ORIGINAL ARTICLE

Factors Associated With Inappropriate Attitude Towards Antibiotic Usage Among Outpatients of a Public Primary Care Specialist Clinic: A Cross Sectional Study

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ABSTRACT

Introduction: Antibiotic resistance is one of the biggest global threat in modern medicine especially in lower-and middle-income countries (LMIC) as financial limitations and health literacy become barriers to an impactful health policy. The World Health Organization has urge for an improvement in the community antibiotic awareness through effective educational interventions. This study aims to identify the community's attitude appropriateness, knowledge gaps, the relationship between antibiotic knowledge and attitude as well as factors associated with inappropriate attitude towards antibiotic among outpatients attending a primary care clinic. **Methods:** This is a cross-sectional study which was conducted among 256 respondents. Data collection was conducted for three months using a self-administered questionnaire which has been validated and translated. **Results:** It was found that the respondents' mean attitude and knowledge score were 29.5 ± 4.19 and 5.94 ± 2.4 respectively. The highest inappropriate attitude response was expecting antibiotic from the doctor for common colds and the most frequent incorrect knowledge response was on the domain of role of antibiotics. There is a weak positive relationship between antibiotic knowledge and attitude (r=0.315, n=256, p=0.0001). Respondents with low education level and poor antibiotic knowledge were at least 2.5 times more likely to have inappropriate attitude when handling antibiotics. **Conclusion:** Antibiotic education should be incorporated in non-pharmacological measures of viral illnesses in primary care that is targeted among those with low education and poor antibiotic knowledge. The weak relationship between antibiotic knowledge and attitude suggest that health campaign should focus on behavioural change rather than a theoretical approach.

Keywords: Antibiotic, Attitude, Knowledge, Primary Care, Family Practice

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INTRODUCTION

Antimicrobial is the world's most common medication consumed by patients (1). Unfortunately, many antibiotic consumptions are injudicious and it has significantly accelerated the spread of antibiotic resistance (ABR). Since penicillin was first discovered, more than 20 000 potential resistant genes were found and it is estimated to claim up to 700 000 lives every year (2, 3). Previous study has demonstrated that ABR is associated with a 2-fold increase in morbidity and mortality. In 2019, the third WHO Sustainable Development Goal has highlighted the need for a collaborative effort to urgently curb the current situation by rejuvenating antimicrobial drug policy especially in low-and middle-income countries (LMIC). This is because ABR is notably higher among LMIC due to its political instability and struggling economy(4). In these countries, antibiotic self-medication is rampant as purchasing antibiotic over the counter (OTC) is more affordable compared to visiting a health care professional (4). Other contributing factors to ABR crisis in LMIC are high burden of infectious diseases, poor infection control policy, substandard medicine, poor knowledge on ABR, irresponsible attitude towards antibiotic, misdiagnosis and lack of laboratories for antibiotic susceptibility test (5, 6).

Therefore, the WHO has developed a global action plan to combat ABR that urges all nations to improve their community's knowledge and attitude towards antibiotics through effective education (3). However, issues pertaining to the usage of antibiotics among patients is distinctive and diverse among LMIC due to the vast differences in the sociodemographic, health care policies, regulations and enforcement as well as public

awareness. Therefore, to design effective educational interventions, it is essential to accumulate research findings to understand and dissect the community's unique behaviour towards antibiotic and its underlying contributing factors.

Malaysia is an upper-middle income country and research has shown that the major contributing factors towards ABR in this country is also attributed to the misuse of antibiotics among patients (7). But the situation of ABR in this country is unique compared to other LMIC. Over the years, the country has managed to sustain a government-led publicly funded health care system that is committed to achieve universal health coverage (UHC). With only a registration payment of RM1 (USD 0.24) in government primary care clinics, patients can attain a complete package of professional consultation, investigations and medications. Unlike most other LMIC, purchasing antibiotics OTC is far more expensive than obtaining it through prescription from government primary care clinics. But the threat of ABR is still notorious in this country despite the imposed cost barrier and authoritative regulations to obtaining antibiotics. Erythromycin and Ampicillin which are the commonest antibiotics prescribed in primary care have shown drastic increment of resistance at 31% and 25% respectively (8).

