Factors associated with inappropriate attitude towards antibiotic usage among outpatients of a large public primary care center in Malaysia: A cross sectional study.

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Abstract

Background: Antibiotic resistance is one of the biggest global threat in modern medicine. The situation is even more consequential in lower-and middle-income countries (LMIC) as financial limitations and political instability may become barriers to an impactful health policy. Therefore, The World Health organization has urge all nations to increase public awareness on antibiotic through effective educational interventions. In order for interventions to be successful, it is important to acknowledge that each country is unique in its problems as the demographic in LMIC are diverse. This study aims to identify the community's attitude appropriateness towards antibiotic usage and their knowledge gaps, the relationship between antibiotic knowledge and their attitude as well as factors associated with inappropriate attitude towards antibiotic among outpatients attending an established primary care specialist center in Malaysia.

Methodology : This cross-sectional study was conducted among 256 respondents attending a public primary care specialist clinic center. Those who fulfilled the inclusion and exclusion criteria from June to August 2017 were given a self-administered, validated and translated questionnaire. Pearson correlation was used to deduce the relationship between knowledge and attitude. Chi square test, independent t-test and multiple logistic regression were used to determine factors associated with inappropriate attitude towards antibiotic.

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: Our study demonstrated the common inappropriate attitude towards antibiotic and areas of knowledge gap among the population. Antibiotic education should be incorporated in non-pharmacological measures of viral illnesses 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 behavioral change rather than a theoretical approach.

Background

Antimicrobial is the world's most common medication consumed by patients.(1) Unfortunately, most of the consumption of antibiotics are injudicious and it has 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 between 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 manage the current situation and

rejuvenate antimicrobial drug policy 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 is more affordable compared to visiting a health care center. (4)

Malaysia in an upper-middle income country and research has shown that major contributing factors towards ABR in this country are also contributed by overuse and misuse of antibiotics.(5) But the situation of ABR in this country is unique compared to other LMIC. Over the years the country has manage 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 medication. Therefore, purchasing antibiotics over-the counter is far more expensive than obtaining it from the government primary care clinic which will require prescription by a health care professional. 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. (6)

Multiple studies have elaborated on clinicians inappropriate prescribing habit.(7, 8) Most clinicians are blamed for inappropriate prescriptions for upper respiratory tract infection (URTI) and acute gastroenteritis (AGE).(7) But little is known about the demand of antibiotics.(9) 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.(7, 10, 11) The inappropriate attitude towards expectation of antibiotics may have derived from poor understanding about antibiotics. (5)

The WHO has recently developed a global action plan to unitedly combat ABR and urges all nations to increase public knowledge of antibiotics through effective education.(3) But issues pertaining to the usage of antibiotics is distinctive among each countries due to the differences in health care systems and public awareness. To design effective educational interventions, it is essential to understand the community's attitude towards antibiotics and its underlying contributors. Furthermore, previous research on antibiotic knowledge and attitude especially among the local population are congregated among hospital-based patients. (5, 12, 13). 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 at the community level.

Methodology

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 is run by 16 primary care physicians and 10 medical officers. It occupies two floors of a three-story building and is equipped with an x-ray department and a laboratory. The centre also has a satellite clinic in Sungai buloh and will soon expand its wings in Puncak Alam which is located outside of the district. The centre was chosen because of its accessibility and establishment to the general public around the area. It has a considerable patient load of 800 to 1300 patients per month. 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 among children, young adults and elderly. Therefore, the study setting was considered appropriate to capture the desired respondents to answer the objective of this study.

Study population

The study population consist of all patients attending the primary care specialist clinic during the study period who meet the inclusion and exclusion criteria. They are either new patients or patients coming for follow up. 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, respondents with known contraindication to antibiotics and who are mentally challenged.

Sampling method

The respondents who registered at the clinic were approached individually using a non-probability 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. Finally, they were asked to give an informed written consent.

