be noted that the respondents also agreed that: a) they take antibiotics via self-medication (with a weighted mean of 3.71), b) they often switch antibiotics during the course of self-medication (with a weighted mean of 3.72), c) they often change the dosage during the course of self-medication (with a weighted mean of 3.78), and d) they take multiple antibiotics at the same time during the course of a single infectious disease (with a weighted mean of 3.67). According to the Centers for Disease Control and Prevention (2022), patients should take antibiotics precisely as the physician directs. During their treatment, patients must never change the antibiotics they are taking, the specific dosage of the antibiotics prescribed, or handle numerous antibiotics at the same time unless their physician says otherwise.

The respondents neither agree nor disagree that they may or may not practice, the following statements: a) taking antibiotics according to their previous prescription (with a weighted mean of 3.13), b) reading the instructions in the package insert carefully before taking antibiotics (with a weighted mean of 3.40), c) stopping antibiotics when they feel better (with a weighted mean of 3.37), and d) choosing a more expensive or new antibiotics when they are sick (with a weighted mean of 3.26). One should only take antibiotics prescribed in real-time and complete the course even if symptoms are relieved prior to the

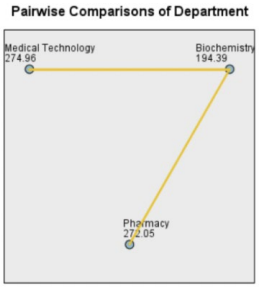
 ISBN: 978-86-87043-83-1

end of the prescribed course for treatment. Labels and instructions on medications and other products should always be read thoroughly before consumption or application to ensure that they are being used for appropriate situations and to know beforehand the troubleshooting measures in case of accidents (Queensland Health, 2017). To receive their maximum benefits, one should hone and turn it into a habit to always read the labels and package inserts, even on familiar drugs or products. There could have been changes or additional information in the instructions. Despite agreeing to the statement that they can cease treatment one or two days after recovery in the assessment of the attitudes concerning self-medication, the respondents did not distinctly agree to be undertaking this practice.

Table 3 Kruskal-Wallis H Test in the Knowledge, Attitudes, and Practices concerning Self-Medication with Antibiotics in terms of the Respondents' Department

Variable	N	df	Test Statistic	p-value	Decision	Remarks
Knowledge	536	2	9.989	0.007	Reject Ho	Significant
Attitude	536	2	14.126	0.001	Reject Ho	Significant
Practices	536	2	17.603	<0.001	Reject Ho	Significant

Table 3 shows that there was a significant difference in the level of knowledge (p=0.007), attitudes (p=0.001), and practices (p<0.001) regarding self-medication with antibiotics between the three departments. Previous research utilizing the KAP framework has also found significant associations between respondents' knowledge, attitudes, and practices for self-medication across different demographics, including undergraduates in Western China (Lv et al., 2014), Public University Students in Bangladesh (Marzan et al., 2021), and medical students. (Patel et al., 2013) (El Ezz and Ez-Elarab, 2011). However, Shankar et al. (2016) contrasts these findings since the authors found no significant difference in knowledge and perception among premedical and primary science undergraduate medical students. Moreover, as all p-values are less than 0.05, this indicates a statistically significant difference in the said factors when respondents are grouped according to their department. Hence, post hoc tests with Bonferroni correction were utilized to compare the groups pairwise and know which groups differ.



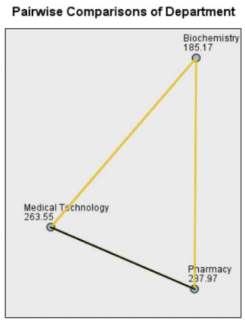
Sample1-Sample2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj.Sig.
Biochemistry-Pharmacy	-77.669	26.171	-2.968	.003	.009
Biochemistry-Medical Technology	-80.573	25.792	-3.124	.002	.005
Pharmacy-Medical Technology	2.905	12.944	.224	.822	1.000

Figure 1.1: P Pairwise Comparison in the Knowledge concerning Self-Medication with Antibiotics in terms of the Respondents' Department

Figure 1.1 displays revealed a statistically significant difference in the knowledge scores between Biochemistry and Pharmacy students (p=.009) and Biochemistry and Medical Technology students (p=.005). This was evident on the diagram as it shows a yellow line

 ISBN: 978-86-87043-83-1

joining the mentioned pair groups, indicating a significant difference. Meanwhile, there is no significant difference in the knowledge scores between students from the Medical Technology and Pharmacy department (p=1.000). From this result, it can be said that Pharmacy and Medical Technology students performed better and had higher scores on knowledge of antibiotics than Biochemistry students. This most likely reflects the differences in educational courses and curriculums of these three departments. The high scores of the Medical Technology students may be due to having Pharmacology as one of the courses included in their curriculum. Meanwhile, Pharmacy students have more drug courses and deeper integration with pharmaceutics. This was similar to the study by Hashemzaei et al. (2021), wherein the ratio of those who had good knowledge of antibiotics and its issue related to self-medication was significantly higher in pharmacy students than the medical students.