Previous research on antibiotic knowledge and attitude among the local population are congregated among hospital-based patients (7, 9, 10). The pattern of antibiotics received by patients from hospitals in Malaysia are different compared to those residing in the community. Most in-patient antibiotics are prescribed by a clinician for indicative severe acute conditions such as lower respiratory tract infections, severe skin conditions or complicated urinary tract infections which are presumably investigated for culture and sensitivity. (11) They are also most likely to be broad-spectrum and administered intravenously throughout the majority of the treatment course. Most of the prescribed antibiotics would have been also administered around the clock in the ward by staff nurses whereby patients would be monitored to take them despite relief of symptoms to complete the treatment course. Therefore, issues of inappropriate antibiotic handling at home such as sharing antibiotic with family members, keeping left over antibiotics, not taking the prescribed dosage and frequency or stopping antibiotics once patient felt better are less likely to be elicited in this particular setting. Furthermore, symptoms that is most commonly associated with antibiotic abuse among patients is for symptoms of upper respiratory tract infection (URTI) which is most likely to present in the primary care setting (12). Primary care is also responsible for the majority of outpatient antibiotic prescriptions.(13)

Many studies have elaborated on clinicians inappropriate antibiotic prescribing habit for URTI and acute gastroenteritis (AGE).(14, 15) However, not much has been explored on patients' expectation of antibiotics during consultation which is most likely to happen in a clinic setting whereby patients are well enough to demand for a prescription (16). Previous studies have demonstrated that patients' expectation of antibiotic during consultation essentially influenced the clinicians prescribing behavior to prescribe antibiotics even when it is not indicated (14, 17, 18). Patients' expectation of antibiotics during consultation is mainly derived from poor knowledge and attitude about antibiotics. (7)

Therefore, the aim of this study is to (i) determine the community's attitude towards antibiotic usage, (ii) their antibiotic knowledge, (iii) the correlation between antibiotic knowledge and their attitude towards antibiotic and (iv) factors associated with inappropriate attitude towards antibiotic usage among patients attending a public primary care clinic. The findings of this study will add to the body of knowledge and aid our policy makers to design a targeted approach in relation to educational campaigns to improve awareness on appropriate usage of antibiotics.

MATERIALS AND METHODS

Study design and setting

This was a cross-sectional study conducted from June until August 2017 at one of the largest public primary care specialist clinic in the district of Gombak, in the state of Selangor, Malaysia. The centre occupies two floors of a three-story building and is equipped with an x-ray department and a laboratory. The centre was chosen because of its accessibility to the general public around the area and the considerable amount of patient load. It is also the referral centre from other clinics located in its periphery as the centre has direct access to secondary and tertiary care. The centre caters to a variety of diseases from acute to chronic complaints. Therefore, the study setting was considered appropriate to capture the desired target population to answer the objective of this study. This research has obtained ethical approval from the institutional ethics committee Universiti Teknologi MARA 600-IRMI (5/1/6)..

Study population

The study population consist of patients attending the primary care specialist clinic during the study period who met the inclusion and exclusion criteria. The inclusion criteria are patients who are more than 18 years old, able to understand English or Malay language, have heard of "antibiotic" and capable of giving consent. The exclusion criteria are health care workers, medical students, those who are mentally challenge and respondents with known contraindication to antibiotics. Respondents with known contraindication to any antibiotic were excluded because they may have been educated by a medical professional before on unnecessary antibiotic consumption, avoided antibiotics

or self-educated themselves as to why they develop such allergic reaction which may create bias when assessing their antibiotic knowledge and attitude.

Sampling method

Patients who registered at the clinic during the study period were approached individually. Respondents were selected using a convenience sampling method. They were briefly explained about the objective of the study and were given a patient information sheet. Those who consented to participate were screened for the inclusion and exclusion criteria. Patients who meet the criteria were then asked to give an informed written consent prior to answering the questionnaire.