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 in the past one year (sources of antibiotics and reason to take antibiotic), Part 3: antibiotic knowledge and Part 4: attitude towards antibiotic.

There are five knowledge domains tested in Part 3 (role of antibiotics, good antibiotics, identification of antibiotics, adverse effects and administration of antibiotics) and distributed among 12 questions. 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 items being tested in the attitude towards antibiotic. 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 and (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 (5) marks for strongly disagree. Minimum score is (0) and maximum score is (40).

This study instrument was chosen because it has previously undergone face and content validation with a Cronbach's alpha of 0.68 and 0.74 for Part 3 (antibiotic knowledge) and Part 4 (attitude towards antibiotic) respectively among the population of Putrajaya, Malaysia.(12) 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.

Data collection and procedures

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 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. Figure 1 illustrates the conduct of the study.

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 %. (14) 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 (15), 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.(16, 17) 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. (16, 17) 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).(18) 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 281 respondents were invited to participate this study. However, 17 people were not interested to participate and 19 had to be excluded as they did not meet the inclusion and exclusion criteria. Therefore, the response rate for this study is 88%. Out of the 264 questionnaires obtained, 8 were found to be incomplete. Therefore, 256 samples were included in this analysis.

Characteristic of the study population

The mean age of the participants was 53.6 ±13.9 years old. There was almost an equal distribution of gender with 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. 9.8% of the respondents had low education (up to primary school). 62 % of the respondents were found to be unemployed but this also includes pensioners. A third (29.7%) of the respondents had first degree family members working in health-related occupations. Table 1 illustrates the sociodemographic characteristic of all respondents.

Table 1: 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			

No	76	29.7
	180	70.3
Chronic disease		
Yes		
No	169	66.0
	87	34.0

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%). However, a total of 34 (17.6%) respondents reported to have self-medicate with antibiotics. Most respondents who self-medicate with antibiotics were able to purchase antibiotics without prescription from retail pharmacy (9.8%). Respondents most common reasons for taking antibiotics were because of fever (57%) and respiratory tract infections (45.1%). Table 2 summarize the usage of antibiotics among all respondents.

Table 2: Usage of antibiotics of 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
Not prescribed:		
· 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		
Fever		
Respiratory tract infection		
Skin problems/ wound	9	4.7
Pain/ inflammation	110	57.0
Others	87	45.1
	23	11.9
	11	5.7
	10	5.2

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 3.

Table 3: 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	170	86 (33.6)

prescribed	(66.4)

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. 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 4.

Table 4: 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)

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.

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 multiple logistic regression was performed by using enter method since all the selected independent variables have the same priority. The preliminary model showed education level up to primary 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 5 and 6 summarize the univariate and multiple logistic regression analysis respectively.

Table 5: Univariate analysis of attitude appropriateness and sociodemographic characteristics and knowledge among all respondents.

Variables	Appropriate attitude (n=127)		Inappropriate attitude (n=129)		Mean diff (95%CI)	t-stat(df) □ or x□ (df) □	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)	0.148
Gender						4.014(1)	0.040
Male	43.2		56.8				
Female	55.7		44.3				
Race						0.003(1)	0.957
Malay	49.5		50.5				
Non-Malay	50		50				
Education level						9.752(1)	0.008
Primary school Secondary school	24		76				
College/university	46.6		53.4				
	57		43				
Employment status						1.741(1)	0.187
Employed							
Unemployed	44.3		55.7				
	52.8		47.2				
Family members as health care worker						5.153(1)	0.020
Yes							
No	60.5		39.5				
	45		55				
Chronic diseases						0.049(1)	0.825
Yes	49.1		50.9				
No	50.6		49.4				
Antibiotic knowledge						14.812(1)	0.0001

Good							
Poor	91(71.7)		62(48.1)				
	36(28.3)		67(51.9)				

