Community Research

Association between public knowledge regarding antibiotics and self-medication with antibiotics in Teling Atas Community Health Center, East Indonesia

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ABSTRAK

Latar belakang: Swamedikasi dengan antibiotik meningkatkan risiko terjadinya resistensi, yang selanjutnya meningkatkan morbiditas dan mortalitas. Masyarakat berperan penting dalam mencegah peningkatan insiden dan penyebaran resistensi. Data mengenai faktor-faktor yang mempengaruhi swamedikasi dengan antibiotik oleh masyarakat dibutuhkan untuk menyusun intervensi yang tepat. Studi ini bertujuan mengetahui determinan swamedikasi dengan antibiotik, terutama pengetahuan masyarakat mengenai antibiotik.

Metode: Studi potong lintang dengan wawancara menggunakan kuesioner dilaksanakan di Puskesmas Teling Atas, Kecamatan Wanea, pada bulan September-Oktober 2015. Kuesioner berisi 35 pertanyaan tentang karakteristik responden, perilaku penggunaan antibiotik, dan pengetahuan responden tentang antibiotik. Regresi logistik digunakan untuk mencari hubungan antara tingkat pengetahuan responden mengenai antibiotik dan determinan lain dari swamedikasi dengan antibiotik.

Hasil: Sebanyak 240 dari 400 responden (60%) menggunakan antibiotik dalam 6 bulan sebelum wawancara. Seratus delapan puluh (45,0%) responden melakukan swamedikasi. Luka atau penyakit kulit (32,2%) menjadi alasan utama penggunaan antibiotik tanpa resep. Mayoritas responden (70,6%) melakukan swamedikasi atas keinginan sendiri dan membeli antibiotik tersebut di apotek (52,2%). Rerata nilai pengetahuan responden mengenai antibiotik termasuk kategori "sedang" (skor 7,14±2,49). Responden dengan pengetahuan yang lebih buruk memiliki kemungkinan lebih tinggi untuk melakukan swamedikasi dengan antibiotik, demikian pula sebaliknya. (RO=16,86; IK 95% = 4,25–66,83).

Kesimpulan: Terdapat hubungan antara swamedikasi dengan antibiotik dengan usia, pendapatan keluarga, serta tingkat pengetahuan responden tentang antibiotik. Responden dengan tingkat pengetahuan yang rendah tentang antibiotik memiliki kemungkinan yang lebih tinggi untuk melakukan swamedikasi, sehingga dibutuhkan edukasi kepada masyarakat tentang antibiotik.

ABSTRACT

Background: Self-medication with antibiotics increases the risk of resistance, which leads to higher morbidity and mortality. The community plays an important role in preventing and controlling the spread of antibiotic resistance. This study aims to determine factors associated with antibiotics self-medication practices in the community, which are the key to developing effective intervention programs.

Methods: This cross-sectional study was conducted between September and October 2015 at Teling Atas Community Health Center in Wanea, a sub-district of East Indonesia region. Data was collected by a questionnaire-guided interview. There were 35 questions which cover respondent demographics, antibiotic use, and respondents' knowledge about antibiotics. Logistic regression was used to analyze the association between self-medication with antibiotics and respondents' level of knowledge as well as other factors.

Results: Among 400 respondents, there were 240 (60%) who had used antibiotics within 6 months prior to the interview and 180 (45.0%) who had self-medicated. Wounds or skin diseases (32.2%) were main reasons for self-medication. The majority of respondents self-medicated on their own initiatives (70.6%) and purchased antibiotics in pharmacies (52.2%). The mean score for respondent knowledge about antibiotic was categorized as "moderate" (score 7.14±2.49). Respondents with lower knowledge scores had higher probabilities to self-medicate with antibiotics than those with higher scores (OR= 16.86; 95% CI= 4.25–66.83).

Conclusion: Self-medication practices with antibiotics in this study are associated with age, family income, and knowledge. Since poorer knowledge about antibiotics is associated with a higher probability of self-medication with antibiotics, education programs to improve public awareness are needed.

