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Abstract

Irrational use of antibiotics is a public health problem. Our study aimed to evaluate knowledge and awareness of antibiotics, and to examine its' associated factors. We conducted a cross sectional survey. The questionnaire was adapted from WHO Multi-country survey. Adults aged 18 years old and were receiving prescription from eight outpatient clinics and pharmacies in Yogyakarta province completed the survey. The questionnaire was consisted of three sections, i.e. socio-demographic factors, knowledge of antibiotics, and experiences in using antibiotics. Scores on questions and data were presented descriptively and analyzed using logistic regression to evaluate the influence of variables on knowledge of antibiotics. Out of 268 respondents, a cumulative 76% of them used antibiotics in last six months. Majority of respondents (58%) had low level knowledge on antibiotic use and awareness, and incorrectly identified that cold and cough are treatable with antibiotics (75%). Interestingly, 71% of participants agreed that internet is a major source of information on antibiotics (71%), while only 58% and 45% of respondents see pharmacists and medical professionals respectively. The antibiotics were received from prescription (79%) and 70% of respondents completed the full course of antibiotics prescribed, but only 32% of them became more cautious about antibiotic use. We found the highest association between gender, age, education level, with the knowledge of antibiotics. The overall level of knowledge and awareness on antibiotics use among residents in Yogyakarta is low. This mandates public health awareness intervention programs to be implemented on the use of antibiotics.

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Research article

Public knowledge and awareness towards antibiotics use in Yogyakarta: A cross sectional survey

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ABSTRACT

Irrational use of antibiotics is a public health problem. Our study aimed to evaluate knowledge and awareness of antibiotics, and to examine its' associated factors. We conducted a cross sectional survey. The questionnaire was adapted from WHO Multi-country survey. Adults aged 18 years old and were receiving prescription from eight outpatient clinics and pharmacies in Yogyakarta province completed the survey. The questionnaire was consisted of three sections, i.e. socio-demographic factors, knowledge of antibiotics, and experiences in using antibiotics. Scores on questions and data were presented descriptively and analyzed using logistic regression to evaluate the influence of variables on knowledge of antibiotics. Out of 268 respondents, a cumulative 76% of them used antibiotics in last six months. Majority of respondents (58%) had low level knowledge on antibiotic use and awareness, and incorrectly identified that cold and cough are treatable with antibiotics (75%). Interestingly, 71% of participants agreed that internet is a major source of information on antibiotics (71%), while only 58% and 45% of respondents see pharmacists and medical professionals respectively. The antibiotics were received from prescription (79%) and 70% of respondents completed the full course of antibiotics prescribed, but only 32% of them became more cautious about antibiotic use. We found the highest association between gender, age, education level, with the knowledge of antibiotics. The overall level of knowledge and awareness on antibiotics use among residents in Yogyakarta is low. This mandates public health awareness intervention programs to be implemented on the use of antibiotics.

1. INTRODUCTION

Antibiotic resistance is a worldwide problem. The irrational use of antibiotics is one of major threats to global health and contributes to rapid growth of antibiotic resistance². The health and economic burden of antibiotic resistance are well acknowledged. The problem of drug resistance has led to an increase in the mortality to 700,000 per annum globally. This is estimated to increase to 10 million deaths in 2050, with associated economic costs as high as USD 100 trillion if no action is implemented^{3,4}. Although the prevalence of antibiotics

consumption is the largest in developed countries, antibiotic consumption still escalates substantially in developing countries as well^{5,6}.

To appropriately address the magnitude of antibiotic misuse, it is essential to understand the main factors driving irrational use of antibiotics. Many studies highlight that patients' attitudes and expectations contribute to inappropriate antibiotic prescribing and antibiotic resistance. The studies on the antibiotic related behaviors in Ethiopia, Lithuania, Malaysia, and Europe have shown that the antibiotic self-medication rates ranged from 19 to 80%⁷⁻¹⁰. It was notable that the lack of general awareness and knowledge of people in the community, access to antibiotics without prescription, and misperception of prescribers, inadequate training to pharmacists and influence of patient-doctor interaction on the prescription have contributed to the antibiotic resistance in the community^{10,11}. Several studies found that high rates of antibiotic misuse may arise from the prescribing behaviors of doctors and the misunderstanding of patients that often requested antibiotics^{12,13}. No clinical guideline in routine practice might also have influenced the overuse of antibiotics^{14,15} and led to inaccurate diagnosis of infections that required treatment with antibiotics.