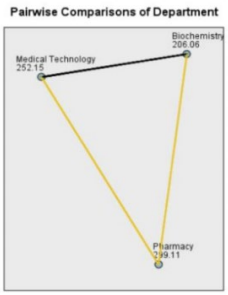


Sample1-Sample2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj.Sig.
Biochemistry-Medical Technology	-78.375	27.556	-2.844	.004	.013
Biochemistry-Pharmacy	-102.801	27.962	-3.677	.000	.001
Medical Technology-Pharmacy	-24.426	13.830	-1.766	.077	.232

Figure 2.2: Pairwise Comparison in the Attitudes concerning Self-Medication with Antibiotics in terms of the Respondents' Department

Figure 1.2 shows a statistically significant difference in attitudes between Biochemistry and Medical Technology students (p=.013) and Biochemistry and Pharmacy students (p=.001). On the other hand, there is no significant difference between Medical Technology and Pharmacy students (p=.232), implied by the connecting black line between the two groups. Hence, it can be said that Biochemistry students have lower attitudes and beliefs concerning self-medication with antibiotics compared to the Medical Technology and Pharmacy students. These observations indicate that knowledge played an essential role in the students' attitudes. This finding corresponds with the study by Nepal et al. (2019) that indicated that the respondents who have less knowledge are most likely to have less appropriate attitudes towards the appropriate use of antibiotics.

 ISBN: 978-86-87043-83-1



Each node shows the sample average rank of Department.

Sample1-Sample2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj.Sig.
Biochemistry-Medical Technology	-46.089	27.640	-1.667	.095	.286
Biochemistry-Pharmacy	-93.051	28.047	-3.318	.001	.003
Medical Technology-Pharmacy	-46.962	13.872	-3.385	.001	.002

Figure 3.3: Pairwise Comparison in the Practices Concerning Self-Medication with Antibiotics in terms of the Respondents' Department

Furthermore, Figure 1.3 shows a significant difference in the practices between Biochemistry and Pharmacy (p=.003) and Medical Technology and Pharmacy students (p=.002). In contrast, there is no significant difference between the Biochemistry and Medical Technology students (p=.286). This indicates that Pharmacy students are the most familiar among the three departments with antibiotics practices. This result coincides with the study done by Nair et al. (2020), where self-antibiotic practice among the participating pharmacy students was good since most students were aware of antibiotic resistance. The authors mentioned that most students in the study were willing to see a doctor when they were sick and did not opt for self-treatment. Additionally, findings obtained by Albusalih et al. (2017) suggest that pharmacy students have a better knowledge of drugs and their toxicology, which may increase their reluctance to practice self-medication.

4 CONCLUSION

According to the findings of the study, the respondents generally demonstrate a superior level of knowledge concerning self-medication with antibiotics. The participants also generally show favorable attitudes regarding antibiotic use. Furthermore, the results indicate that most respondents exhibit good practices when taking antibiotics. Overall, the data reveals a significant difference between the knowledge, attitudes, and practices among the undergraduates of Medical Technology, Pharmacy, and Biochemistry. Hence, the study's findings highlight the need for further efforts to encourage responsible self-medication, particularly among health allied students, to raise new generations of individuals capable of combating unregulated self-medication.

The researchers recommend that future researchers conduct a similar study that would utilize a different target population (e.g., non-health allied students) or a different age group (e.g., working population). A study involving respondents from health allied and non-health allied fields can also be carried out to correlate the findings between the two respondent categories. Finally, future researchers may consider comparing different settings, such as conducting a study with the general population in a designated urban and rural area.

