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Research Article

Knowledge and attitude towards antibiotic use and awareness on antibiotic resistance among older people in Malaysia

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Abstract: Antibiotic resistance is a significant global health concern. The challenges of antibiotics usage among elderly include antibiotic overuse, antibiotic resistance, dosing of antibiotics and adverse effects. This study aimed to evaluate the knowledge and attitude towards antibiotics usage among the elderly as well as the awareness on antibiotic resistance. A prospective cross-sectional study was conducted in outpatient department of a tertiary hospital in Malaysia from September 2016 to November 2016 using researcher-assisted and validated questionnaires. A total number of 250 elderly patients were recruited and majority of them (n=152, 60.8%) had moderate level of knowledge, with a median (IQR) score of 6.00(3.00) out of 12 points and positive attitude with a median (IQR) score of 7.00(1.00) out of 8 points. There was a positive correlation between knowledge and attitude scores ($r = 0.335$, $p<0.001$). Generally, awareness on antibiotic resistance was low as majority of the elderly respondents were not familiar (n=182, 71.8%) with the term "antibiotic resistance" and had never hear or read about antibiotic resistance before (n=150, 60.0%). In conclusion, majority of the elderly respondents had moderate level of knowledge and positive attitude towards antibiotics, implying the necessities of having public awareness campaigns to rectify the incomplete understanding of antibiotic use.

Keywords: Antibiotic resistance, Antibiotic use, Elderly

1. INTRODUCTION

Antibiotics were one of the largest groups of drugs being utilized in the health care system other than anti-diabetic, anti-hypertensive and lipid-lowering agents. There were temporal relationship between the increased use of antibiotics over the years and the growing rates of antimicrobial resistance worldwide. Inappropriate antimicrobial use has been associated with increased morbidity, mortality and hospital costs [1]. There were several issues related to proper antibiotic use, which potentially affecting the delivery of quality and effective healthcare [2]. Patients are the end consumers of all medical treatments, including antibiotics [3]. However, misconceptions about antibiotics existed. People deem antibiotics as powerful medicines and always capable of preventing and treating most of the perceived illness [4].

The irrational use of antibiotics will result in the emergence of resistant bacterial strains that adding the burden on national health system. Older people were the most vulnerable population as they knew less about medications as compared to the young [5]. The older adults are more susceptible to certain infections as compared to the young; hence they tend to have more serious infections with atypical and non-specific clinical manifestations [6]. The challenges in the use of antibiotics in older people include antibiotic overuse, antibiotic resistance, dosing of antibiotics and adverse effects. Antibiotic resistance also is associated with a high mortality risk and increased economic costs. As a result of population ageing, there is an urge to address issues of older adults so that more information on this population will be available [7].

To date, there is a lack of information regarding antibiotic usage among the older people, along with their knowledge about, attitude toward and awareness on antibiotics use and resistance. Therefore, this

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study aimed to evaluate the knowledge and attitude towards antibiotic use among older people. This study also aimed to investigate the awareness of older people on antibiotic resistance and their perceptions about patient-doctor relationship on antibiotic prescribing.

2. MATERIALS AND METHODS

2.1 Study design

A cross-sectional study was conducted among older people from out-patient pharmacy departments in a tertiary hospital in Malaysia from September to November 2016 using researcher-assisted and validated questionnaire upon their informed consent. Respondents were recruited based on the following criteria; aged 60 years old and above who are seeking treatment in that medical center and aware of the term "antibiotic". Those who did not complete the questionnaire were excluded from the study. This study was approved by our Institutional Human Research Ethics Committee.

