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The level of knowledge, attitude and practice on antibiotics among selected community pharmacists and its possible contribution to the prevalence of antibiotic resistance in Manila, Philippines

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Abstract

Antibiotics offer lifesaving benefits and definitive treatments for infections caused by pathogenic bacteria. However, their efficacy has significantly decreased with the occurrence of antibiotic resistance due to the inappropriate use of antibiotics. Thus, the study aims to determine the possible contribution of community pharmacists to the prevalence of antibiotic resistance in Manila City by investigating their socio-demographic profile and their level of knowledge, attitude, and practice (KAP) regarding antibiotic use. This descriptive cross-sectional study utilized a pre-validated questionnaire to identify the socio-demographic and level of KAP of 150 respondents who were selected through convenience sampling. Notably, 119 (79.3%) of the respondents were female, and 82 (54.7%) out of 150 community pharmacists belong to the age group 30 and below. The majority of 146 (97.3%) respondents have Bachelor's degrees, and 66 (44%) respondents had been in practice for less than or equal to five years. Statistical results showed that the respondents have sufficient knowledge with a total mean score of 8.18, high confidence with a mean rating for attitude of 4.79, and good practice with a mean rating of 4.52 regarding antibiotic use. Age, Gender, and Years of practice ($p>0.05$) were found to be correlated with their KAP level. However, the respondents' highest educational attainment did not significantly affect practice. Overall, there is a significant correlation between the majority of socio-demographic and the respondent's level of KAP. In contrast, there is no significant relationship between the respondents' KAP as a whole. This study implies that there is only a low contribution of community pharmacists' knowledge, attitude, and practice to antibiotic resistance in Manila City.

Keywords: Antibiotics; Antibiotic resistance; Knowledge; Attitude; Practice; Community Pharmacists

1. Introduction

Antibiotics have been widely used in the treatment of diseases caused by pathogenic microbes. However, as time passes by, the surge in global consumption of antibiotics over the past years poses a problem as these drugs have limitations and their improper use can lead to antibiotic resistance (ABR). In the Philippines, the said crisis has always been a threat in the healthcare system. Annual reports by the Department of Health (DOH) and Antimicrobial Resistance Surveillance Program (ARSP) Committee show that antibiotic resistance rates continuously rose from 2009 up to the present, especially in Metro Manila. In the 2019 ARSP report, 31% of the total isolates are from Metro Manila alone, making it

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the highest data collected in the entire country in 2019. The same report also shows that 28.2% of the infection origin is hospital-acquired while 55.5% are acquired from the community in 2019 DOH-ARSP [1].

Given the rising issue of antibiotic resistance in the Philippines, the community pharmacists are involved in the study as they play an essential role in the provision of antibiotics as well as in setting limitations to the rapid spread of ABR. The respondents were targeted through designated sampling sizes and techniques. Data were acquired through the distribution of online and printed survey questionnaires were analyzed by means of corresponding statistical treatments.

Obtaining the respondents' level of knowledge, attitude, and practice (KAP) on antibiotics and its possible contribution to the prevalence of antibiotic resistance in Manila serves as the primary outcome and the main objective of the study. Determining its correlation with one another and its relationship with their socio-demographic characteristics comes secondary in order to further specify the relevance of the study.

The results obtained from this study may be beneficial to the community as healthcare practitioners will raise awareness about the prevalence of ABR. Assessing their KAP on antibiotics would help strengthen the implementation of existing action plans, provide more possible interventions, and improve planning programs for local health education and training on its safe and responsible use. Hence, it will not only decrease long-term hospitalizations among the general public but also improve their quality of life.

2. Material and methods

2.1. Study Design

A cross-sectional study survey was utilized to measure the relationship between the knowledge, attitude, and practice on antibiotics among community pharmacists as well as its possible outcome, in the emergence of antibiotic resistance.