In general, the healthcare system in Indonesia consists of three referral levels: provincial hospitals with speciality services, district hospitals with inpatient and outpatient services, and primary healthcare centers with extended primary care services in rural area. In addition, many pharmacies under responsibilities of pharmacists, in contrast with drug stores without pharmacists' supervision are usually found in town area. A doctor's prescription is legally required for obtaining antibiotics from a pharmacy, but in practice customers sometimes ask for antibiotics without consultation and prescription from the doctor. Antibiotics are frequently used in Indonesian population, with observational study reporting that among household, the medication kept in the household included at least one antibiotic¹⁶.

In Indonesia, very little research data is available on the knowledge, awareness and practices of general population towards the use

of antibiotics. Hence it is important to study the knowledge and awareness about the use of antibiotics among the communities in Indonesia. The aims of this study were to describe community knowledge and awareness on antibiotic use and to identify socio-demographic characteristics of caregivers that may contribute to inappropriate use of antibiotics.

2. MATERIALS AND METHODS

This study was a cross sectional survey. The questionnaire was adapted from WHO Multi-country survey¹. Translation was conducted using the standard forward and backward method. Content validity of questionnaire was performed by practicing pharmacists considered as experts in social pharmacy. First, a pilot study with the questionnaire was carried out on 30 non-sample respondents who had visited pharmacies before the timeline of main survey. An ethical approval of this study was obtained from the Gadjah Mada University Medicine and Health Ethics Committee. Convenience sampling method was used to select study subjects. Adults aged 18 years old and more and who were willing to participate in the study after briefing them on the aims and objectives of this study were invited to fill out questionnaire. Respondents with educational background in health were excluded to reduce information bias. A survey was carried out by trained surveyors, final year pharmacy students, during the period of September 2018 to November 2018. A total of 268 patients receiving prescription from eight outpatient clinics and pharmacies in Yogyakarta province completed the survey. Respondents awaiting for their medications at the waiting room of each pharmacy were interviewed by the surveyors using closed-ended questions.

Initially, respondents were asked whether they have taken antibiotics in oral form at any time in the last six months and one month. The second set of questions concerned respondents' knowledge of antibiotics on the basis of indication, access, administration, and resistance to antibiotics. Respondents were asked if each of eleven statements about antibiotics was 'true' or 'false'. The statements were as follows: (1) Antibiotics work on most colds & coughs; (2) Antibiotics can treat a sore throat; (3) Antibiotics can kill bacteria; (4) Antibiotics can be used to treat viral infections; (5) Antibiotics can

be purchased without prescription; (6) Leftover antibiotics are good to keep at home in case of future need; (7) If you feel better you can stop taking antibiotics; (8) Taking less antibiotic than prescribed is more healthy than taking the full course prescribed; (9) Overuse of antibiotics can cause antibiotic resistance; (10) Antibiotic resistance occurs when body becomes resistant to antibiotics; and (11) antibiotic resistance is only a problem for people who take antibiotics regularly.

The third set of questions dealt with the accuracy of source of information perceived by respondents about the antibiotics. Respondents were asked to give their opinion on which sources of information about antibiotics are the most trustworthy. For awareness of antibiotics to the respondents, (1) I am taking antibiotics only for infection; (2) I got antibiotics from prescription; (3) I am taking full dose of antibiotics prescribed;

and (4) I have become more cautious about antibiotic use.

Data were presented descriptively in the form of frequency table. Statistical tests were used to determine the association between characteristics of respondents and their knowledge towards antibiotic use. The data were tested by chi square test for 95% confidence level ($p < 0.05$).

3. RESULTS

A total of 268 participants completed the survey. The socio-demographic background of respondents are presented in Table 1. Majority of respondents were female (67%), aged 31-59 years (55%), passed senior high school (47%), employed (49%), and monthly income of 2-4 million IDR (50%). The vast majority of respondents reported using antibiotics in last six months (76%). Among them, antibiotics were consumed in past month (35%).

Table 1. Demographics of respondents

Characteristics (N=268)	N	%
Sex		
Male	87	32.46
Female	181	67.54
Age, year (mean: 47.5 (11.42))		
18-30	34	12.69
31-50	148	55.22
>50	86	32.09
Education		
Primary	32	11.94
Senior high school	127	47.39
bachelor	80	29.85
Master degree	29	10.82
Occupation		
employed	132	49.25
housewife	89	33.21
student	23	8.58
Retired	24	8.96
Income (IDR)		
<2 million	96	35.82
2-4 million	134	50
>4 million	38	14.18
Antibiotic use		
Experience in antibiotic use in past 6 months	203	75.75
received antibiotics for my medication in the past month	94	35

The next area of survey covered in this study is the level of knowledge about the appropriate use of antibiotics including efficacy of antibiotics, how antibiotics should be administered, and antibiotic resistance. A vast majority of respondents had lower knowledge on antibiotic use and awareness (58%). The condition which is most often incorrectly identified as being treatable with antibiotics is cold and cough (75%) and viral infection (78%). Most of them knew that antibiotics can kill bacteria, only 9% of them answered this incorrectly. Regarding respondents' knowledge in getting their antibiotics, most of them knew that antibiotics must be legally

obtained with prescription, only 23% of them responded incorrectly for this item. The detailed responses of respondents for each question are presented in Table 2.