A set of validated instruments was utilized in this study. The first section of this questionnaire was to document respondents' recent antibiotic usage within the past three months [8]. An arbitrary scoring system was employed according to the answer provided. The knowledge score was calculated as a continuous variable by summing the respondents' number of correct answers to 12 statements. The original Bloom's cut-off points, 80.0%–100.0%, 60.0%–79.0%, and ≤59.0%, were adapted and modified from another study [9]. The scores for knowledge varied from 1 to 12 points and were classified into three levels as follows: 1. high level: 9–12 scores; 2. moderate level: 5–8 scores; and 3. low level: 0–4 scores. Another section of this questionnaire consisted of 8 statements to assess respondents' attitudes towards antibiotic usage. The attitude statements were used to address usage of antibiotics during common colds, patients' expectation of their doctor when they are suffering from common colds, completion of antibiotic treatment course, sharing of antibiotics with family members, keeping antibiotics stocks at home for emergency use, usage of leftover antibiotics, compliance with the instructions on the label in taking antibiotics and the awareness of expiry date before taking the antibiotics. Respondents were required to answer according to a five point Likert scale ranging from "Strongly agree" to "Strongly disagree". Those who answered "Strongly agree" and "Agree" were classified as "agreed" and those who answered "Strongly disagree" and "Disagree" as having disagreed in order to simplify the results' presentation and analysis. The attitude score was also calculated as a continuous variable by summing the respondents' number of positive responses to eight statements. One point will be given for each positive response, whereas zero point will be given for each negative or uncertain response. Total attitude scores ranged from zero to eight, with a higher total score indicating a more positive attitude towards antibiotic usage.

Eight questions were also included to assess the awareness of respondents on antibiotic resistance [10]. Respondents were required to answer "Yes", "No" or "Not sure" to the statements related to antibiotic resistance. For those who had heard or read about antibiotic resistance, they were required to provide further information regarding the source of information about antibiotic resistance. The last section included six statements to explore respondents' perception about patient-doctor relationship in antibiotic prescribing [11]. Responses were measured using a five point Likert scale ranging from "Strongly disagree" to "Strongly agree". To simplify the results' presentation and analysis, those who answered "Strongly agree" and "Agree" were classified as "agreed" and those who answered "Strongly disagree" and "Disagree" as having disagreed.

All data analyses were performed using Statistical Package for Social Science (SPSS) version 22.0. Demographic characteristics, recent usage of antibiotics, knowledge of and attitude towards antibiotic, awareness on antibiotic resistance and perception about patient-doctor relationship on antibiotic prescribing were summarized using descriptive statistics. Shapiro-Wilk's test was used to determine the normality of knowledge and attitude scores. Chi-square test was used to determine association between respondents' demographic characteristics and level of knowledge regarding antibiotics. In addition, Mann-whitney U Test and Kruskal-Wallis H Test were performed to determine the differences in attitude scores among the respondents with different demographic

characteristics, where appropriate. Post hoc test was done after Kruskal-Wallis H Test for pairwise comparison of attitude scores among respondents with different demographic characteristics. Besides, Spearman's rank correlation analysis was performed to examine the degree of relationship between knowledge and attitude score. Chi-square test was used to determine association between level of knowledge and awareness on antibiotic resistance. Correlation between related statements was performed using Chi-square test. In all statistical analyses, a p-value of less than 0.05 was considered to be statistically significant.

3. RESULTS AND DISCUSSION

A total of 250 subjects were included in the study (**Table 1**). The median (interquartile, IQR) age was 69(8) years, with most falling within 65-69 age group (n= 87, 34.8%). A total of 55 respondents (22.0%) reported using antibiotics within the past three months of the survey; most of whom obtained their antibiotics as prescribed and given by clinic or hospital after consultation with doctors (98.2%). In this study, the knowledge score about antibiotics use ranged from 1 to 12 points, with a median (IQR) score of 6.00(3.00). Majority of the respondents (n=152, 60.8%) had moderate level of knowledge. Overall, the level of education ($p<0.001$) and total number of medication taken ($p=0.015$) were found to have significantly positive associations with the level of knowledge towards antibiotics.