2.2. Survey Instrument

The modified survey instrument was adapted from studies of Kinsman et. al, 2019; Nair et. al, 2019; Karasneh et.al, 2021 and was validated and tested for reliability using Cronbach's Alpha. This was prepared through the online platform, Google Forms, as well as printed questionnaires.

2.3. Setting of the Study

The respondents of the study were located in the community pharmacies within the sixteen (16) districts of the City of Manila.

2.4. Respondents and Population Size

The selected 150 community pharmacists in Manila are the respondents of this study.

2.5. Sampling Technique

Convenience sampling was employed due to COVID-19 and to easily gather data and to consider the time that the respondents are only available within their work schedule.

2.6. Survey and Data Collection

The researchers administered survey questionnaires via an online platform called Google Forms, as well as printed questionnaires at the respective sites of the selected drugstores.

2.7. Statistical Analysis

The data in regards to the socio-demographic profile of the respondents and the correlation of their KAP on antibiotics was analyzed using descriptive statistics, measures of central tendency/variabilities (*e.g.* mean, median, standard deviation), and regression analysis (*e.g.* Pearson's Correlation Coefficient, Analysis of Variance or ANOVA) for normal data distribution.

2.8. Reliability

The reliability score of the survey instrument computed by Cronbach's Alpha was determined to be 0.821.

3. Results and discussion

3.1. Sociodemographic Characteristics

A total of 150 participants in Manila City completed the survey, with <30 years old being the majority. The predominant gender in the participants were female, with a total of 119 or 81% of the total sample. Majority of the participants are bachelor's degree holders with 97.3%. A study conducted by Mudenda et al (2021), also shows that the majority of the participants have a bachelor's degree [2]. The majority of 44% or 66 of participants have less than or equal to 5 years of professional practice. A study by Poyongo & Sangeda (2020) also shows that the participants have predominant practice of less than or equal to 5 years of professional practice [3].

Table 1 Sociodemographic Characteristics

Variable	Frequency	Percentage (%)
Age Group		
≤ 30 yrs. old	82	55%
31-40 yrs. Old	41	27.5%
≥ 41 yrs. old	26	17.4%
Gender		
Male	24	16.3%
Female	119	81%
Prefer not to say	4	2.7%
Highest Educational Attainment		
Bachelor's Degree	146	97.3%
Master's Degree	2	1.3%
Doctorate Degree	1	0.7%
Years of Practice		
≤ 5 years	66	44%
6-10 years	42	28%
11-15 years	16	10.7%
> 15 years	25	16.7%

3.2. Knowledge on Antibiotics among Selected Community Pharmacists

The tallied total score of the selected 150 community pharmacy respondents was 8.18, indicating that they are adequately knowledgeable regarding antibiotic dispensing, resistance, and information protocol.

A mean of 3.36 among the 150 respondents answered correctly on 4 statements regarding their knowledge about antibiotic dispensing. About a mean of 3.01 also answered correctly on 4 statements regarding their knowledge about antibiotic resistance. Furthermore, a mean of 1.8 answered correctly on 2 statements regarding their knowledge about antibiotic information protocols. The results of the survey showed similar results to the study conducted by Gajdac et al. (2020) and by Khan et al. (2021) where Pharmacist from Hungary and Pakistan are knowledgeable enough regarding antibiotic use and resistance [4][5].

