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Knowledge, attitude and practice (KAP) towards antibiotic use and its resistance among the general public in Klang Valley

Abstract

Antibiotics have saved millions of lives and changed the history of infectious diseases. However, in recent years, antibiotic resistance has become a major global public health problem. Likewise, an increasing trend of antibiotic resistance (ABR) is observed in Malaysia. This study aims to determine the knowledge, attitude and practice (KAP) towards antibiotics use and its resistance among the general public in Klang Valley, Malaysia. Our hypothesis is the general public has a low level of KAP towards antibiotic use and its resistance. A cross-sectional study was distributed through a pre-validated questionnaire to all Klang Valley residents who are ≥18 years old through email and social media. Vulnerable residents and those from non-English speaking backgrounds were excluded. All data were analysed by SPSS software version 27.0. A total of 408 participants were recruited. Based on the scoring system of the study it was found that 47.0% had moderate knowledge, 41.7% had good attitude and 59.6% had good practice towards antibiotic use and its resistance. Overall, 53.4% recruited participants had moderate KAP towards antibiotic use and its resistance. Chi-Square test of independence was used to determine the association of socio-demographic variables and KAP towards antibiotic use and its resistance. The results indicated that only one categorical variable "area" was statistically significant with a p value of 0.041. The mean± SD values indicated that those individuals living in Selangor have a comparatively higher KAP towards antibiotic use and its resistance as compared to those living in Kuala Lumpur (KL) most probably due to higher educational levels. This study provided us with baseline evidence about the KAP regarding antibiotic use among the general public in Malaysia. Hence, it will be useful in guiding further interventions to improve awareness about antibiotics use and enhance antimicrobial stewardship in our community.

Keywords: antibiotic, resistance, Selangor, knowledge, attitude, practice

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Abbreviations

ABR, antibiotic resistance; KAP, knowledge, attitude, practice; HKL, hospital Kuala Lumpur

Introduction

Antibiotic resistance is a natural phenomenon. However, insufficient antibiotic use, poor patient adherence to antibiotics, and insufficient antibiotic regulation increase its prevalence.[1] The main reason for the development of resistance is the insufficient use of antibiotics, especially in developing countries where the use of antibiotics is often not well regulated, which allows self-treatment.[2] Worldwide, more than 50% of antibiotics are purchased from pharmacies or street vendors without a prescription.[3]

In 2006, a study was conducted on antibiotic resistance as a global threat in U.S, China and Kuwait. In terms of the rapid growth of the antibiotic resistance during the period of 1999-2023, China had the highest level of antibiotic resistance (22%) followed by Kuwait (17%) and the U.S (6%). This rise in the antibiotic resistance was attributed mainly to the inappropriate prescribing of antibiotics and overuse of antibiotics including self-medication.[4] Another study conducted in Kuwait highlighting the KAP of public towards antibiotic showed that almost 47% of participants had low knowledge regarding the use and resistance of antibiotics. Likewise, 41% of the respondents had inappropriate attitude and poor practice towards the antibiotic's usage.[5]

In the Asian countries such as Bangladesh and Pakistan studies were conducted among general public to inquire the KAP of the respondents towards antibiotic use and its resistance. The respondents in Bangladesh demonstrated average knowledge (52.29%), moderate attitude (67.84%) and good practices (50.61%).[6] The findings of the public respondents in Punjab, Pakistan were that 46.7% respondents have better knowledge, 31.6% are having positive attitude whereas 59.6% reported poor practice towards antibiotics use.[7]

In Malaysia, the main contributors to the rising trend of ABR are the misuse and overuse of antibiotics for example, 68-100% of the *E. coli* isolated in Malaysia showed penicillin resistance.[8] This is further supported by another systematic review which concluded that around 21.1% of the encounters in Malaysian primary care clinics have resulted in antibiotic prescribing, with half of them being prescribed for upper respiratory tract infection (URTI), for which, in most cases, antibiotics are not required due to its viral nature.[9]