ACKNOWLEDGEMENTS: The researchers of this study would like to express their sincere gratitude to acquaintances who aid in disseminating the survey across social media platforms; the respondents who have voluntarily participated in the data collection; Ma. Janna J. Dela Cruz for sharing her expertise in research methods and being the statistician for this

study; Anne Valkyrie S. Flores for proofreading the entirety of the study; William BaThein and Salequl Islam for generously granting permission to adapt the data collection tool that they have created; and last but not the least; Almighty God, for granting the researchers the wisdom, perseverance, and patience to conduct and accomplish this study.

FUNDING: This research received no external funding.

CONFLICT OF INTEREST: Authors declare no conflict of interest.

REFERENCES

Albusalih, F., Naqvi, A., Ahmad, R., and Ahmad, N. (2017). Prevalence of self-medication among students of pharmacy and medicine colleges of a public sector university in Dammam City, Saudi Arabia. *Pharmacy,* 5(4), 51. https://doi.org/10.3390/pharmacy5030051

Aljaouni, M. E., Hafiz, A. A., Alalawi, H. H., Alahmadi, G. A., and AlKhawaja, I. (2015). Self-medication practice among medical and non-medical students at Taibah University, Madinah, Saudi Arabia. *Int J Acad Sci Res*, 3(4), 54-65.

American Lung Association. (2021). Pneumonia Treatment and Recovery. https://www.lung.org/lung-health-diseases/lung-disease-lookup/pneumonia/treatment-and-recovery

Antimicrobial Resistance Surveillance Program. (n.d.). https://icamr.doh.gov.ph/wp-content/uploads/2020/12/2019_annual_report_summary.pdf

Ansorge, R. (2011). *Bacterial and Viral Infections*. https://www.webmd.com/a-to-z-guides/bacterial-and-viral-infections

Center for Disease Control. (2020). *About Antibiotic Resistance*. https://www.cdc.gov/drugresistance/about.html

Center for Disease Control. (2021). *Antibiotic Resistance Questions and Answers*. https://www.cdc.gov/antibiotic-use/antibiotic-resistance.html

Center for Disease Control. (2022). *Are you using antibiotics wisely?* https://www.cdc.gov/antibiotic-use/do-and-dont.html

Chopra, D., Bhandari, B., Sidhu, J. K., Jakhar, K., Jamil, F., and Gupta, R. (2021). Prevalence of self-reported anxiety and self-medication among upper and middle socioeconomic strata amidst COVID-19 pandemic. *Journal of education and health promotion*, *10*, 73. https://doi.org/10.4103/jehp.jehp_864_20

Dagan, R. (2014). What is 'judicious use of antibiotics,' and is it achievable in children? *International Journal of Infectious Diseases*, 21, 40–41. https://doi.org/10.1016/j.ijid.2014.03.500

El Ezz, N. F., and Ez-Elarab, H. S. (2011). Knowledge, attitude, and practice of medical students towards self-medication at Ain Shams University, Egypt. *Journal of Preventive Medicine and Hygiene*, 52(4), 196–200.

Food and Drug Administration. (2021). *FDA Circular No. 2020–007.* https://www.fda.gov.ph/fda-circular-no-2020-007-guidelines-in-the-implementation-of-the-use-of-electronic-means-of-prescription-for-drugs-for-the-benefit-of-individuals-vulnerable-to-covid-19/

Harvard Health Publishing (2021). *Do generic drugs compromise on quality?* https://www.health.harvard.edu/staying-healthy/do-generic-drugs-compromise-on-quality

Hashemzaei, M., Afshari, M., Koohkan, Z., Bazi, A., Rezaee, R., and Tabrizian, K. (2021).

Knowledge, attitude, and practice of pharmacy and medical students regarding self-medication, a study in Zabol University of Medical Sciences; Sistan and Baluchestan province in the south-east of Iran. *BMC Medical Education*, 21, 49. https://doi.org/10.1186/s12909-020-02374-0

Karimy, M., Rezaee-Momtaz, M., Tavousi, M., Montazeri, A., and Araban, M. (2019). Risk factors associated with self-medication among women in Iran. *BMC Public Health*, *19*(1). https://doi.org/10.1186/s12889-019-7302-3

Kim, S. S., Moon, S., and Kim, E. J. (2011). Public knowledge and attitudes regarding antibiotic use in South Korea. *Journal of Korean Academy of Nursing*, 41(6), 742. https://doi.org/10.4040/jkan.2011.41.6.742