Study tools

The study tool consists of a four-part self-administered questionnaire. Part 1: socio demographics (Age, gender, race, education level, employment status, family member's occupation related to health care and past medical history of any chronic diseases), Part 2: history of antibiotic usage (sources of antibiotics and reason to take antibiotic), Part 3: antibiotic knowledge and Part 4: attitude towards antibiotic.

There are 12 questions among five antibiotic knowledge domains tested in Part 3 which are the role of antibiotics, good antibiotics, identification of antibiotics, adverse effects and administration of antibiotics. Respondents may answer 'yes, no or not sure'. A score of (1) is given for each correct answer and (0) for incorrect response or when they are not sure. Respondents were able to score from 0-12 marks.

There are 8 attitude items being tested in Part 4. Respondents are required to answer each item following a 5 points Likert Scale (1= strongly agree, 2 = agree, 3 = not sure, 4 = disagree and 5 = strongly disagree). Item 1 until 6 is a positive statement. Respondents will get (5) marks for strongly agree to (1) mark for strongly disagree. Item 7 and 8 is a negative statement. For these items, respondents will get (1) mark for strongly agree and up to (5) marks for strongly disagree. The minimum score is (8) and maximum score is (40).

This study instrument was chosen because it has previously undergone face and content validation among the population of Putrajaya, Malaysia (9). Putrajaya has the closest resemblance to this study population. Most importantly, it has also been translated and validated into the Malay language which is the national language of Malaysia. The Cronbach's alpha is 0.68 and 0.74 for Part 3 (antibiotic knowledge) and Part 4 (attitude towards antibiotic) respectively. Written permission was obtained from the original author to utilize the questionnaire for this study tool.

Data collection and procedures

All patients who arrived to the clinic are required to register before waiting at the patients' waiting area. Throughout the data collection period, 300 patients were approached. However, 17 individuals were not interested to participate and 19 (15 medical student and 4 medical doctors) had to be excluded. Questionnaires were successfully distributed to 264 respondents. However, 8 questionnaires were found to be incomplete. Therefore, 256 samples were entered for analysis. Data was collected by the researcher and assisted by an enumerator. The enumerator involved were trained prior to data collection to minimize variability in the method of data collection.

Questionnaire administration

Respondents were approached individually after they have registered and before their consultation with the doctor. This was to avoid patients from feeling time pressured to go home after the consultation. Respondents who agreed to answer the questionnaire were ushered to a separate corner away from family members to avoid response bias. Verbal and written explanation were given to respondents on how to answer the questionnaire. They were asked to tick the most appropriate boxes for each question. The researcher was available during data collection process and participants were encouraged to ask for clarification should any queries arises. The respondents took about 15 to 20 minutes to complete the questionnaire. All questionnaires were collected immediately after.

Sample size calculation

Sample size were calculated for all four objectives and the highest sample size was obtained from objective one which is the prevalence of inappropriate attitude towards antibiotics (antibiotic self-medication). To ensure the sample size is adequately powered, sample size calculation was done using proportion formula from OpenEpi, Version 3, open source calculator. From a systemic review and meta-analysis of antibiotic self-medication in developing countries, the overall prevalence of antibiotic self-medication is 38.8 % (4). This percentage is used as the hypothesized frequency of outcome factor in the population (p). The estimated population size is taken from the average monthly number of patients attending the clinic at the time which is 838 patients. With 5 % absolute precision, a total of 255 patients are needed to achieve 95 % Confidence level. Taking into consideration 10% non-response rate, the study aimed for 281 respondents.