Table 2 Level of Community Pharmacists' Knowledge

Knowledge items	Respondents' Answer			
	Expected Ideal Response	Frequency		Verbal Interpretation
		True	False	
Antibiotics are useful for bacterial infections.	True	150 (100%)	0 (0%)	Adequate knowledge
Antibiotics are effective against viral infections.	False	33 (22%)	117 (78%)	Adequate knowledge
Antibiotics are not indicated to reduce the symptoms of pain and inflammation.	True	100 (66.7%)	50 (33.3%)	Poor knowledge
Taking antibiotics has associated side effects and risks.	True	138 (92%)	12 (8%)	Adequate knowledge
Unnecessary use of antibiotics makes them ineffective.	True	138 (92%)	12 (8%)	Adequate knowledge
Every person treated with antibiotics is at an increased risk of antibiotic- resistant infection.	True	123 (82%)	27 (18%)	Adequate knowledge
Antibiotic-resistant bacteria can spread from person to person.	True	68 (45.3%)	82 (54.7%)	Poor knowledge
Healthy people can carry antibiotic-resistant bacteria.	True	123 (82%)	27 (18%)	Adequate knowledge
Laboratory test results and diagnosis indicating that a patient has an active bacterial infection are needed before dispensing antibiotics.	True	123 (82%)	27 (18%)	Adequate knowledge
Informing the patient regarding prudent use of antibiotics is a necessary step before dispensing the medicine.	True	147 (98%)	3 (2%)	Adequate knowledge

3.3. Attitude towards Antibiotics of Selected Community Pharmacists

All of the questions were positively answered by the 150 participants in Manila which indicates that they exhibit a positive attitude towards antibiotics and in controlling antibiotic resistance. A total mean rating of 4.79 and modal rating of always (5) with an interpretation of every day it is true, specify the high confidence of each selected community pharmacists in Manila. In connection with the study conducted by Khan et al. (2021), showed that most Pakistani community pharmacists also have a positive attitude towards antibiotics [5].

The results emphasized that about 92.7% of the respondents believed that they are certainly correct upon dispensing antibiotics. Similar to the study conducted by Mudenda et al (2021), where appropriate use of antibiotics through proper dispensing can reduce problems or threats of antibiotic resistance [2]. On the other hand, only 70.7% community pharmacists had easy access to antibiotic guidelines. As stated by Siltrakool et al. (2021), guidelines for antibiotic dispensing must be updated based on the local resistance rates and treatment duration, and must be readily accessible by all community pharmacists in their respective practices [6].

Table 3 Level of Community Pharmacists' Attitude

Attitude items	Respondents' Answer					
	5 Always (%)	**4 Often (%)**	**3 Sometimes (%)**	**2 Rarely (%)**	**1 Never (%)**	**Verbal Inter-pretation**
I am certain that the antibiotics I dispense to my patients are correct.	139 (92.7%)	10 (6.7%)	1 (0.7%)	-	-	High Confidence
I can manage to dispense antibiotics properly to control antibiotic resistance.	114 (76%)	33 (22%)	3 (2%)	-	-	High Confidence
I have to spread awareness about the dangers of inappropriate antibiotic use to combat antibiotic resistance in my practice.	126 (84%)	21 (14%)	3 (2%)	-	-	High Confidence
I need to follow all guidelines related to antibiotic use.	130 (86.7%)	17 (11.3%)	3 (2%)	-	-	High Confidence
I have to consider the possibility of antibiotic resistance before dispensing antibiotics to patients.	115 (76.7%)	26 (17.3%)	9 (6%)	-	-	High Confidence
I have a sufficient understanding on the appropriate use of antibiotics for my current practice.	125 (83.3%)	23 (15.3%)	-	1 (0.7%)	1 (0.7%)	High Confidence
I am self-assured when it comes to making antibiotic dispensing decisions.	122 (81.3%)	27 (18%)	1 (0.7%)	-	-	High Confidence
I have easy access to antibiotic guidelines provided to properly dispense antibiotics to patients.	106 (70.7%)	37 (24.7%)	7 (4.7%)	-	-	High Confidence
I believe that it is not okay to dispense antibiotics to my patients if it is not indicated.	133 (88.7%)	10 (6.7%)	2 (1.3%)	3 (2%)	2 (1.3%)	High Confidence
I believe that it is not right to dispense antibiotics to patients who ask for it just so I can maintain a good relationship with them.	128 (85.3%)	16 (10.7%)	5 (3.3%)	1 (0.7%)	-	High Confidence

3.4. Practice on Antibiotics among Selected Community Pharmacists

A mean rating of 4.52 of the total respondents revealed that the majority of community pharmacists had good practice regarding provision of antibiotics. In addition, the results showed that modal rating is always (5) with an interpretation of every day it is true for statements 4.1 to 4.6 and never (1) with an interpretation of never true for statements 4.7 to 4.12 which are considered good practice. In a study conducted in Pakistan, similar results were also reported (Khan et al.,2021) wherein they leaned towards educating patients about the rational use of antibiotics [5].