More than half of the respondents did not know that antibiotics are not effective in treating viral infection or common cold and cough (**Table 2**). For the knowledge regarding identification of antibiotic, most of the respondents correctly answered that antibiotics are not the same as other medications that are used to relieve pain and fever such as

Table 1. Association of respondents' demographic characteristics with level of knowledge to the antibiotic use (N=250)

Demographic characteristics		Frequency, n (%)	Level of knowledge			
			Poor n (%)	Moderate n (%)	Good, n (%)	p-value
Age (in years)	60-64	55 (22.0)	7(12.7)	34(61.8)	14(25.5)	0.251[a]
	65-69	87 (34.8)	21(24.1)	54(62.1)	12(13.8)	
	70-74	59 (23.6)	9(15.3)	37(62.7)	13(22.0)	
	75 or older	49 (19.6)	14(28.6)	27(55.1)	8(16.3)	
Gender	Male	162 (64.8)	34 (21.0)	96(59.3)	32(19.8)	0.787[a]
	Female	88 (35.2)	17 (19.3)	56(63.6)	15(17.0)	
Educational level	Primary school	59 (23.6)	22 (37.3)	31(52.5)	6 (10.2)	0.001 [b**]
	Secondary school	118 (47.2)	25 (21.2)	69(58.5)	24(20.3)	
	College/ University	66 (26.4)	2 (3.0)	47(71.2)	17(25.8)	
	None	7 (2.8)	2 (28.6)	5 (71.4)	0 (0.0)	
Common healthcare location	Government clinic/hospital	238 (95.2)	48 (20.2)	147(61.8)	43(18.1)	0.836 [b]
	Private clinic/ hospital	10 (4.0)	3 (30.0)	4 (40.0)	3 (30.0)	
	Others	2 (0.8)	0 (0.0)	1 (50.0)	1(50.0)	
Total medication taken	1-4	109 (47.6)	14 (12.8)	69 (63.3)	26(23.9)	0.015[a*]
	5 and more	120 (52.4)	32 (26.7)	71 (59.2)	17(14.2)	

a=chi square test, b=Yate's correction of chi square, ** Significant at the 0.01 level (2-tailed), *Significant at the 0.05 level (2-tailed)

Table 2. Percentage of answers based on knowledge statements regarding antibiotics (N=250)

Statement	Correct answer, n (%)	Incorrect answer, n (%)	Unsure, n (%)
Role of Antibiotic			
1. Antibiotic are medicine that can kill bacteria.	215 (86)	11 (4.4)	24 (9.6)
2. Antibiotic can be used to treat viral infection.	41 (16.4)	144 (57.6)	65(26.0)
3. Antibiotic work on most cold and cough.	76 (30.4)	143 (57.2)	31(12.4)
Identification of antibiotic			
4. Penicillin is an antibiotic.	98 (39.2)	51 (20.4)	101(40.4)
5. Antibiotic are the same as medications used to relieve pain and fever such as aspirin and paracetamol.	166 (66.4)	42 (16.8)	42 (16.8)
Good Bacteria			
6. Antibiotic can kill bacteria that normally live on skin and gut.	140 (56.0)	20 (8.0)	
7. Bacteria that normally live on the skin and in the gut are good for your health.	72 (28.8)	88 (35.2)	
Adverse effect			
8. Antibiotic may cause allergic reactions	192 (76.8)	23 (9.2)	35 (14.0)
9. Antibiotic does not cause side effects	165 (66.0)	44 (17.6)	41 (16.4)
10. Overuse of antibiotics can cause antibiotic to lose effectiveness in long term.	204 (81.6)	7 (2.8)	39 (15.6)
Administration of antibiotic			
11. It is okay to stop taking antibiotic when symptoms are improving.	117 (46.8)	129 (51.6)	4(1.6)
12. Taking less antibiotics than prescribed is more healthy than taking the full course prescribed.	165 (66.0)	55 (22.0)	30(12.0)

aspirin and paracetamol. More than half of the respondents knew that antibiotic can kill bacteria that normally live on skin and gut, however, most of them did not agree that or were unsure whether these bacteria are good for their health. In terms of adverse effect of antibiotic, more than half of them respondents were aware that antibiotics may cause allergic reactions or side-effects. About all of the participants correctly answered that antibiotic resistance may occur due to overuse of antibiotics. Nevertheless, more than half of the respondents thought it is fine to stop taking antibiotic when symptoms are improving.