Statistical analysis

All data were entered in the IBM SPSS (Statistical Package for the Social Sciences) version 23. Continuous variables were described as mean (±) SD and number (n) with percentage (%) for categorical data. The score for item 7 and 8 in Part 4 (attitude towards antibiotic) was reversed as the questions were negatively phrased. Normality checking was performed using the Kolmogorov–Smirnov test and data was found to be normally distributed. The

dependent variable which is attitude appropriateness was converted into dichotomous data using the mean ± SD as the cut-off point. Respondents who scored 30 and above were categorized to have appropriate attitude while those who scored below 30 were considered to have inappropriate attitude towards antibiotic (19, 20). Antibiotic knowledge was also categorized according to the mean ± SD. Respondents who score 6 and above were considered to have good knowledge and below 6 to have poor antibiotic knowledge(19, 20). The relationship between antibiotic knowledge and attitude towards antibiotic was analysed using Pearson's correlation test. The coefficient of correlation $r > 0$ indicates positive relationship, $r < 0$ indicates negative relationship and $r = 0$ indicates no relationship. A value of $r \geq 0.8$ or -0.8 (strong relationship), r =0.5to 0.8 or -0.5 to -0.8 (moderate relationship) and $r \leq 0.5$ or -0.5 (weak relationship)(21). Factors associated with inappropriate attitude towards antibiotic were first analysed using chi square test and independent t-test for categorical and continuous variables respectively. Variables with p value of less than 0.25 were included in multiple logistic regression. A p value of less than 0.05 was considered statistically significant in the multiple logistic regression.

RESULTS

A total of 300 respondents were invited to participate in this study and 264 samples were obtained. Therefore, the response rate was 88%.

Characteristic of the study population

The mean age of the participants was 53.6 ±13.9 years. There was almost an equal distribution of gender among male (48.8%) and female (51.2 %). Most of the respondents were Malay in ethnicity (84.4%) which is the largest group of ethnicities in Malaysia. Only 9.8% of the respondents had low education (up to primary school). However, more than half of the respondents (62%) were found to be unemployed. Nevertheless, this may also include pensioners. A third (29.7%) of the respondents had first degree family members working in health-related occupations. Table I illustrates the sociodemographic characteristic of all respondents.

Usage of antibiotics among respondents

A total of 193 (75.4%) respondents reported to have been taking antibiotics for the past one year. Of those who had took antibiotics, the majority had their antibiotics prescribed following doctors' consultation (82.4%). Respondents most common reasons for taking antibiotics were because of fever (57%) and respiratory tract infections (45.1%). Table II summarize the usage of antibiotics among all respondents.

Respondents antibiotic knowledge

The mean knowledge score of all respondents is 5.94 ± 2.4. Up to 86% of respondents thought that antibiotics is used to treat viral infection and 81.3% felt that antibiotics can work for cough and colds. However, 83.6% knew that antibiotics are medicine meant for bacterial infection. Most of the respondents were able to answer the domain antibiotic adverse effect correctly whereby 75.8% were aware that antibiotics may cause allergic reactions and 66 % of them were aware of antibiotic resistance. Nearly halve of the respondents knew that antibiotics have certain side effects and 34 % of them felt that taking less antibiotics than prescribed is better for their health. The proportions of correct and incorrect answers for antibiotic knowledge are summarized in the table III.

Table I: Sociodemographic characteristics of all respondents (N=256)

Demographic characteristic	Number (n)	Percentage (%)	Mean ±SD
Age group (year)			53.6 ±13.9
18 – 30	23	9.0	
31 – 40	28	10.9	
41 – 50	36	14.1	
51 – 60	72	28.1	
> 60	97	37.9	
Gender			
Male	125	48.8	
Female	131	51.2	
Race			
Malay	216	84.4	
Chinese	18	7.0	
Indian	20	7.8	
Others	2	0.8	
Highest education level			
Primary school	25	9.8	
Secondary school	103	40.2	
College / University	128	50.0	
Employment status			
Employed	97	37.8	
Unemployed	159	62.1	
First Degree family member's occupation related to health care			
Yes	76	29.7	
No	180	70.3	
Chronic disease			
Yes	169	66.0	
No	87	34.0	