Respondents were asked to give their opinion on which sources of information about antibiotics they rely the most. The significant majority of respondents agreed that internet is major source of information on antibiotics (71%), while only 58% and 45% of respondents consider pharmacists and medical professionals respectively, as the most reliable sources of health information on health in relation to antibiotics (Table 3).

Table 2. Knowledge about antibiotics

Knowledge on antibiotic use and resistance (N=268)	Incorrect response, N (%)	Correct response, N (%)
Indication		
Antibiotics work on most cold & cough*	203 (75.64)	65 (24.36)
Antibiotics can treat a sore throat *	181 (67.43)	87 (32.57)
Antibiotics can kill bacteria	27 (9.86)	241 (90.14)
Antibiotics can be used to treat viral infections*	210 (78.45)	58 (21.55)
Access to antibiotics		
Antibiotics can be purchased without prescription*	62 (23.12)	206 (76.88)
Leftover antibiotics are good to keep at home in case of future need* 152 (56.76)	116 (43.24)	
Administration of antibiotics		
If you feel better you can stop taking antibiotics*	123 (45.9)	145 (54.1)
Taking less antibiotic than prescribed is more healthy than taking the full course prescribed*	179 (67)	89 (33)
Antibiotic resistance		
Overuse of antibiotics can cause antibiotic resistance	145 (55.22)	123 (44.78)
Antibiotic resistance occurs when the body becomes resistant to antibiotics* 206 (76.9)	62 (23.1)	
antibiotic resistance is only a problem for people who take antibiotics regularly*	216 (80.67)	52 (19.33)
Number of respondents with low level of knowledge	155 (57.83)	

*incorrect statement

Table 3. Perception towards information sources on antibiotics

Statements Response, N (%)	Strongly agree	Agree	Disagree	Strongly disagree
Pharmacy staff often tell you how antibiotics should be used'	112 (41.79)	78 (29.10)	69 (25.74)	43 (16.04)
Doctors often take time to inform the patient during the consultation how antibiotics should be used	75 (27.98)	45 (16.79)	81 (30.22)	67 (25)
I usually use internet source to get information on antibiotics	101 (37.68)	89 (33.20)	48 (17.91)	30 (11.19)

*likert scale with score 1-4

In order to explore levels of awareness and understanding of the appropriate use of antibiotics, the respondents were asked about their individual experience of using antibiotics. This data is presented in Table 4. The vast majority of respondents (79%) had received antibiotics from prescription and 70% of them completed the full course of antibiotics prescribed. However, only 35% of respondents had used antibiotics for bacterial infection, and only 32% of them became more cautious about antibiotic use.

In last part, we examine the association between respondents' demographic and the level

of knowledge of appropriate use of antibiotics (Table 5). The highest association is shown between the level of education and the knowledge about antibiotics, where respondents with a bachelor degree were more likely to have good knowledge than those with lower education (OR 3.853, CI 2.912-7.901). It was observed that female respondents were more likely than male respondents to have good knowledge on antibiotics use and resistance (OR 2.671, CI 2.128-5.902), younger respondents were slightly more likely than older respondent to report good knowledge on antibiotics (OR 2.593, CI 1.896-3.671).

Table 4. Awareness on the use of antibiotics

Awareness of antibiotics usage	N	%
I am taking antibiotics only for infection	93	34.76
I got antibiotics from prescription	211	78.90
I am taking full dose of antibiotics prescribed	186	69.32
I have become more cautious about antibiotic use	86	32.19

Table 5. Factors associated with knowledge of antibiotics

Knowledge of antibiotics (Categories)	Adjusted Odds ratio (OR)*	CI for OR
Sex		
Female	2.671	2.128-5.902
Male	1	
Age (mean 47.5 (11.42))		
≤50	2.593	1.896-3.671
>50	1	

Table 5. Factors associated with knowledge of antibiotics (Cont.)