According to a study conducted in Perak, Malaysia, 52.7% of the respondents erroneously believed that antibiotics could treat viral infections. Besides, over half of the respondents in this study had no

knowledge of ABR. In terms of practice, this study revealed that 70.0% of the respondents expected their doctors to prescribe antibiotics if they suffered from symptoms.[10] To the best of our knowledge, no studies have been done in the general public in Malaysia other than a cross-sectional study conducted among orthopaedic and surgical ward patients at the Hospital Kuala Lumpur (HKL).[11] A lack of knowledge regarding the role of antibiotics and inaccurate beliefs about ABR were observed among elderly aged at least 60 years.[12] Another study carried out to identify the knowledge and expectations of the general public found that the majority had been involved in one or more inappropriate practices, the most common of which was not finishing an antibiotic treatment.[13]

This warrants the need for our research to investigate the KAP of the general population in Klang Valley, Malaysia. We focused on the Klang Valley as geographically it is the heart of West Malaysia, with vast majority of population that comes from various socio-demographic backgrounds. With 19.9% of the Malaysia population residing within this area, it can best represent the Malaysian population when compared to other states in Malaysia.[14] Thus, this leads to our research question: "What is the level of KAP towards antibiotic use and its resistance among the general public in Klang Valley Malaysia?"

Material and methods

A cross-sectional study was done to evaluate the level of KAP of the general public towards antibiotic use and its resistance. This study design is chosen because data collection occurs at a single time point. Also, it is less expensive and less time-consuming compared to other study designs. The KAP instrument was selected after an extensive relevant literature review. We seek approval of two pre-validated and pre-tested questionnaires targeting general public in Indonesia and Nepal.[15,16] We tailored these questionnaire's only in the context of the ethnic groups (Malay, Chinese, Indian and others) as per the requirements of the research study and the geographical location of Malaysia. The questionnaire includes four parts. Part A includes socio-demographic information such as the living area, gender, age, ethnicity, education, profession, occupation and marital status. Part B is related to knowledge (12 questions). Part C includes questions related to attitude (8 questions) and part D refers to the practices (6 questions). For each question, the participants must mark the relevant column with "yes", "no", or "don't know".

Ethics approval was obtained from the Monash University Human Research Ethics Committee (Project ID: 32567). The general public ≥ 18 years residing within the Klang Valley area were included in this study. Residents who cannot understand the questionnaire and vulnerable patients such as those with chronic diseases were excluded. Eligible and interested participants (as personal contacts) were contacted via email and responded "yes" to register. Confirm participation received an email invitation that has a direct link to the survey to fill out and submit. Interested participants (public) referring to the advertisement material (research poster) posted on social media platforms such as Facebook, Instagram, Telegram were used have direct access to the questionnaire/survey link to fill out and submit. A small number of participants were recruited in early May 2022 whereas the estimated sample size was recruited from the end of May over a period of 4 to 5 weeks until completion.

The estimated sample size was calculated by using a Raosoft sample size calculator.[17] A 5% margin of error and 95% confidence interval were allowed with the estimated population size of the Klang Valley to be around 1055207.[18] The response distribution was 50%. Hence, the minimum recommended sample size is 385. The collected data were entered into the SPSS software version 27.0.[19] The research study included dependent variables such as KAP and independent variables that include socio-demographic data for descriptive analysis, socio-demographic variables were displayed as frequencies, percentage, standard deviation, mean, maximum and minimum values whereas KAP were reported as good, moderate and poor using the scoring system.[20] The mean and standard deviation of each socio-demographic variable with regards to KAP were also reported. Chi-square test was used and p-value was reported to determine the association between socio-demographic data and KAP. Spearman correlation was determined to reflect the relationship between KAP.

Results

A total of 408 Klang Valley residents were recruited. The complete socio-demographic information of the respondents is displayed in Table 1. Majority are females (68.6%) with a mean age of 25.5 years (SD 8.9 years), Chinese (80.6%), from non-medical related professions (43.6%), unemployed (70.8%), single (88.7%) and have completed or are currently a university student (84.1%). Scoring system for this study is shown as per Table 2.