Table II: Usage of antibiotics among all respondents

Antibiotic usage	Number (n)	Percentage (%)
Taken antibiotic in the past 1 year		
Yes	193	75.4
No	63	24.6
Source(s) of antibiotic (n=193)		
Prescribed by a doctor	159	82.4
Purchased from private clinic pharmacy	6	3.1
Purchased from retail pharmacy	19	9.8
Use someone else's antibiotic	2	1.0
Left over from last prescription	7	3.6
Reason(s) for taking antibiotic:		
Urinary tract infection	9	4.7
Fever	110	57.0
Respiratory tract infection	87	45.1
Skin problems/ wound	23	11.9
Pain/ inflammation	11	5.7
Others	10	5.2

Table III: Proportion of correct and incorrect knowledge statements among all respondents

Knowledge domain	Statements	Correct n(%)	Incorrect n(%)
Identification of antibiotic	Antibiotics are the same as medications used to relieve pain and fever such as aspirin and paracetamol. (Panadol)	159 (62.1)	97 (37.9)
	Penicillin is an antibiotic	81 (31.6)	175 (68.4)
Role of antibiotic	Antibiotics are medicine that kill bacteria	214 (83.6)	42 (16.4)
	Antibiotics can be used to treat viral infections	35 (13.7)	221 (86.3)
	Antibiotics work on most colds and cough	48 (18.8)	208 (81.3)
Good bacteria	Antibiotics can kill bacteria that normally live on the skin and gut	125 (48.8)	131 (51.2)
	Bacteria that normally live on your skin and gut, are good for your health	92 (35.9)	164 (64.1)
Adverse effects	Antibiotics may cause allergy reactions	194 (75.8)	62 (24.2)
	Antibiotics do not cause side effect	110 (43)	146 (57)
	Overuse of antibiotics can cause the antibiotics to lose effectiveness in long term	169 (66)	87 (34)
Administration of antibiotic	It is okay to stop taking an antibiotic when symptoms are improving	123 (48)	133 (52)
	Taking less antibiotic than prescribed is more healthy then taking the full course prescribed	170 (66.4)	86 (33.6)

Respondents attitude towards antibiotic

The mean attitude score of all respondents is 29.5 ± 4. The highest inappropriate response is 76% will expect antibiotics to be prescribe when they see a doctor for common cold. More than half of the respondents (55.1%) would take antibiotics because they perceive that it will help them recover faster and 48.4% will stop the course of antibiotic once they started feeling better. The highest appropriate response towards handling antibiotic is respondents would take antibiotics according the instruction label (93.8%) and surprisingly, 90% would check the expiry date before consuming the antibiotic. The proportion (%) of appropriate and inappropriate attitude are summarized in Table IV.

The relationship between knowledge and attitude on antibiotic usage among all respondents

There was a weak positive correlation but highly significant relationship between the respondent antibiotic knowledge and attitude towards antibiotic. r = 0.315, n =256, p = 0.0001. Correlation is significant at P value <0.01.

Table IV: Proportion (%) of appropriate and inappropriate attitude among all respondents.

Statements	Appropriate n (%)	Inappropriate n (%)
1. When I get a cold, I will take antibiotics to help me get better more quickly	115 (44.9)	141 (55.1)
2. I expect antibiotic to be prescribed by my doctor if I suffer from common cold symptoms	62 (24.2)	194 (75.8)
3. I normally stop taking antibiotic when I start feeling better	132 (51.6)	124 (48.4)
4. If my family member is sick I usually will give my antibiotics to them	233 (91)	23 (9)
5. I normally keep antibiotic stock at home in case of emergency	232 (90.6)	24 (9.4)
6. I will use leftover antibiotic for a respiratory illness	222 (86.7)	34 (13.3)
7. I will take antibiotic according to the instruction on the label	240 (93.8)	16 (6.3)
8. I normally will look at the expiry date of antibiotic before taking it	231 (90.3)	25 (9.8)

Factors associated with inappropriate attitude on antibiotic usage among all respondents