The attitude score towards antibiotics use ranged from 1 to 8 points, with a median (IQR) score of 7.00(1.00) (**Table 3)**. Overall, gender (p=0.022), level of education (p=0.002) and total number of medication taken (p=0.015) were found to contribute significantly to the attitude score. Mann-Whitney U Test reported that the attitude score of female respondents (mean rank = 139.36) was significantly higher (p=0.022) than the male respondents (mean rank = 117.97). Kruskal-Wallis H Test reported a significant difference (p=0.002) in attitude score among respondents with different level of education. Post hoc analysis revealed that the attitude score of respondents with primary education was significantly lower (p<0.001) than the attitude score of respondents with secondary education and tertiary education. Meanwhile, Mann-Whitney U Test reported that the attitude score of older people who taking 1 to 4 medications (mean rank = 125.86) was significantly higher (p=0.015) than the attitude score of the respondents taking 5 and more medications (mean rank = 105.13).

In general, our respondents were found to have positive attitudes towards antibiotics with results showing positive responses of more than half from

Table 3. Difference in attitude score in respondents with different demographic characteristics (N=250)

Demographic characteristics		Attitude score	
		Mean rank	p-value
Age (in years)	60-64	133.75	0.410§
	65-69	130.80	
	70-74	115.40	
	75 or older	118.99	
Gender	Male	117.97	0.022‡*
	Female	139.36	
Employment status	Employed	87.00	0.116§
	Housewife/househusband	138.79	
	Retired/unemployed	123.64	
Common healthcare location	Government clinic/hospital	125.95	0.776§
	Private clinic/hospital	121.60	
	Others	91.50	
Total medication taken	1-4	125.86	0.015‡**
	5 and more	105.13	

** Significant at the 0.01 level (2-tailed)
* Significant at the 0.05 level (2-tailed)
‡ Mann-Whitney U Test
§ Kruskal-Wallis H Test
Post hoc test for pairwise comparison of groups-"ab" and "ac" showed statistically significant difference with $p < 0.001$.

all attitude statements (**Table 4).** Nevertheless, one fifth of the respondents will take antibiotics when they get cold in order to recover from illness. Besides, a portion of the respondents expected antibiotic to be prescribed by their doctors if they suffer from common cold symptoms. More than

Table 4. Attitude statements regarding antibiotics usage (N=250)

Statement	Agree, n (%)	Neutral, n (%)	Disagree, n (%)	Median (IQR)
1. When I get cold, I will take antibiotics to help me get better more quickly.	52 (20.8)	24 (9.6)	174 (69.6)	3(1)
2. I expect antibiotic to be prescribed by my doctor if I suffer from common cold symptoms.	72(28.8)	26 (10.4)	152 (60.8)	3(2)
3. I normally stop taking an antibiotic when I start feeling better.	94 (37.6)	11 (4.4)	145 (58.0)	3(2)
4. If my family member is sick I usually will give my antibiotic to them.	5 (2.0)	4(1.6)	241 (96.4)	3(0)
5. I normally keep antibiotic stock at home in case of emergency.	14 (5.6)	5(2.0)	231 (92.4)	3(0)
6. I will use leftover antibiotics for a respiratory illness (runny nose/ sore throat / flu).	29(11.6)	16 (6.4)	205 (82.0)	3(0)
7. I will take antibiotic according to the instruction on the label.	241 (96.4)	8 (3.2)	1 (0.4)	1(0)
8. I normally will look at the expiry date of antibiotic before taking it.	208 (83.2)	18 (7.2)	24(9.6)	1(0)

Table 5. Awareness on antibiotic resistance (N=250)

	Yes, n (%)	No, n (%)	Unsure, n(%)
1. Are you familiar with the term 'Antibiotic Resistance'?	54 (21.6%)	182 (71.8%)	14 (5.6%)
2. Have you ever heard or read about Antibiotic Resistance?	81 (32.4%)	150 (60.0%)	19 (7.6%)
3. Do you think this is an important healthcare issue?	188 (75.2%)	6 (2.4%)	56 (22.4%)
4. Has your doctor ever talked to you about Antibiotic Resistance?	56 (22.4%)	187 (74.8%)	7 (2.8%)
5. Has your doctor ever given your reading materials about Antibiotic Resistance?	9 (3.6%)	237 (94.8%)	4 (1.6%)
6. Does your pharmacist talk to you about your prescription medications?	210 (84.0%)	28 (11.2%)	12 (4.8%)

one third of the respondents admitted to stop taking an antibiotic when they began to feel better from their condition. There was a significant correlation between knowledge score and attitude score ($r = 0.335$, $p<0.001$) implying that a higher knowledge score was associated with a more positive attitude score. The knowledge statement "Antibiotics work on most colds and coughs" was significantly associated with the attitude statement "When I get cold, I will take antibiotics to help me get better more quickly" ($p<0.001$) and "I expect antibiotic to be prescribed by my doctor if I suffer from common cold symptoms" ($p=0.019$).