Specifically, this study highlighted that more than 80% of the respondents only dispense antibiotics upon diagnosis of bacterial infection and double-check the correctness of antibiotics before dispensing them which is reflected in the study conducted by Mudenda et al (2021) [2]. In contrast, respondents got the lowest score in statement 4.7 that describes if the respondents dispense antibiotics for the treatment of viral infection. This implies that some of the respondents are not knowledgeable enough regarding the appropriate usage of antibiotics.

Table 4 Level of Community Pharmacists' Practice

Practice items	Respondents' Answer						
	5 Always N (%)	**4 Often N (%)**	**3 Sometimes N (%)**	**2 Rarely N (%)**	**1 Never N (%)**	**Missing N (%)**	**Verbal Inter-pretation**
I only dispense antibiotics upon diagnosis of bacterial infection.	128 (85.3)	19 (12.7)	2 (1.3)	1 (0.7)	-	-	Good Practice
I inform patients that taking antibiotics has associated side effects or risks.	100 (66.7)	39 (26)	10 (6.7)	1 (0.7)	-	-	Good Practice
I avoid unnecessary dispensing of antibiotics because it makes the drug ineffective.	112 (74.7)	28 (18.7)	6 (4)	1 (0.7)	2 (1.3)	1 (0.7)	Good Practice
I give out advice related to prudent antibiotic use or management of infections to an individual.	87 (58)	54 (36)	9 (6)	-	-	-	Good Practice
I double-check the correctness of antibiotics before dispensing them.	135 (90)	14 (9.3)	-	-	-	-	Good Practice
I explain the proper usage of antibiotics to patients first before dispensing them.	113 (75.3)	33 (22)	4 (2.7)	-	-	-	Good Practice
I dispense antibiotics for the treatment of viral diseases.	20 (13.3)	11 (7.3)	14 (9.3)	18 (12)	87 (58)	-	Good Practice
I dispense antibiotics for pain and inflammation when presented with proof that the symptoms are caused by a bacterial infection.	11 (7.3)	5 (3.3)	8 (5.3)	14 (9.3)	112 (74.7)	-	Good Practice
I dispense antibiotics because I fear patient deterioration or complications.	14 (9.3)	3 (2)	10 (6.7)	23 (15.3)	100 (66.7)	-	Good Practice
I stopped an antibiotic provision earlier than the prescribed course length.	11 (7.3)	5 (3.3)	6 (4)	14 (9.3)	112 (74.7)	-	Good Practice
I dispense an antibiotic even when I am uncertain about the diagnosis of infection.	8 (5.3)	8 (5.3)	9 (6)	16 (10.7)	109 (72.7)	-	Good Practice
I dispense an antibiotic to maintain my relationship with the patient.	9 (6)	3 (2)	6 (4)	10 (6.7)	122 (81.3)	-	Good Practice

3.5. Correlation of Socio-Demographic Profile with KAP Level

All p-values in age groups, genders, and years of practice are higher than the set alpha which is 0.05. This means that all three do not significantly differ, are highly correlated with the level of knowledge, attitude, and practice of the respondents, and failed to reject the null hypothesis. The correlation of age to the respondents' KAP level was confirmed

by a study in China wherein age was significantly associated with the 394 participating community pharmacists' antimicrobial stewardship program scores (Feng, Z. et al., 2020) while age was also found to be a significant factor for a community pharmacists' self-perceived knowledge and professional attitude on antibiotic use and infectious diseases among Hungarian community pharmacists (Gajdács, Paulik,& Szabó, 2020) [7][4]. Meanwhile, in a study conducted in Italy, gender was found to be significant where younger male pharmacists have knowledge about what causes antibiotic resistance and have a positive attitude towards it (Napolitano et. al., 2019) [8]. For the years of practice, a previous study by Napolitano and others, suggests that the number of years in practice have a high correlation with the community pharmacists' KAP level [8].