Since the discovery of Penicillin in 1928, antibiotics have been playing an important role in the treatment of infectious diseases, one of the leading causes of death.[1,2] Unfortunately, many antibiotics have been less efficacious due to increased resistance. This condition has become a global health problem.[2–5]

The impact of antibiotic resistance is devastating to patients, the community, and healthcare. It reduces the efficacy of treatment which subsequently poses patients to higher morbidity and mortality up to two-folds and longer duration of treatment.[1,5,6] Patients may also need second or even third-line antibiotics to cure their infections and will be burdened with higher cost consequently.[1,2,6] At worst, the increasing number and spreading of resistant bacteria put us on the cusp of a post-antibiotic era when common infections and minor injuries could cause death.[1]

A study conducted in Surabaya and Semarang showed that 54% of individuals, either in the community or hospitals, had carried resistant *Escherichia coli*.[7] Self-medication has been proven to be one of the causes of antibiotic resistance.[8,9] Widayati et al[10] found that the 7.3% of people in Yogyakarta had self-medicated with antibiotics. The prevalence was higher (17%) in another study held in teaching hospitals and public health centers in Surabaya and Semarang.[11] In those studies, self-medication practices were predisposed by multiple factors, such as lack of knowledge about antibiotics, poor access to the health facilities, high-cost low-quality health services, poor regulation, and lack of control by the government.[8–10]

The role of the community in controlling the spread of resistance is essential. Appropriate use, such as not taking antibiotics without a prescription, taking antibiotics exactly as directed, not using leftover antibiotics from previous treatments, and not giving nor suggesting antibiotics to others based on prior personal medical history, can help prevent the grim prospect of antibiotic resistance mentioned previously.[12]

The World Health Organization (WHO) has urged its members to start educating and increasing people's awareness towards proper antibiotic use as one way to control the spread of antibiotic resistance.[2,4–6] Since self-medication is not only influenced by knowledge and belief at individual level but also by economic and socio-demographic factors which differ across regions, it is important to first identify what factors contribute to it.[5,6,8,13,14] Unfortunately, those data are still limited in Indonesia, and most of the studies were conducted in Java.

The purpose of this study is to determine public knowledge regarding antibiotics and other determinants of self-medication with antibiotics. The result of this study is expected to be a valuable input to develop effective community education programs to raise public awareness of antibiotic resistance as well as appropriate use of antibiotics.

METHODS

This cross-sectional study was conducted in Wanea, a sub-district of Manado, North Sulawesi, East Indonesia, between September and October 2015. A questionnaire-structured interview with each subject was performed to collect data. This study had been approved by the Integrated Health Research Unit, Prof. Dr. R. D. Kandou General Hospital (No. 082/EC-UPKT/IX/2015). Each respondent was asked for a written consent after being provided information about the study.

The study population was Teling Atas Community Health Center visitors, the only community health center in Wanea, North Sulawesi, Indonesia. A total of 400 samples were recruited using consecutive sampling. Inclusion criteria were as follows: (1) patients who were Wanea sub-district residents, (2) aged ≥18 years old, (3) able to speak Bahasa Indonesia, and (4) willing to participate in this study.

Visitors who fulfilled the above criteria were then informed about the purpose, benefit, and procedure of this study. Those who agreed to participate were asked for a written consent by the interviewer. The next step was the interview guided by a questionnaire which had been adapted from previous studies.[4–6,14,15] An interview was considered finished when a respondent had answered all questions or withdrew his/her participation from this study. Incomplete questionnaires were excluded from the study. Data collection was performed by the first author, assisted by six medical doctors.

A total of 35 questions in the questionnaire were divided into three sections as follows: (1) 8 questions about respondent demographics, (2) 13 questions about recent antibiotic use by the respondent within the past six months, and (3) 14 questions about the respondent's knowledge regarding antibiotics (the role of antibiotics, identification of antibiotics, adverse effects of antibiotics, and antibiotic use). Self-medication was defined as the use of any antibiotics without a prescription within six months prior to the interview.[4–6,16]

Respondents' knowledge about antibiotics was assessed based on 14 questions in the third section of the questionnaire; all of which must have been answered with "yes", "no", or "do not know". Each correct answer was given 1 point while each wrong or "do not know" answer was given 0 point. Hence, the maximum possible score was 14. Respondents' levels of knowledge were classified into 3 categories, i.e. low (score 0–4), moderate (score 5–9), and high (score 10–14). Before being used for the survey, the questionnaire had been pretested to 30 individuals whose characteristics were similar to the study population in order to verify the clarity of the language used and the questionnaire's structure. Wording revision had been done accordingly. A Cronbach's alpha of 0.71 means that the reliability of the questionnaire is acceptable.

Data was processed using the Statistical Package for the Social Sciences (SPSS) version 15 for Windows. Descriptive statistics of respondents' demographic profile, antibiotic use, and knowledge about antibiotics used 95% confidence interval. A bivariate analysis was performed to determine the association between respondents' demographics and self-medication with antibiotics. Any associations with p<0.05 were considered statistically significant, and the variables were included in the subsequent logistic regression analyzing the association between respondents' knowledge score with self-medication practices. Results of the logistic regression analysis are presented as adjusted odd ratios (OR), each with 95% confidence interval.