Variables with p value of less than 0.25 from the univariate analysis were selected into the multiple logistic regression analysis and they are age, gender, education level, employment status, having family member working in health care and antibiotic knowledge. The preliminary model showed that low education and poor antibiotic knowledge among respondents were found to be significant variables. The two-way interaction between primary education and poor antibiotic knowledge were checked and it was found insignificant at p value 0.131. Multicollinearity was checked using linear regression analysis whereby the Variance Inflation Factor (VIF) was measured and no problem with multicollinearity was found that requires remedial measures. Model fitness was checked using the Hosmer Lemeshow goodness of fit test, classification table and area under ROC (receiver operating characteristics) curve. Hosmer Lemeshow goodness of fit test was not significant with the p value 0.659, proving that the model is fit. The Receiver Operating Characteristic (ROC) curve gave an area under the curve of 0.645 (95% CI 0.577, 0.712) which shows acceptable discriminant whereby the model can accurately discriminate 64.5 % of the cases. The final model depicts that respondents with low education level were 2.6 times more likely to have inappropriate attitude towards antibiotics (AOR= 2.642. 95% CI (0.991,7.047) and respondents with poor antibiotic knowledge were 2.5 times more likely to have inappropriate attitude towards antibiotics (AOR=2.472. 95% CI (1.458,4.192). Table V and V1 summarize the univariate and multiple logistic regression analysis respectively.

Table V: Univariate analysis on the association between attitude appropriateness with sociodemographic and antibiotic knowledge among all respondents.

Variables	Appropriate attitude (n=127)		Inappropriate attitude (n=129)		Mean diff (95%CI)	t-stat(df)[a] or χ^2 (df)[b]	p-value
	Freq (%)	Mean (SD)	Freq (%)	Mean (SD)			
Age		54.9 (13.6)		52.4 (14.2)	2.518 (-0.9, 5.93)	1.452(254)[a]	0.148
Gender						4.014(1)[b]	0.040
Male	43.2		56.8				
Female	55.7		44.3				
Race						0.003(1)[b]	0.957
Malay	49.5		50.5				
Non-Malay	50		50				
Education level						9.752(1)[b]	0.008
Primary school	24		76				
Secondary school	46.6		53.4				
College/university	57		43				
Employment status						1.741(1)[b]	0.187
Employed	44.3		55.7				
Unemployed	52.8		47.2				
Family members as health care worker						5.153(1)[b]	0.020
Yes	60.5		39.5				
No	45		55				
Chronic diseases						0.049(1)[b]	0.825
Yes	49.1		50.9				
No	50.6		49.4				
Antibiotic knowledge						14.812(1)[b]	0.0001
Good	91(71.7)		62(48.1)				
Poor	36(28.3)		67(51.9)				

[a] Independent t test b Chi Square test

Table VI: Multiple logistic regression summarizes the factors associated with inappropriate attitude towards antibiotic usage

Variables		Adjusted OR (95% CI)	Wald statistics (df)	P value
Low education	No	1.00		
	Yes	2.642 (0.991,7.047)	3.796 (1)	0.052
Antibiotic knowledge	Good	1.00		
	Poor	2.472 (1.458,4.192)	11.281 (1)	0.001

DISCUSSION

This study is one of the few in Malaysia that assess the local community's attitude appropriateness towards antibiotic usage and their knowledge gaps as well as factors associated with inappropriate attitude towards antibiotic among respondents in a primary care setting.

The knowledge gap and common injudicious attitude towards antibiotic among the population

Findings from this study suggest that more than 80% of patients will look for antibiotics when they have symptoms of URTI. Suggestive similar finding was found in Korea whereby patients were found to pressure physicians to prescribed antibiotics when they have respiratory tract symptoms(18). To improve antibiotic awareness, it is crucial for the public to recognize that antibiotic is only prescribed for when they have bacterial infections and that does not include most URTI symptoms.