Table 6: 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

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

The most common incorrect knowledge item among this population is regarding the role of antibiotics whereby more than 80% believe that antibiotics is used to treat viral infection and can work for cough and colds. This is consistent across two other local studies whereby 83% and 86.6% of the population in Putrajaya and Penang respectively thought that antibiotics can work for viral infection.(15, 19) 82% of the population of Putrajaya thought that antibiotics could work to cure cough and colds.(19) Therefore, the misconception about the role of antibiotics is a nationwide issue. In develop countries such as the Great Britain, it was found that percentage is lower whereby only 53% of their population believe that antibiotics is the medicine of choice for viral infections.(20)

The highest inappropriate attitude response was expecting antibiotic from the doctor for symptoms of common colds (76%). This is followed by taking antibiotic to recover faster from their illness (55%) and stopping antibiotics once they start feeling better (48%). This finding is comparable to a study done within Putrajaya population whereby they had found 73.8 % of their respondents were also expecting antibiotics from their doctors when they experienced common cold. However, several other studies found

lower percentage for this attitude item. In a study done in Penang, the percentage is lower at 57.8%, which is comparable to the study done in United States at 53.6%. The lowest percentage of inappropriate attitude in relation to this attitude item is a study in Taiwan with only 25 % of the population would expect antibiotics from their doctor for common colds.(21)

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 is 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).(12) 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).(22)

Common sense would suggest that good antibiotic knowledge would lead to appropriate attitude when handling antibiotics as reflected in this study. It does so to a certain extent until the situation becomes challenging or unfavourable.(23) For an example, studies have shown that clinicians are prone to self-medicate with antibiotics when they are unwell.(24) 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.(25) Previous study has demonstrated that the link between antibiotic knowledge and attitude towards antibiotic is weak in the context of LMIC.(26) As people from rural areas become more financially secure, they also become more empowered and assertive towards their health. In other words, their attitude towards handling antibiotic is inappropriate not because of ignorance but because they are now able to exercise this assertiveness.(26)

Factors associated with inappropriate attitude towards antibiotic usage

(i) Poor antibiotic knowledge

This study shows that respondents with poor antibiotic knowledge are 2.5 times more likely to have inappropriate attitude towards antibiotic.(27) In South Korea, respondents with good antibiotic knowledge were 1.52 times more likely to demonstrate appropriate attitude when using antibiotic.(28) In Northern Tanzania, respondents with good antibiotic knowledge were three times more likely to have appropriate attitude towards antibiotic. (29) Previous studies have also demonstrated that good antibiotic knowledge does not always translate to appropriate attitude. Another study in Korea demonstrated that good antibiotic knowledge is associated with antibiotic self-medication.(28) Furthermore, the Korean elderly population with the lowest overall knowledge score on antibiotics has a more appropriate attitude towards antibiotics usage. (28) In Trinidad and Tobago, it was found that even though their respondents' antibiotic knowledge were outstanding, it was not associated with appropriate attitude towards their 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.(30) 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. (31) In the UK, a survey conducted by the Department of Health Standing Medical Advisory Committee on Antimicrobial Resistance (SMAC) 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. Furthermore, the respondents with goods knowledge on antibiotics were more likely to self-medicate themselves with antibiotic and to keep left-over antibiotics from previous prescriptions.(32)

(ii) Low education level

This study has also demonstrated that respondents with low education level are 2.6 times more likely to have inappropriate attitude towards antibiotic.(27) This is similar to a study done Penang whereby respondents with low education level were significantly associated with inappropriate attitudes towards antibiotic.(15) In another local study conducted in Putrajaya, education level is significantly associated with their mean attitude score.(19) It was also found that respondent with lower education level is significantly associated with using leftover antibiotics to self- treat themselves and not using antibiotics according to instructions.(19) In a cross-sectional study done 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.(33) In addition, a study done in Kuwait found that respondents with higher level education level were two times likely to a positive attitude towards antibiotic usage.(34) In contrary, among the Lebanese, education level is not an associated with attitude towards antibiotic.(35)

Study limitation

The non-probability sampling method applied in this study is vulnerable to selection bias. However, great effort was put into covering all patients who attended the centre during the study period. 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. The findings of this study may not be generalizable to this country. However, it is the first of its kind around this district and among patients attending a primary care setting. It also compliments other findings around the country for the nation to further consolidate our effort to combat antibiotic resistance.