Lv, B., Zhou, Z., Xu, G., Yang, D., Wu, L., Shen, Q., Jiang, M., Wang, X., Zhao, G., Yang, S., and Fang, Y. (2014). Knowledge, attitudes, and practices concerning self-medication with antibiotics among university students in western China. *Trop Med Int Health*, 19, 769-779. https://doi.org/10.1111/tmi.12322

Marzan, M., Islam, D. Z., Lugova, H., Krishnapillai, A., Haque, M., and Islam, S. (2021). Knowledge, attitudes, and practices of antimicrobial uses and resistance among public university students in Bangladesh. *Infection and Drug Resistance*, Volume 14, 519–533. https://doi.org/10.2147/idr.s289964

Mehta, R.K., and Sharma, S. (2015). Knowledge, Attitude, and Practice of Self- Medication among Medical Students. IOSR Journal of Nursing and Health Science. https://doi.org/10.14445/24547484/IJNHS-V7I2P101

Nair, C. C., Mahadeven, S., Asheeta, A., Hima, C. S., Beena, M. I., and Ajitha, J. (2020). Knowledge, attitude and practices related to antibiotic use among pharmacy students in South India. *World Journal of Pharmaceutical Research*, 9(13). https://doi.org/10.20959/wjpr202013-18909

Nepal, A., Hendrie, D., Robinson, S., and Selvey, L. A. (2019). Knowledge, attitudes, and practices relating to antibiotic use among community members of the Rupandehi District in Nepal. *BMC Public Health*, 19(1). https://doi.org/10.1186/s12889-019-7924-5

Nepal, G., and Bhatta, S. (2018). Self-medication with antibiotics in WHO Southeast Asian Region: A systematic review. *Cureus.* https://doi.org/10.7759/cureus.2428

Office of the Commissioner. (2019). *Combating Antibiotic Resistanc*e. U.S. Food and Drug Administration. https://www.fda.gov/consumers/consumer-updates/combating-antibiotic-resistance

Patil, S.B., Vardhamane, S.H., Patil B.V., et al. (2014). Self-medication practice and perceptions among undergraduate medical students: A cross-sectional study. *Journal of Clinical and Diagnostic Research*. https://doi.org/10.7860/jcdr/2014/10579.5313

Patel, P., Prajapati, A., Ganguly, B., and Gajjar, B. (2013). Study on the impact of pharmacology teaching on knowledge, attitude, and practice on self-medication among medical students. *International Journal of Medical Science and Public Health*, 2(2), 181. https://doi.org/10.5455/ijmsph.2013.2.173-178

Queensland Government Queensland Health. (2017). *How to read a medicine label (and why you always should)*. https://www.health.qld.gov.au/news-events/news/how-to-read-medicine-labels-instructions

Shankar, P. R., Dubey, A. K., Dwivedi, N. R., Nandy, A., and Barton, B. (2016). Knowledge, perception, and practice of self-medication among premedical and basic science undergraduate medical students. *Asian Journal of Medical Sciences*, 7(6), 63–68. https://doi.org/10.3126/ajms.v7i6.15246

 ISBN: 978-86-87043-83-1

Simoens, S. (2011). Factors Affecting the Cost-Effectiveness of Antibiotics. *Chemotherapy Research and Practice*, *2011*, 1–6. https://doi.org/10.1155/2011/249867

Sirijoti K, Hongsranagon P, Havanond P, Pannoi W. Assessment of knowledge attitudes and practices regarding antibiotic use in Trang province, Thailand. *J Health Res*. 2014; 28(5): 299-307.

Stivers, T. (2021). Managing Patient Pressure to Prescribe Antibiotics in the Clinic. *Pediatric Drugs*, *23*(5), 437–443. https://doi.org/10.1007/s40272-021-00466-y

Sontakke, S. D., Bajait, C. S., Pimpalkhute, S. A., Jaiswal, K. M., and Jaiswal, S. R. (2011). Comparative study of evaluation of self-medication practices in first and third-year medical students. *Int J Biol Med Res.*, *2*(2), 561-564.

Wang, X., Lin, L., Xuan, Z., Li, L., and Zhou, X. (2018). Keeping antibiotics at home promotes self-medication with antibiotics among Chinese university students. *International Journal of Environmental Research and Public Health*, *15*(4), 687. https://doi.org/10.3390/ijerph15040687

World Health Organization. (2020). *Record number of countries contribute data revealing disturbing rates of antimicrobial resistance*. https://www.who.int/news/item/01-06-2020-record-number-of-countries-contribute-data-revealing-disturbing-rates-of-antimicrobial-resistance