The most prominent incorrect knowledge item among this population is regarding the role of antibiotics. Most of them (80%) believe that antibiotics is used to eliminate viral infections. This finding is found to be consistent across two local studies in the northern and west-central part of Malaysia among patients attending a tertiary hospital (9, 10).Therefore, the role of antibiotics is a critical misconception that is widespread across this country among hospital and community-based patients which warrants strong emphasis in antibiotic campaigns. In contrary, develop countries such as the Great Britain, found a much lower percentage whereby only 53% believe that antibiotics is the medicine of choice for viral infections (22). The misconception may have resulted from a learned behaviour. Previous study described that past experiences of taking antibiotic for viral symptoms followed by a speedy recovery may have influenced patients decision to look for antibiotics when they have similar symptoms (23). This is reflected in this study finding whereby 55% consume antibiotic because they assume that it will help them recover faster from their illness.

The highest inappropriate attitude response among this population was to expect antibiotic from their doctor during consultation when they are having common colds (76%). However, in Penang, only 57.8% exhibit similar behaviour and this is comparable to the study done in United States at 53.6%(10). Interestingly, among the Taiwanese study population only 25 % of them would demand antibiotics from their doctors for common colds(24). The huge difference between our population and the Taiwanese may have been contributed by the Taiwanese national health insurance policy which is made compulsory to most of its population. The policy implements a antibiotic restriction policy since 2001 which has resulted in the country witnessing a drastic reduction in antibiotic consumption.(25) The policy involves conducting regular peer review on their patients' medical record whereby no claim will be paid if the medication prescribed are deemed inappropriate. (25)Furthermore, a penalty up to 100 times of the total cost will be imposed upon the clinician responsible of such prescription.(25) Their antibiotic stewardship programme is also conducted extensively whereby their health inspectors would conduct random audit of antibiotic that are being prescribed in the hospital and community health centre. The stringent authoritative regulation may have discouraged clinicians over there to give out antibiotics to patients upon request.(25)

Previous study has demonstrated that patients expect antibiotics because they perceived that it will prevent the deterioration of the illness (26). They also expect antibiotics because they felt that they should receive more than just supportive advice for the time and cost invested for a doctor's consultation (26). Patients' expectation for antibiotic have been shown to significantly increase the likelihood of injudicious antibiotic prescription among doctors despite the availability of clinical practice guidelines (18). The antibiotic prescription is mainly driven by the consideration of doctor-patient relationship whereby doctors do not want to disappoint their patients(27).

The relationship between antibiotic knowledge and attitude towards antibiotic

A positive correlation was demonstrated between the respondent's antibiotic knowledge and their attitude towards antibiotic usage. This indicates that the higher the respondent's antibiotic knowledge the more appropriate their attitude towards antibiotic. However, the relationship was found to be a weak correlation but highly significant. This finding is supported by another local study conducted in Putrajaya whereby they have also found a similar positive but weak correlation ($r = 0.462$, $p<0.001$)(9). In Ethiopia, there was also a positive correlation between health care professionals antibiotic knowledge and their attitude towards antibiotic but with an even weaker correlation ($r = 0.117$, $p=0.229$) (28).

The weak positive correlation can be explained by several reasons. Most study would suggest that good antibiotic knowledge would lead to appropriate attitude when handling antibiotics as reflected in this study. However, the positive relationship may work to a certain extent, until the situation becomes challenging or unfavourable (29). For an example, studies have shown that clinicians, who understandably have good antibiotic knowledge, are prone to self-medicate with antibiotics when they become unwell (30). This is because their clinical background made them to believe that they could self-diagnose. Self-medication may save time and they can avoid sick leaves in order to maintain their work performance in their busy schedule (31). Previous study has also shown that the link between antibiotic knowledge and attitude towards antibiotic is weak in the context of LMIC (32). This is because, as people from less developed areas become more health literate and financially stable, they also become more empowered and assertive towards their health. In other words, their attitude towards handling antibiotic becomes inappropriate not because of ignorance but because they are now able to exercise this assertiveness (32).

Factors associated with inappropriate attitude towards antibiotic usage

This study shows that respondents with poor antibiotic knowledge are 2.5 times more likely to have inappropriate attitude towards antibiotic. In South Korea, respondents with good antibiotic knowledge were 1.52 times more likely to demonstrate appropriate attitude when using antibiotic (19). In Northern Tanzania, respondents with good antibiotic knowledge were three times more likely to have appropriate attitude towards antibiotic (33).