Table 1 Socio-demographic data of the respondents (N=408)

Serial No.	Variables	Category		n (%)
1	Area	Kuala Lumpur		168 (41.2%)
		Selangor		240 (58.8%)
2	Gender	Male		128 (31.4%)
		Female		280 (68.6%)
3	Age	Mean	25.5	
		SD	8.9	
		Minimum	18	
		Maximum	70	
4	Ethnicity	Malay		56 (13.7%)
		Chinese		329 (80.6%)
		Indian		9 (2.2%)
		Others		14 (3.4%)
5	Education	Primary		8 (2.0%)
		Secondary		57 (14.0%)
		University		343 (84.1%)
6	Profession	Medical-related		74 (18.1%)
		Non-medical related		178 (43.6%)
		Not specified		156 (38.2%)
7	Occupation	Unemployed		289 (70.8%)
		Employed		119 (29.2%)
8	Marital Status	Single		362 (88.7%)
		Married		45 (11.0%)
		Divorced		1 (0.2%)

SD = Standard deviation

Table 2 Scoring system to assess the level of KAP of the respondents towards antibiotic use and its resistance Anand & Puri, 2013.[20]

	Knowledge	Attitude	Practices	KAP
Scoring	1 - correct answer 0 - incorrect answer	0=Yes 1=Don't know 2=No (correct answer)	Q1, Q4, Q5: 0=No, 1=Don't know, 2=Yes (correct answer) Q2, Q3, Q6: 0=Yes, 1=Don't know, 2=No (correct answer)	Knowledge score + Attitude score + Practice score
Range	0-12	0-16	0-12	0-40
Classification	Poor: 0-4 Moderate: 5-8 Good: 9-12	Poor: 0-5 Moderate: 6-10 Good: 11-16	Poor: 0-4 Moderate: 5-8 Good: 9-12	Poor: 0-13 Moderate: 14-26 Good: 27-40

Knowledge

The calculated mean ± SD is 6.19±3.082, with most respondents (47.0%) having a moderate level of knowledge (Table 3). Most respondents (51.7%) were aware that paracetamol is not an antibiotic, whereas only 25.7% knew that antacid is not an antibiotic. Most respondents believed that antibiotics were required for cold and flu illness (59.8%) and diarrhoea (30.6%). A small proportion of respondents (37.7%) knew that antibiotics can cause secondary infections after eradicating good bacteria in the body. Over half of the respondents answered correctly about ABR with 71.1% knowing that resistance can make treating some infections more difficult and that antibiotic misuse can contribute to the development of ABR (67.9%) According to Chi-square test, the level of knowledge is statistically insignificant to all socio-demographic variables.

Table 3 The level of knowledge, attitude and practice towards antibiotic use and its resistance (n=408)

	Score range	Total score (mean±SD)	Level, n (%) N=408		
			Poor	Moderate	Good
Knowledge (K)	0-12	6.19±3.082	121 (29.7%)	192 (47.0%)	95 (23.3%)
Attitude (A)	0-16	9.26±3.869	71 (17.4%)	167 (40.9%)	170 (41.7%)
Practice (P)	0-12	9.07±2.457	24 (5.9%)	141 (34.5%)	243 (59.6%)
KAP	0-40	24.52±7.283	25 (6.1%)	218 (53.4%)	165 (40.5%)

SD = Standard deviation

Attitude

The mean ± SD is calculated as 9.26±3.869. Most respondents (41.7%) hold good attitude (Table 3). 51.2% of the respondents believed that an antibiotic was required to prevent their cold from getting worse, and 55.4% agreed that antibiotics were required when they had a fever. 45.8% of the respondents were unaware that skipping doses could contribute to ABR. A minority will be less satisfied (15.2%) and seek care from another doctor (16.9%) if they do not receive any antibiotics for their treatment. The association between level of attitude with socio-demographic variables is not statistically significant with p-value more than 0.05.

Practice

The mean±SD is 9.07±2.457. 59.6% had a high degree of practice (Table 3). 67.6% of respondents will continue taking the whole course of antibiotics treatment even if they get better after consuming a few doses, and 67.2% would rather get their antibiotics from a doctor or other healthcare provider than from a pharmacy if they were sick. The majority will seek medical advice before starting an antibiotic (82.4%) and will check the expiration date before taking it (84.8%). Around 65% of those surveyed stated that they would not use antibiotics for a cough, sore throat, or as a preventive measure against disease. As per Chi square test the level of practice of the respondents is significantly associated with gender (p=0.003), age (p=0.031), occupation (p=0.009) and marital status (p=0.031). Those who are females, aged 18-54 years, unemployed and single have a better practice.

In summary, nearly half of the respondents (53.4%) have moderate KAP with a mean±SD of 24.52±7.283 (Table 3).

The Chi-Square test of independence was conducted to determine association between socio-demographic variables of the study (area of study, age, gender, ethnicity, education, status of employment and marital status) and KAP of participants towards antibiotics use and its resistance. The test results showed significant association for only one socio-demographic variable which is area and KAP of respondents with an overall *P*-value of 0.041. The mean±SD values indicates respondents residing in Selangor have better KAP than residents of KL (Table 4).