Table 5 Analysis of Variance (ANOVA) between age group and KAP Level

			Sum of Squares	df	Mean Square	F	Sig.	Verbal Interpretation
Score of Respondents on Knowledge * Age Group	Between Groups	(Combined)	6.384	3	2.128	1.481	0.222	No significant difference; Highly correlated
	Within Groups		209.756	146	1.437			
	Total		216.140	149				
Mean Rating of Respondents on Practices * Age Group	Between Groups	(Combined)	0.767	3	0.256	0.795	0.499	No significant difference; Highly correlated
	Within Groups		46.926	146	0.321			
	Total		47.692	149				
Mean Rating of Respondents on Attitude * Age Group	Between Groups	(Combined)	0.218	3	0.073	0.821	0.484	No significant difference; Highly correlated
	Within Groups		12.925	146	0.089			
	Total		13.143	149				No significant difference; Highly correlated

Table 6 Analysis of Variance (ANOVA) between gender and KAP Level

			Sum of Squares	df	Mean Square	F	Sig.	Verbal Interpretation
Score of Respondents on Knowledge * Gender	Between Groups	(Combined)	1.041	3	0.347	0.235	0.872	No significant difference; Highly correlated
	Within Groups		215.099	146	1.473			
	Total		216.140	149				
Mean Rating of Respondents on Practices * Gender	Between Groups	(Combined)	1.908	3	0.636	2.028	0.112	No significant difference; Highly correlated
	Within Groups		45.784	146	0.314			
	Total		47.692	149				
Mean Rating of Respondents on Attitude * Gender	Between Groups	(Combined)	0.447	3	0.149	1.714	0.167	No significant difference; Highly correlated
	Within Groups		12.696	146	0.087			
	Total		13.143	149				

In terms of highest educational attainment, only the practice of the respondents is highly correlated since the p-values significantly differ in knowledge and attitude with a value lower than the set alpha of 0.05. This can also be seen based on the mean rating of the respondents where bachelor's degree and doctorate degree holders got high scores in knowledge while master's degree holders got a mean rating of only 6.0000. The explanation of this finding could be that the current curriculum has not yet emphasized topics about antibiotic resistance and should be updated (Khan et al., 2021). In contrast, results from a study conducted by (Feng, Z. et al., 2020) revealed that respondent's level of education has a significant correlation with their level of KAP [5][7].

Table 7 Analysis of Variance (ANOVA) between highest educational attainment and KAP Level

			Sum of Squares	df	Mean Square	F	Sig.	Verbal Interpretation
Score of Respondents on Knowledge * Highest Educational Attainment	Between Groups	(Combined)	15.154	3	5.051	3.669	0.014	With significant difference; Not highly correlated
	Within Groups		200.986	146	1.377			
	Total		216.140	149				
Mean Rating of Respondents on Practices * Highest Educational Attainment	Between Groups	(Combined)	1.065	3	0.355	1.112	0.346	No significant difference; Highly correlated
	Within Groups		46.627	146	0.319			
	Total		47.692	149				
Mean Rating of Respondents on Attitude * Highest Educational Attainment	Between Groups	(Combined)	0.909	3	0.303	3.614	0.015	With significant difference; Not highly correlated
	Within Groups		12.234	146	0.084			
	Total		13.143	149				