Previous studies have also demonstrated that good antibiotic knowledge does not always translate to appropriate attitude. Respondents with good antibiotic knowledge has been associated with antibiotic self-medication(19). In Korea, the elderly population with the lowest overall knowledge score on antibiotics has a better attitude when handling antibiotics (19). In Trinidad and Tobago, it was found that even though their respondents' antibiotic knowledge were outstanding, it was not associated with appropriate attitude towards antibiotics. Some of their respondents believed that skipping antibiotic doses would not contribute to ABR. They are also incline to self-medicate with antibiotics especially for common colds (34). In Sweden, male respondents were found to be more knowledgeable on antibiotics compared to females. However they were also found to have unsatisfactory attitude towards antibiotics (35). In the UK, a survey found that individuals with good antibiotics knowledge were more likely to be prescribed antibiotics during consultations as they are more inclined to request for antibiotics during consultation (22).

This study has also demonstrated that respondents

with low education level are 2.6 times more likely to have inappropriate attitude towards antibiotic.(36). In Putrajaya, respondent with lower education level is significantly associated with using leftover antibiotics to self- treat themselves and not using antibiotics according to instructions (9). In Nigeria, similar finding was found whereby their respondents with low education level were less likely to behave appropriately when handling antibiotic. However, low education level in their population was defined as no formal education at all (37). In contrary, among the Lebanese, education level was not an associated with attitude towards antibiotic. (38) Low education among respondents is related to the lack of information on antibiotic and poor health seeking behaviour which lead to inappropriate behaviour (39).

Study limitation

The non-probability sampling method applied in this study is vulnerable to selection bias and may not be generalizable to this country. The self-administered questionnaire allows for recall bias and it depends heavily on the honesty and understanding of the respondents. Therefore, the findings of this study should be interpreted with caution.

Clinical implications

(i) Targeted counselling and patient education with effective communication as part of the non-pharmacological management in all viral illnesses presented to primary care clinics. Patient education should be routinely incorporated in the management of patients with viral illness as part of the non-pharmacological management of viral infections to avoid patients from looking for antibiotics elsewhere. For clinics with high patient load whereby time is a barrier to effective patient education such as in this country, perhaps a targeted approach should be administered. This may involve focusing on "high risk" individuals identified in this study such as patients with poor antibiotic knowledge and lower education background. This requires clinicians to improve on their communication skills especially when handling patients who expects antibiotics during consultation (40). Previous study has shown that improved communication skills in primary care setting can bridge the gap between clinicians and patient's expectation. In a study conducted in Netherlands, primary care doctors who were given training in communication skills prescribe less antibiotics for patients who came in with respiratory symptoms (40).

(ii) Design an outreach awareness campaign focusing on behavioural changes in areas of the country with lower educational background. This study has demonstrated that the relationship between antibiotic knowledge and attitude appropriateness is positive but weak. Attitudes are often the result of experience and have a very powerful influence over a patient's behaviour. Health campaign should shift the approach to instilling appropriate behaviour, clarifying and rectifying misconceptions rather than focusing on theoretical aspects especially in areas where the population are mostly from lower educational background. In fact, previous study have demonstrated that campaigns focusing on antibiotic knowledge among the public increases the incidence of self-medication (9). Nevertheless, special emphasis should be given to educating the public knowledge regarding the role of antibiotics and the viral etiology of URTI.

CONCLUSION

In summary, this study has demonstrated that there is a weak positive relationship between antibiotic knowledge and the community's attitude towards antibiotic. Therefore, antibiotic campaigns should focus on behavioral change rather than a theoretical approach. Patients with low education level and poor antibiotic knowledge are at least two times more likely to have inappropriate attitude towards antibiotic. Most patients believe that antibiotics can treat viral infection and expects antibiotics from their doctors for URTI symptoms. Patient education should be incorporated as part of the non-pharmacological management of all viral illnesses. However, in a clinic where time is a barrier to effective communication, efficient educational interventions should be targeted to "high risk" individuals identified in this study.

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