Table 4 Chi-Square test between socio-demographic variables and knowledge, attitude and practice towards antibiotic use and its resistance (n=408)

Variables	Knowledge (K) Mean±SD (p- value)	Attitude (A) Mean±SD (p- value)	Practice (P) Mean±SD (p- value)	KAP Mean±SD (p- value)
Area				
Kuala Lumpur (KL)	5.80± 2.963	9.02± 3.675	8.76± 2.518	23.58± 7.123
	-0.063	-0.153	-0.091	0.041*
Selangor	6.46± 3.141	9.43± 3.998	9.29± 2.394	25.19± 7.336
	-0.063	-0.153	-0.091	0.041*

* P <0.05 = Statistically Significant.

Spearman correlation test reveals that there is a significant positive correlation between knowledge with attitude, knowledge with practice and attitude with practice (Table 5).

Table 5 Spearman correlation between knowledge, attitude and practice

Variables		Spearman correlation
Knowledge-Attitude	0.352	Correlation is significant at the 0.01 level
Knowledge-Practice	0.384	Correlation is significant at the 0.01 level
Attitude-Practice	0.522	Correlation is significant at the 0.01 level

Discussion

This cross-sectional study explores the KAP towards antibiotic use and its resistance among the general public in Klang Valley, Malaysia using a pre-validated questionnaire. Our finding demonstrates a significant positive relationship between KAP, which is consistent with previous studies.[15,16] This implies that good knowledge of the general public translates into good attitude and good practice. Those living in Selangor were reported to have higher levels of KAP than in Kuala Lumpur (KL) because 88.75% of them were from a higher educational level - University compared to only 77.38% in KL. This may indicate that higher education enhances an individual's KAP, but it contradicts our findings which show that there is no statistical significance between educational degree and the level of KAP.

In terms of knowledge, we found that 47.0% of the participants have moderate knowledge. This finding differs from a similar study in in India[21] and that conducted in Kuwait[5] both studies concluded that participants have low knowledge about antibiotic usage. One reason for the conflicting result could be that we involved a large proportion of university students (84.1%). Approximately 73% of the participants were aware that antibiotics are useful in killing germs, but 59.8% believed that an antibiotic is required for a cold and flu illness, which is similar to a study done in Harar City and Eastern Ethiopia.[22] This could be because many people are unaware that most flu and colds are caused by viruses that cannot be treated with antibiotics. The increased use of antibiotics in treating common cold and viruses may also be due to inappropriate doctor's prescribing practice as evidenced by a study in Nepal reporting that most medical students (46.1%) reported that the use of antibiotics may fasten recovery from common cold and flu.[23] With respect to side effects of antibiotics, over half (54.7%) knew that antibiotics can kill good bacteria in our bodies, but only 37.7% agreed that antibiotics can cause secondary infections after killing good bacteria. This finding is similar to a study in India.[20] This could indicate that they are unaware of the role of good bacteria in keeping us healthy. Antibiotics can kill the good bacteria in our gut, leading to side effects such as stomach upset and diarrhoea. Furthermore, we found that most participants have good knowledge of ABR, knowing that misuse of antibiotics may lead to the development of ABR. This is further supported by our result that 67.6% of participants will complete the full course of antibiotics treatment even if they feel better. However, even though many believe that misuse of antibiotics may lead to ABR, only 45.8% claimed that skipping doses does contribute to ABR.

In terms of attitudes, our study revealed that 55.1% of the participants will take an antibiotic to recover faster from a fever. This finding is consistent with an Indonesian study[15] which could be because they believed that the fever is caused by bacteria and antibiotics are therefore effective against fever. In addition, more than half of our participants will not use antibiotics when it is not recommended by the doctor, which is consistent with another study from Riyadh, Saudi Arabia.[24] This could be due to the fact that the general public is aware that antibiotics are not always necessary for every illness after consultation with the doctors. However, a minority (16.9%) of our study participants will approach another doctor if they were not prescribed antibiotics when they thought one was needed. This inappropriate attitude is also found in a study from Nepal, where the majority (88.2%) of the participants will go to another doctor if antibiotics are not prescribed.[25] This could be due to their limited knowledge about unnecessary use of antibiotics, which not only cause ABR but also expose patients to various side effects.