Knowledge of antibiotics (Categories)	Adjusted Odds ratio (OR)*	CI for OR
Education		
Bachelor and higher	3.853	2.912-7.901
< Bachelor	1	
Income (IDR)		
>2 million	2.918	1.931-3.218
≤2 million	1	
Experience in antibiotic use in past 6 months		
Yes	2.329	1.628-3.277
No	1	
Information source of antibiotic use		
Health professional	1.263	0.821-3.283
Internet	1	

*statistical analysis with Chi-Square test

4. DISCUSSION

This is the first study on knowledge and awareness towards antibiotic usage among public in Yogyakarta Province, Indonesia. From the present study it is evident that more than one third respondents received antibiotics during the previous six months (75%), which is slightly higher compared to WHO studies in 2015, conducted in six regions, which showed that about 65% of respondents used antibiotics within six months¹.

Confusion about the appropriate use of antibiotics was the most critical, with more than 75% of respondents failing to identify that antibiotics do not aimed to relieve cough and flu and kill viral infections. This is consistent with the study in rural area in China, showed that caregivers expressed over-expectation for antibiotics for common childhood symptoms, stating that antibiotics were always or usually necessary when a child has a fever or cough.¹⁷ In particular in our study, about 45% respondents from this survey reported that they would stop antibiotics when they start to feel better, and 56% would use left-over antibiotics for treating future illnesses. It is notable that there was a good attitude of respondents towards antibiotics usage, that it cannot be purchased

without prescription. Most of the respondents in the present study received antibiotics with doctor's prescription (67%), which is in accordance with a previous study in Sweden where the respondents only used antibiotics after consultation with a doctor¹⁸.

The majority of participants had incorrect knowledge of antibiotic resistance, where they misunderstood that resistance of antibiotics occurs when their body becomes resistant to antibiotics. Most of them argued that the problem is only for people who take antibiotics regularly. About 55% of respondents believed that prolonged treatment might result in higher resistance rates, while shorter treatments could be more appropriate. Therefore, in order to avoid misconceptions about antibiotic resistance, public health campaigns have been investing to educate people on this issue.

It is interesting to highlight that almost 70 % of participants reported trusting internet as main information source regarding antibiotics use. Similar findings have been seen in other developing countries, reporting that the local communities have relatively high reliance on internet as a source of information on the antibiotic usage.

In terms of practice, the role of pharmacists as the source of information was mentioned by 58%

respondents in this study. Since more respondents in the study stated that they obtained information on antibiotic usage from pharmacy personnel rather than from the other health professionals, pharmacists seem to have a critical role to play in enhancing public understanding about appropriate antibiotic treatment. Empowering the pharmacists' role in raising public awareness through digital media would increase the spread of information on antibiotic usage.

Regarding respondents' awareness towards antibiotic use, they were unaware that antibiotics are used only for infection, they perceived still possible to obtain antibiotics without prescriptions even though this practice is illegal in Indonesia, based on Ministry of Health Law no 197 year 1993, stated that oral forms of antibiotics were included in medication category with prescription. Understanding which conditions can be treated with antibiotics is very important, as the use of antibiotics for conditions which are not in fact treatable with these medicines is another contributor to misuse, and therefore to the development of resistance. Various studies show that public awareness on antibiotic use can influence patient demand for antibiotic^{19, 20}. Therefore, stronger prescription policies might be solution for antibiotic resistance control and prevention of antibiotic resistance.

Our analysis on factors associated with knowledge of antibiotics show that elderly individuals, male, lower level of education than bachelor, relying on the internet as the source of information about antibiotic usage had limited knowledge of antibiotic use. These categories should be the main targets for future educational interventions. Since professional pharmacists play an important role in educating the public about antibiotics, they must be involved as role models to improve misperception and increase awareness both in the public and in clinical setting. Antimicrobial stewardship programs should be encouraged widely in academic, patient and community levels, to reduce antibiotic misuse and the problem of resistance.

Our study has several limitations. As the study was conducted in a local area of Indonesia, the findings may not be generalized to the whole population or another setting of health care. Secondly, a convenience sampling method was used, which involves the possibility of selection

bias and hence the results cannot be generalized. Third, close ended questions limit the extent to which a researcher can probe into respondents' answers to explore levels of knowledge.

5. CONCLUSIONS

We conclude that awareness of antibiotic usage and antibiotic resistance as being a critical public health problem, with low level of knowledge and attitudes. Furthermore, campaigning for appropriate antibiotic use as well as restricted antibiotic prescribing in Indonesia should be prioritized in efforts to reach rational use of medicine.

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