RESULTS

A total of 400 individuals were studied. The median age of respondents was 45.0 (18–49) years old. The majority of respondents were female (65.8%) and senior high school graduates (56.3%). The respondents' demographics are presented in Table 1.

In this study, almost half (45%) of the respondents had self-medicated with antibiotics within six months prior to the interview. Wounds or skin diseases (32.2%), acute respiratory infections (18.3%), and fever (11.7%) were the main reasons to take antibiotics without any prescriptions. (Table 2).

Table 1. Respondent's demographics

Variables	No antibiotic use (%) [n=160]	Antibiotic use (%)			Total (%)
		Without prescription (n=180)	With prescription (n=60)	p	
Sex					
Male	58 (36.3)	58 (32.2)	21 (35.0)	0.692	137 (34.3)
Female	102 (63.8)	122 (67.8)	39 (65.0)	0.692	263 (65.8)
Age					
≤30 years old	40 (25.0)	39 (21.7)	28 (46.7)	0.001	107 (26.8)
31–45 years old	37 (23.1)	53 (29.4)	8 (13.3)	0.001	98 (24.5)
46–60 years old	39 (24.4)	53 (29.4)	14 (23.3)	0.001	106 (26.5)
>60 years old	44 (27.5)	35 (19.4)	10 (16.7)	0.001	89 (22.3)
Marital status					
Single	28 (17.5)	20 (11.1)	14 (23.3)	0.019	62 (15.5)
Married	132 (82.5)	160 (88.9)	46 (76.7)	0.019	338 (84.5)
Highest level of educational attainment					
≤ Primary School	21 (13.1)	24 (13.3)	2 (3.3)	0.010	47 (11.8)
Junior high school	31 (19.4)	37 (20.6)	7 (11.7)	0.010	75 (18.8)
Senior high school	86 (53.8)	101 (56.1)	38 (63.3)	0.010	225 (56.3)
≥ University	22 (13.8)	18 (10.0)	13 (21.7)	0.010	53 (13.3)
Employment status					
Unemployed*	115 (71.9)	101 (56.1)	40 (66.7)	0.150	256 (64.0)
Employed	45 (28.1)	79 (43.9)	20 (33.3)	0.150	144 (36.0)
Health Insurance					
Not having health insurance	14 (8.8)	12 (6.7)	7 (11.7)	0.268†	33 (8.3)
Having health insurance	146 (91.3)	168 (93.3)	53 (88.3)	0.268†	367 (91.8)
Family Income‡					
<Rp 2,500,000	114 (71.3)	146 (81.1)	40 (66.7)	0.020	300 (75.0)
≥Rp 2,500,000	46 (28.8)	34 (18.9)	20 (33.3)	0.020	100 (25.0)

* Includes housewives, students, and retirees; † Fisher's Exact; ‡ Average monthly family income

Table 2. Characteristics of self-medication

Variable	(n=180)	%
Complaints		
Wounds / skin diseases	58	32.2
Upper respiratory tract infections	33	18.3
Fever	21	11.7
Muscle / joint pain	21	11.7
Others	18	10
Toothache	15	8.3
Sore throat	14	7.8
Last antibiotic used within the last six months		
Amoxicillin	123	68.3
Ampicillin	47	26.1
Cefadroxil	2	1.1
Others*	8	5.3
Source of suggestion to self-medicate		
On their own initiative	127	70.6
Family / friends	46	25.6
Other medical workers	5	2.8
Pharmacists	2	1.1
Source of antibiotics		
Pharmacies	94	52.2
Stalls / small shops / "warung"	79	43.9
Leftover antibiotics	6	3.3
Friends or family	1	0.6

*Three respondents failed to mention the name of antibiotic

More than half of respondents who self-medicated (n=100; 55.6%) stated that doing so was more practical than seeking a doctor for a treatment. Slightly more than one-fourth (26.7%) of respondents said that they were too busy to see a doctor, whereas another 14.4% had used the same antibiotic as the one medically prescribed for similar complaint in the past. On the other hand, six (3.3%) respondents self-medicated because they did not have enough money to pay for the doctor visit.

Most respondents (70.6%) self-medicated on their own initiative and purchased antibiotic in pharmacies (52.2%). When asked about their opinions regarding safety of self-medication, 122 (67.8%) respondents considered the practice was safe, 41 (22.8%) thought it was dangerous, and 17 (9.4%) could not answer the question.

The mean value of knowledge score in this study was 7.14±2.49. The majority of respondents (67.5%) had moderate level of knowledge, whereas respondents with high and low level of knowledge comprised 18.0% and 14.5% of the sample, respectively.