Table 8 Analysis of Variance (ANOVA) between years of practice and KAP Level

			Sum of Squares	df	Mean Square	F	Sig.	Verbal Interpretation
Score of Respondents on Knowledge * Yrs of Practice	Between Groups	(Combined)	7.304	4	1.826	1.268	0.285	No significant difference; Highly correlated
	Within Groups		208.836	145	1.440			
	Total		216.140	149				
Mean Rating of Respondents on Practices * Yrs of Practice	Between Groups	(Combined)	1.659	4	0.415	1.306	0.270	No significant difference; Highly correlated
	Within Groups		46.034	145	0.317			
	Total		47.692	149				
Mean Rating of Respondents on Attitude * Yrs of Practice	Between Groups	(Combined)	0.120	4	0.030	0.335	0.854	No significant difference; Highly correlated
	Within Groups		13.023	145	0.090			
	Total		13.143	149				

3.6. Relationship between the respondents' knowledge, attitudes and practices on antibiotics

The Pearson correlation value of 0.020 between knowledge and attitude shows a negligible positive coefficient which suggests a very weak positive trend. However, since the significant value of knowledge between attitudes was higher than the significance level of 0.05, it fails to reject the null hypothesis. Thus, the knowledge of community pharmacists toward their attitude are not statistically correlated from across the whole set of variables. Thus, interventions to establish a positive relationship between knowledge and attitude must be put forward to lessen the rate of antibiotic resistance with the right attitude sustained by adequate knowledge on antibiotic use within the community. The Pearson correlation value of 0.038 proves that the knowledge level does not have any significant effect on the community pharmacists' practice. Feasibly, the reason for this is the influence of other factors affecting the practice among community pharmacists. There is a positive coefficient of 0.395 between the respondents' level of attitude and practice, then an increase in the level of attitude is likely associated with the increase of practice as well. This positive relationship between the aforementioned variables is statistically significant as the significant value is less than 0.05. This was similar to the study conducted by Gajdács, Paulik, and Szabó (2020), wherein the attitude of the respondents was notably connected to their practice. It implies that an improved attitude will result with better practice of community pharmacists [4].

Table 9 Pearson's correlation coefficient for test of association between KAP

		Score of Respondents on Knowledge	**Mean Rating of Respondents on Practices**	**Mean Rating of Respondents on Attitude**
Score of Respondents on Knowledge	Pearson Correlation	1	0.038	0.020
	Sig. (2-tailed)		0.645	0.804
	N	150	150	150
Mean Rating of Respondents on Practices	Pearson Correlation	0.038	1	0.395
	Sig. (2-tailed)	0.645		0.000
	N	150	150	150
Mean Rating of Respondents on Attitude	Pearson Correlation	0.020	0.395	1
	Sig. (2-tailed)	0.804	0.000	
	N	150	150	150

4. Conclusion

Selected community pharmacists in Manila have sufficient knowledge, positive attitudes/high confidence, and good practices regarding antibiotics. There was a significant correlation between the majority of socio-demographic variables involved and the respondent's level of KAP. Hence, the alternative hypothesis is accepted and the null hypothesis is rejected. Furthermore, although a positive correlation was seen between their attitudes and practices, there was no significant relationship between the respondents' KAP as a whole, indicating that the null hypothesis is accepted and the alternative hypothesis is rejected. Therefore, the assessed level of KAP overall among the selected respondents shows a low to minimal contribution to the prevalence of antibiotic resistance in Manila.

Compliance with ethical standards

Acknowledgments

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Disclosure of conflict of interest

As per submission to Centro Escolar University Institutional Ethics Review Board (CEU-IERB), a review of management of conflict arising from financial, familial, or proprietary consideration of the PI, sponsor, or the study is not available. There is no conflict of interest in this study.

Statement of ethical approval

The research protocol received approval from the CEU Institutional Ethics Review Board. The respondents of this study are human subjects. The endeavor to thoroughly examine and interpret such data issues is needed to secure their confidentiality.

Statement of informed consent

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

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