Besides, in terms of practice, 82.4% of our participants claimed they would seek medical advice before taking antibiotics, which was similar to the study conducted in Nepal, which found that 89.3% of university students consulted doctors before starting an antibiotic.[23] Consulting a doctor before using antibiotics can help to avoid unnecessary use as doctors will make appropriate diagnosis and investigate the nature and bug causing the illness. Furthermore, over half of the participants (67.6%) stated that they will finish the full courses of antibiotic treatments. Notwithstanding, according to a study done in Riyadh, Saudi Arabia, 67.0% participants cease taking antibiotics when they feel better.[24] This inconsistency could be attributed to inadequate proper counselling from the physicians or pharmacists, self-medication by patients, and a lack of trust in the prescribers. Indeed, before dispensing antibiotics, hospital or community pharmacists have the responsibility of screening the prescription to ensure the right treatment of choice and dose being prescribed as well as providing counselling to the patients about the importance of adherence. Moreover, 65.9% of participants from our study do not use antibiotics as prevention of illness. Nonetheless, a study conducted in Perak, Malaysia showed 66% believed that taking antibiotics early could help prevent their illness from worsening.[10] Such incorrect perceptions could be due to lower levels of education, non-healthcare-related occupations and a lack of understanding of ABR in different areas of our nation with it being a crucial socio-demographic variable. However, antibiotic prophylaxis may be indicated in some circumstances. As a result, an open discussion between healthcare practitioners such as doctors and pharmacists with patients should be organised so that the patients understand the indications for using them and adhere to the directions of use.

To further improve the KAP of the general public towards antibiotic use and its resistance, interventions such as campaigns targeting the general public on improving their insight on antibiotics and healthcare professionals on the dispensing of antibiotics should be organised. Also, since community pharmacy is always the first point of care contact, pharmacists should always make sure that their primary ailments are being managed properly and advise them lifestyle approaches that may help them in improvement of symptoms. Hospital pharmacists should also clarify with doctors the indication of using antibiotics and probably justify why antibiotics are not needed in some cases.

The strengths of our study include a high response rate that can minimise selection bias. This is because the sampling of our study was conducted privately via email and through posters on social media. Respondents are only required to complete the questionnaire online, hence this study design is cost-effective and convenient. However, only English language questionnaires are used to collect data.

Furthermore, the majority of our respondents are between the ages of 18 and 54, implying a less elderly population, rendering the results inapplicable to these populations. Also, since some participants that we approached are currently not using any antibiotics, they will need to recall the last time they took antibiotics, possibly leading to recall bias.

The study has following limitations. First, due to COVID-19 restrictions in Malaysia, survey was conducted online relying solely on the participants understanding while completing the questionnaire. Second, the study recruited participants from the Klang valley only hence the findings cannot be generalised to whole Malaysian population. Third, despite recruiting participants with min. age 18 years old and max. age 70 years old, due to the online distribution of survey majority of the respondents fall between age range of 18-35 years old and more educated.

Conclusion

Participants in Selangor have a higher KAP than that of KL which may be due to the higher education level. To improve the KAP of this population group, education campaigns can be organised both in educational institutes to provide basic concepts of antibiotics, its usage and associated resistance. The finding of this study provides the baseline evidence about the KAP towards antibiotic use and its resistance among the general public in Klang Valley, Malaysia. It is useful in guiding further interventions to improve the awareness of antibiotic use and enhance antimicrobial stewardship in our community. Future studies can be done to include a more elderly population, rural population and non-educated participants and to explore their KAP, reasons for rising ABR other than misuse and overuse of antibiotics by the general public.