Table 3 displays respondents' knowledge about antibiotics. A large number of respondents

Table 3. Respondents' knowledge about antibiotics

Question	Correct Answer	%
The role of antibiotics		
Antibiotics are medicines which can kill bacteria	292	73.0
Antibiotics can be used to treat viral infections	72	18.0
Antibiotics can accelerate the healing of cough/ runny nose	104	26.0
When someone is catching a fever, he/she must consume antibiotic immediately	169	42.3
Antibiotics must be given to any diseases	230	57.5
Antibiotics can kill good bacteria	97	24.3
Identification of antibiotics		
Paracetamol is one example of antibiotics	233	58.3
Amoxicillin is not an antibiotic	346	86.5
CTM is one example of antibiotics	252	63.0
Adverse effects		
Improper use of antibiotics can cause bacteria to be resistant	238	59.5
Antibiotics do not have any side effects	251	62.8
Antibiotics can cause allergic reactions	211	52.8
Antibiotic use		
Antibiotics can be discontinued when symptoms have improved	169	42.3
A higher dose of antibiotic can accelerate healing	212	53.0

(73.0%) knew that antibiotics target bacteria, but only less than one-fifth (18.0%) of respondents knew that antibiotics do not play any role in viral infections. Meanwhile, there were a lot of patients (74.0%) in our study who thought that antibiotics could accelerate the healing of cough or runny nose. Although 59.5% of respondents knew that improper use of antibiotics could lead to resistance, only 24.3% of respondents knew that antibiotic use could kill good bacteria.

Respondents' age, marital status, highest level of educational attainment, family income, and knowledge about antibiotics were all significantly associated (each has a p<0.05) with self-medication practices (Table 1). All of them were then included in the multivariate analysis where knowledge was an independent variable, and the rest were confounders. After having adjusted for age, marital status, education, employment status, and family income, the final logistic regression model came up with a significant association between knowledge about antibiotics and self-medication practices. Respondents with lower level of knowledge have higher probabilities to self-medicate with antibiotics than those with higher level (OR= 16.86; 95% CI= 4.25–66.83) (Table 4).

DISCUSSION

The prevalence of self-medication within six months prior to the interview in Wanea was 45.0%. This result is greater than the prevalence in Kuwait, Abu Dhabi, and Greece which were 27.5%, 44.0%, and 44.6%, respectively.[5,16,17] It is strikingly higher than the finding of another study in Putrajaya and Penang, Malaysia, Indonesia's neighboring country, which came up with 4.5% and 7.6%, respectively.[4,15] When compared to previous studies in Semarang-Surabaya (17.0%) and Yogyakarta (7.3%), all of which located in Java island, the result of our study still shows a remarkably higher number.[10,11]

In this study, wounds and skin diseases were two main reasons for respondents to take antibiotics without a prescription. This finding is different from other studies that showed acute respiratory infection as the major cause of self-medication with antibiotics.[4,5,10]

Although the majority (67.8%) of respondents who self-medicated were female, we cannot yet conclude whether women tend to self-medicate rather than men because during our study, the Wanea community health center was mostly visited by women (65.8%). However, we should

Table 4. Associations between knowledge and self-medication

Variable	Antibiotic use				OR (95%CI)
	Without prescription (n=180)		With prescription (n=60)		
	n	%	n	%	
Level of knowledge*					
Low	33	91.7	3	8.3	16.86 (4.25–66.83)
Moderate	132	81.0	31	19.0	6.95 (3.12–15.47)
High	15	36.6	26	63.4	1 (Reference)
Age*					
≤30 years old	39	58.2	28	41.8	0.50 (0.19–1.28)
31–45 years old	53	86.9	8	13.1	2.56 (0.83–7.96)
46–60 years old	53	29.4	14	20.9	1.21 (0.442–3.33)
>60 years old	35	77.8	10	22.2	1 (Reference)
Family Income*					
<Rp 2,500,000	146	78.5	40	21.5	1.94 (0.89–4.20)
≥Rp 2,500,000	34	63.0	20	37.0	1 (Reference)

*Odd ratios were adjusted for level of knowledge, age, marital status, educational level, employment status, and family income

acknowledge that women could play an important role in preventing self-medication with antibiotics, especially in children. A study in Peru that aimed to determine factors affecting caregivers' decisions about antibiotic use in children showed that 15.9% of children had received antibiotics without a prescription.[18] In China, 62.0% of parents had self-medicated their children with antibiotics.[19] As a mother, a woman does not only act as the caregiver in her family, but also the central decision maker regarding her family's health.