Clinical implications

(i) Targeted counselling for busy clinics and patient education as part of non-pharmacological management in viral illness

Patient education should be routinely incorporated in the management of patients with viral illness as part of the non-pharmacological management of viral infections. For clinics with high patient load whereby time is a barrier to effective patient education, 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.(36) Previous study have shown that improved communication skills in primary care setting can bridge the gap between clinicians and patients 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. (36)

(ii) Design an awareness campaign focusing on behavioural change.

This study has demonstrated that the relationship between antibiotic knowledge and attitude appropriateness is weak. Recent studies on behavioural science delineates that a person’s attitude is more important than intelligence when it comes to having a successful life. Attitudes are often the result of experience and have a very powerful influence over a patient’s behaviour. Therefore, it is crucial for educational intervention to adopt a different approach by screening the population for inappropriate attitude when handling antibiotics and rectifying their misconceptions. Health campaign should also shift their approach to instilling appropriate behaviour rather than focusing on theoretical aspects. In fact, previous study have demonstrated that campaigns focusing on antibiotic knowledge among the public increases the incidence of self-medication.(12)

Conclusion

In summary, this study has demonstrated a weak positive relationship between antibiotic knowledge and the community’s attitude towards antibiotic. Factors associated with inappropriate attitude towards antibiotic are low education level and poor antibiotic knowledge whereby respondents with this set of characteristics are at least two time more likely to have inappropriate attitude towards antibiotic. Most respondents believe that antibiotics can be used for viral infection and expects antibiotics from their doctors if they have common cold. In LMIC where resources are limited, educational interventions should be targeted to “high risk” individuals and patient education especially pertaining to the role of antibiotics should be incorporated as part of the non-pharmacological management of viral illness. Health campaign should also focus on behavioral change rather than theoretical approach.

Abbreviations

ABR: Antibiotic resistance, LMIC: Lower- and middle-income countries, UHC: Universal health coverage, WHO: World health organization, URTI: Upper respiratory tract infection, AGE: Acute gastro enteritis, RM: Ringgit Malaysia, USD: United States dollar.

Declarations

Acknowledgement

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Availability of data and materials

Study findings are kept at the office of Faculty of Medicine, Universiti Teknologi MARA (UiTM) Selayang campus, Jalan Prima Selayang 7, 68100 Batu Caves, Selangor, Malaysia. Data may be shared upon request of reviewers and it is subjected to the data protection regulations.

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Authors’ contribution

ZSAZ, KAM and ZI conceptualized and designed the study. ZSAZ performed data collection, data entry, data analysis and prepare initial draft of the manuscript. KAM and ZI overseas that data collection and management was carried out according to the appropriate conduct of the research. KAM and ZI critically appraised the draft and provide expert content. ZI supervised statistical method, confirmed findings and ensure its validity. All authors have read the final manuscript and given approval. Each author is accountable for the content of this research findings.

Ethical approval and consent to participate

This research has obtained ethical approval from the institutional ethics committee at the faculty of medicine, UiTM Sg Buloh and at the ethics committee in UiTM Shah Alam (main campus) on 17 January 2017. Written permission was obtained from the original author to utilize the questionnaire for this study tool.Verbal and written consent were obtained from the participants prior to answering the questionnaire. Participation in this study is entirely voluntary. They were also informed that they could withdraw from the study at any time if they wish.

Consent for publication

Respondents’ consent for publication is not applicable as their individual data was neither provided nor presented in the manuscript.