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Conflict of interest

No conflict of interests

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References

1. Arora G, Sajid A, Kalia VC. *Drug resistance in bacteria, fungi, malaria, and cancer.* 1st edn. Springer Cham; 2017.
2. Elong Ekambi GA, Okalla Ebongue C, Penda IC, et al. Knowledge, practices and attitudes on antibiotics use in Cameroon: Self-medication and prescription survey among children, adolescents and adults in private pharmacies. *PLoS One.* 2019;14(2):e0212875.
3. Choe YJ, Shin JY. Trends in the use of antibiotics among Korean children. *Korean J Paediatr.* 2019;62(4):113–118.
4. Zhang R, Eggleston K, Rotimi V, et al. Antibiotic resistance as a global threat: evidence from China, Kuwait and the United States. *Global Health.* 2006;2:6.
5. Awad AI, Aboud EA. Knowledge, attitude and practice towards antibiotic use among public in Kuwait. *PLOS One.* 2015;10(2):e0117910.
6. Azim MR, Ifteakhar KMN, Rahman MM, et al. Public knowledge, attitudes, and practices (KAP) regarding antibiotics use and antimicrobial resistance (AMR) in Bangladesh. *Heliyon*. 2023;9(10):e21166.
7. Gillania AH, Changa J, Aslam F. Public knowledge, attitude, and practice regarding antibiotics use in Punjab,Pakistan: a cross-sectional study. *Expert Rev Anti Infect Ther*. 2021;19(3):399–411.
8. Naeemmudeen NM, Mohd Ghazali NAN, Bahari H, et al. Trends in antimicrobial resistance in Malaysia. *Med J Malaysia.* 2021;76(5):698–705.
9. Rahman NZ, Teng CL, Sivasampu S. Antibiotic prescribing in public and private practice: A cross-sectional study in primary care clinics in Malaysia. *BMC Infect Dis.* 2016;16(208):1–8.
10. Choo SJ, Chee TC, Jason Choong, et al. A cross-sectional study on public belief, knowledge and practice towards antibiotic use in the state of Perak, Malaysia. *J Infect Dev Ctries.* 2018;12(11):960–969.
11. Pauzi ZM, Hassan BAR, Neo CF, et al. Antibiotic use and resistance in a tertiary care hospital: Knowledge and attitude among patients of orthopaedic and surgical wards in Malaysia. *Journal of Pharmaceutical Health Services Research.* 2024;15(1):1–8.
12. Kong LS, Islahudin F, Muthupalaniappen L, et al. Knowledge and expectations on antibiotic use among older adults in Malaysia: A cross-sectional study. *Geriatrics (Basel).* 2019;4(4):61.
13. Kong LS, Islahudin F, Muthupalaniappen L, et al. Knowledge and expectations on antibiotic use among the general public in Malaysia: A nationwide cross-sectional study. *Patient Prefer Adherence*. 2021;15:2405–2416.
14. Department of Statistics Malaysia Official Portal. *Current population estimates, Malaysia, 2014-2016.* 2016.
15. Karuniawati H, Hassali MAA, Suryawati S, et al. Assessment of knowledge, attitude, and practice of antibiotic use among the population of Boyolali, Indonesia: A cross-sectional study. *Int J Environ Res Public Health*. 2021;18(16):8258.
16. Nepal A, Hendrie D, Robinson S, et al. Knowledge, attitudes and practices relating to antibiotic use among community members of the Rupandehi district in Nepal. *BMC Public Health.* 2019;19(1):1558.
17. Raosoft Inc. *Raosoft sample size calculator*. 2004.
18. Population HUB. *Population of Klang.* 2022.
19. SPSS® Inc. *SPSS: Statistical package for the social sciences*. (Version 27). 1970.
20. Anand D, Puri S. Nutritional knowledge, attitude, and practices among HIV-positive individuals in India. *J Health Popul Nutr.* 2013;31(2):195–201.
21. Chinnasami B, Sadasivam K, Ramraj B, et al. Knowledge, attitude and practice of parents towards antibiotic usage and its resistance. *International Journal of Contemporary Pediatrics.* 2016;3(1):256–261.
22. Jifar A, Ayele Y. Assessment of knowledge, attitude, and practice toward antibiotic use among Harar city and its surrounding community, Eastern Ethiopia. *Interdiscip Perspect Infect Dis*. 2018;2018:8492740.
23. Shrestha R. Knowledge, attitude and practice on antibiotics use and its resistance among medical students in a tertiary care hospital. *JNMA J Nepal Med Assoc.* 2019;57(216):74–79.
24. Al-Shibani N, Hamed A, Labban N, et al. Knowledge, attitude and practice of antibiotic use and misuse among adults in Riyadh, Saudi Arabia. *Saudi Med J*. 2017;38(10):1038–1044.
25. Shah P, Shrestha R, Mao ZF, et al. Knowledge, attitude, and practice associated with antibiotic use among university students: A survey in Nepal. *Int J Environ Res Public Health*. 2019;16(20):3996.