The level of knowledge about the role of antibiotics in viral infections is lower when compared to other studies conducted in Yogyakarta (29.0%), Kuwait (29.8%), South Korea (30.6%), and Sweden (73.2%).[5,6,10,20] It is shown by the relatively high number of respondents who did not know that antibiotics have no role in viral infections, despite the fact that a lot of them had known that the target of antibiotics is bacteria. Moreover, many still thought that antibiotics could speed up the healing of cough or runny nose and that antibiotics should be given to all diseases. Those data display respondents' lack of knowledge about the role of antibiotics in the treatment of infectious diseases in general.

The level of knowledge regarding appropriate use of antibiotics was also low. More than half (57.7%) of respondents said antibiotics should be discontinued when symptoms had improved. There were 40.5% of respondents who were not aware that inappropriate use of antibiotics could cause resistance.

Better knowledge about antibiotics is expected to improve practice towards antibiotic use as it helps people to better understand the role of antibiotics and the negative effects of its misuse. To change behavior, people need to know the consequences of their behavior. Lack of public knowledge about antibiotics may cause a high number of self-medicating people.[5] The results of this study has proven a significant association between the level of knowledge and self-medication with antibiotics. Respondents with poorer knowledge have higher probabilities to self-medicate with antibiotics, and vice versa. Therefore, to prevent self-medication with antibiotics and change this unhealthy habit, it is necessary to develop multifaceted educational programs to improve public knowledge about

antibiotics and to raise public awareness of antibiotic resistance.

"Antibiotics: Handle with Care" was a campaign launched by WHO on the first World Antibiotic Awareness Week in 2015. The theme of the campaign reflects the overarching message to the community that antibiotics are a precious resource and should be preserved. They should be used to treat bacterial infections, only when prescribed by a certified health professional. Antibiotics should never be shared or saved for the future. Furthermore, health professionals also have a role in preventing and controlling the spread of antibiotic resistance, such as by ensuring prudent use of antibiotics as well as educating patients about antibiotic resistance, the dangers of its misuse, and the importance of preventing infections.[12]

As shown by Table 4, although not significantly associated, self-medication practices were more prevalent in those whose family income were less than Rp 2.500.000 (OR=1.94; 95% CI= 0.89–4.20). Although inability to pay for health service may be an underlying factor, it may not be the only cause. It was shown from the data that 45.8% of respondents who covered by health insurance turned out to purchase antibiotics without a prescription. This indicates that apart from financial barriers, self-medication may also be caused by other factors, such as poor quality care, poor access to public health services, and misconception about the use of antibiotics.[8–10]

Self-medication practices are also made possible by the easy access to buy antibiotics without a prescription. Although in Indonesia antibiotics are classified as prescription only medicines and, therefore, cannot be sold as over the counter (OTC) drugs, in this study, more than half of respondents (52.2%) bought antibiotics without a prescription at pharmacies. Many other respondents (43.9%) could even get antibiotics without a prescription from stalls (small shops or *"warung"*). These disturbing situations have also happened elsewhere in Indonesia. In Yogyakarta and Surabaya, 63.4% and 90.0% of respondents, respectively, could easily buy antibiotics from pharmacies without prescriptions.[3,10]

The ease of obtaining antibiotics at pharmacies without a prescription, consumers' demands,

and weak government control over the sale of antibiotics have opened people's access to antibiotics so freely that it has been a commonplace to find them in stalls along with snacks and beverages. The government needs to tighten supervision over antibiotic sale and selling antibiotics without prescriptions must be strictly prohibited. Furthermore, to prevent and control the spread of antibiotic resistance, policymakers must strengthen policies, programs, and the implementation of infection prevention and control measures. Appropriate use of antibiotics must also be well regulated and promoted.

We understand that recall bias was inevitable and might affect the result of this study. We have tried to minimize this bias by using a shorter time limit, which was 6 months, to define self-medication, while other studies commonly used 1 year interval. Another limitation would be measurement bias since the questionnaire used in this study might not be completely accurate in measuring the level of knowledge about antibiotics. Moreover, the language used to form the questions might not have been fully understood by respondents and led to inaccurate answers. To prevent this from happening, we had pretested the questionnaire and chose the questionnaire-structured interview over the self-answered questionnare technique so that we could directly see the respondents in person and make sure if they understood the questions.

In conclusion, there are associations between self-medication with antibiotics and age, family income, and the level of knowledge. Poorer knowledge about antibiotics may increase the probability to self-medicate with antibiotics, and vice versa. Thus, a better understanding of antibiotics and antibiotic resistance is required. Physicians, especially those working in primary care, have an important role to improve people's awareness of antibiotic resistance and to promote prudent use of antibiotics.

Conflicts of Interest

Acknowledgment

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