Nevertheless, only less than quarter of the respondents were familiar with the term "antibiotic resistance" (**Table 5**). A majority of respondents were of the opinion that doctors should inform them about antibiotic resistance. Of those respondents who had heard or read about antibiotic resistance, most of them reported that they obtained this information through media, followed by information from doctors. A significant association was found between the level of knowledge and awareness on antibiotic. Older people who were familiar with the term "antibiotic resistance" ($p<0.001$), ever heard or read about antibiotic resistance ($p<0.001$) and felt antibiotic resistance as an important healthcare issue ($p<0.001$) had significantly higher level of knowledge towards antibiotics. Most of the respondents agreed that pharmacists often tell them how antibiotics should be used and doctors often spend a good time to inform them how antibiotics should be used during the consultation. Majority of respondents trusted the doctors' decision whether or not they were being prescribed with antibiotics. More than half of the respondents did not agree that doctors will be affected by patients' expectation in antibiotic prescribing. Lastly, less than half of the older people agreed that doctors often time to consider carefully whether antibiotics are needed or not (**Table 6**).

Table 6. Perception about patient-doctor relationship on antibiotic prescribing (N=250)

Statement	Disagree, n (%)	Unsure, n (%)	Agree, n (%)	Median (IQR)
1. Pharmacists often tell you how antibiotics should be used.	62 (24.8)	28 (11.2)	160 (64.0)	3(1)
2. Doctors often take time to inform you during the consultation how antibiotics should be used.	32 (13.2)	25 (10.0)	192 (76.8)	3(0)
3. I trust the doctor decision if she or he decides not to prescribe antibiotic.	3 (1.2)	18 (7.2)	229 (91.6)	3(0)
4. I trust the doctor's decision when she or he prescribes antibiotics.	4 (1.6)	20 (8.0)	226 (90.4)	3(0)
5. Doctors often prescribe antibiotics because the patient expects it.	164 (65.6)	43 (17.2)	43 (17.2)	1(1)
6. Doctors often take time to consider carefully whether antibiotics are needed or not.	54 (21.6)	75 (30.0)	121 (48.4)	2(1)

In our study, low level of knowledge about antibiotics was found among older people with primary school education, suggesting patients with higher educational level had higher accessibility to health information through advanced sources including books, electronic article, social media or direct communication with their health care professionals [12]. Multiple medications can result in increased complexity of medication regimen, leading to the difficulties in remembering the name and purposes of medications. Misconceptions about the role of antibiotics in treating viral infection and most of the cough and cold were prevalent among the older people. Such misconceptions could be attributed to the fact that the general terms such as "germ" or "microbes", instead of "bacterial" and "virus" were commonly used by healthcare providers in providing medical advice to the patients without medical background [13]. Proper patient education was then suggested to correct the misconceptions about the role of antibiotics among the older people.

Most of older people were not familiar with the identity of penicillin as an antibiotic. This was not surprising as older people relied mostly on pill size, shape and color to recognize the medications instead of the actual names [14]. Nevertheless, most of the respondents were able to differentiate antibiotics from analgesics and antipyretics such as aspirin and paracetamol. It was possible that they used to differentiate antibiotics from other classes of drugs according to the perceived efficacy of antibiotics, but not the pharmacological action of antibiotics. It was observed that older people might not really understand the importance of completing full course of antibiotic regimen. Poor compliance to antibiotic regimen may result in undesirable treatment outcomes as patients may experience recurrent infection, which further worsening their health conditions. Hence, healthcare professionals should take sufficient steps in tackling antibiotic compliance issues among the older people by providing adequate and relevant patient education.