Competing interests

None to declare

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Figures

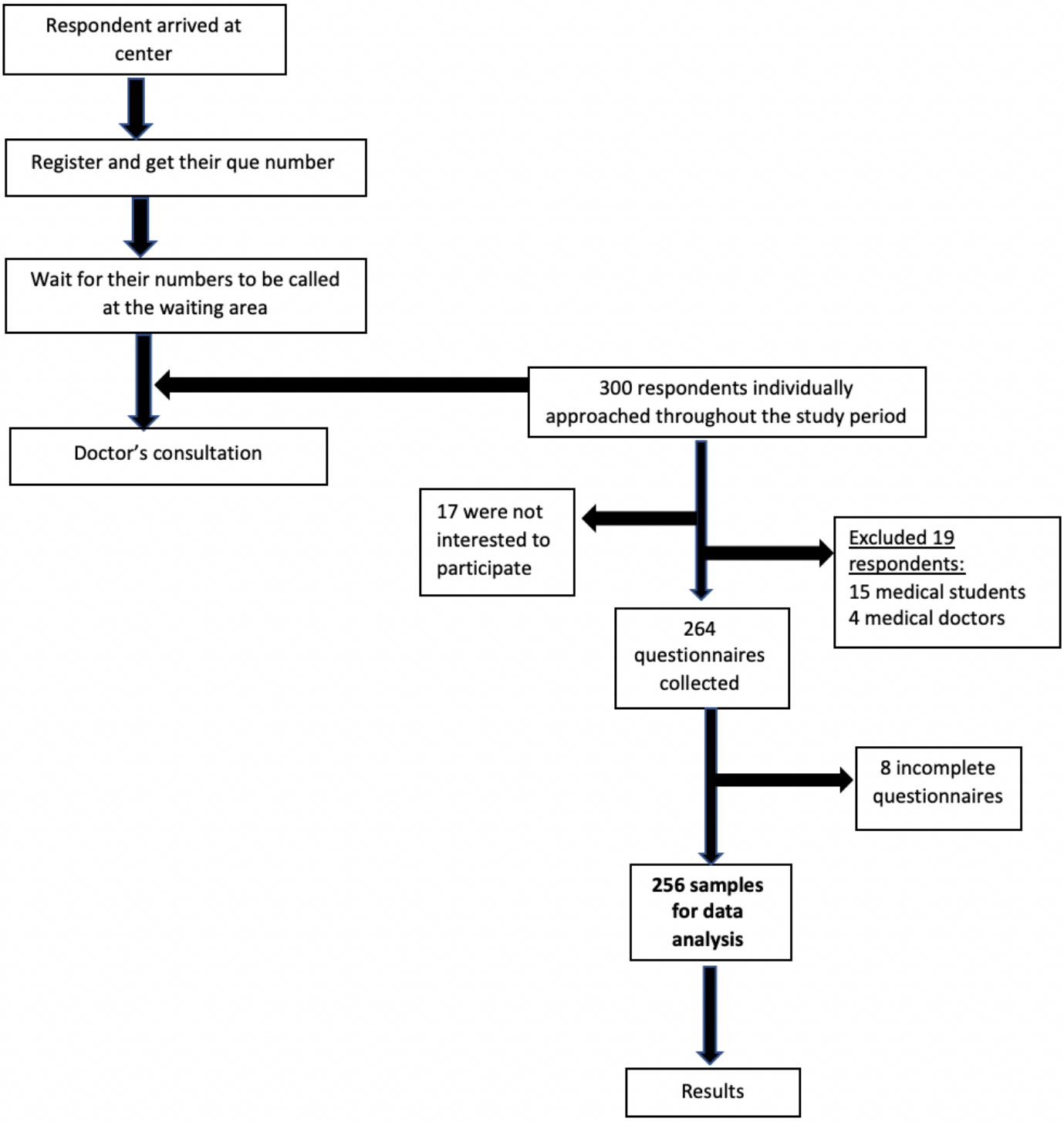

Figure 1

Flow chart of the conduct of the study