Female were found to have a more positive attitude towards antibiotic usage than the male older people. Some studies showed that older people women utilized more healthcare services than older people men; it may indirectly reflect their greater concerns in health-related problems and better attitude towards medication usage [15-16]. With higher level of education, patients were able to understand more about their health needs as well as comply with the medical instructions provided by healthcare professionals [17]. Older people who took higher number of medications were also found to have more negative attitude towards antibiotic usage. This can be explained by the complexity of medication regimen arised as a result of multiple medications [18-19].

Overall, majority of the older people had a positive attitude towards antibiotic use, Yet, antibiotics were assume to be able to provide a better recovery period for the common cold and older people did expect antibiotics to be prescribed by doctors for their common cold symptoms. The belief on "antibiotics work on most cough and cold" implied that the expectations of antibiotics during common colds were built upon the perceived effectiveness of antibiotics in relieving coughs and colds. Patients' expectation of antibiotics can be also affected by their past experience. For example, patients who have taken antibiotics for their common colds before this will have misperceptions that antibiotics were effective, although common colds were generally self-limiting [20]. Alternatively, some patients may expect an antibiotic to be prescribed by doctors to compensate for the time and effort spent to visit the doctor and to avoid multiple doctor visit when their illness deteriorated [21].

Prematurely stopping the antibiotic treatment was a common mistake among patients when they have experienced symptomatic relief, especially when the infections are mild in nature [22]. Nevertheless, it was encouraging to observe that majority of the older people showed high disagreement to the wrong practice of using antibiotics such as sharing of antibiotics with family members or using leftover antibiotics. Also, it was found out that the older people were less able to understand the medical instructions on the medication labels as compared to the young [23]. Thus, consistent, complete, organized and standardized information on medication labels are important to improve readability and understanding of patients on the administration of medication safely.

Only a quarter of our respondents was familiar with the term "Antibiotic Resistance" or came across with the term prior to this study. In western countries, patients were more exposed to the issues and they also perceived antibiotic resistance as an important healthcare issue [9]. Generally, older people who were more aware of antibiotic resistance had a higher level of knowledge about antibiotics. Inadequate awareness on antibiotic resistance can stimulate more inappropriate antibiotic use and further accelerate the antibiotic resistance [3]. It was notable that discrepancy existed between patients' expectations and the actual information about antibiotic resistance provided by their healthcare professionals. Many believed that their doctors should be the one that inform them about antibiotic resistance, however few received such information. Most people relied on media to provide information about this issue. These findings addressed the importance of involvement of healthcare professionals in informing patients regarding causes and consequences of antibiotic resistance. Educating the older people regarding appropriate antibiotic use can lead to better health outcomes and slow down antibiotic resistance [9].

Good relationship between patients and attending doctors are important as older people would able to voice their concerns on antibiotics directly. This was encouraging as trust is one of the main components in maintaining patient-doctor relationship [24]. Furthermore, majority of our older people also disagreed that doctors often prescribe antibiotics upon patients' expectation although almost one third of them expected antibiotics to be prescribed by doctors for common cold symptoms.

4. CONCLUSIONS

This study was to assess the knowledge and attitude towards antibiotics use and resistance among older people, highlighting the necessities of having public awareness campaigns to rectify the incomplete understanding of antibiotic uses. Nevertheless, our findings were limited as those who did not aware of the term "antibiotic" were excluded in the beginning of the recruitment process, giving potential risk of missing of important information about older people in relation to antibiotic uses. Our results showed that majority of the older people had moderate level of knowledge about and positive attitude towards antibiotics. Misunderstandings regarding the effectiveness of antibiotic in treating viral infection and common cold symptoms existed. Majority of the older people were not aware of the antibiotic resistance, but they perceived it as an important healthcare issue. In addition, good patient-doctor relationship was observed in this study. Further study can be conducted to investigate the impact of antibiotic awareness campaign and patient counseling on rational antibiotic usage among the older people, such as misconceptions about antibiotics, compliance to antibiotic regimen and unnecessary expectation of antibiotics.

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