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Knowledge, attitude, and practice on antibiotic use in DKI Jakarta during COVID-19 pandemic

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ABSTRACT

Insufficient knowledge of antibiotic use among the general public could lead to antibiotic resistance. As the COVID-19 pandemic might encourage antibiotic self-medication, a study about recent knowledge, attitude, and practice (KAP) levels on antibiotic use during the COVID-19 pandemic needs to be carried out, including its possible associated factors. It is a cross-sectional study with 420 subjects living in DKI Jakarta and aged 18 or above. A validated KAPAQ questionnaire was used. Chi-square analysis was used to analyze the correlation between KAP levels and its possible associated factors. Most subjects' score of KAP in antibiotic use were considered high. A statistically significant correlation between knowledge and attitude ($p<0.001$), knowledge and practice ($p<0.001$), and between attitude and practice ($p<0.001$) was found. A statistically significant correlation between gender and occupation fields with KAP ($p<0.05$), education level with knowledge ($p<0.05$), and history of self-medication with attitude and practice ($p<0.05$) were found. Age, marital status, and history of COVID-19 do not show any statistically significant correlation with KAP levels. In conclusion, most subjects have a high score of KAP in antibiotic use. All three variables also show significant correlations between each other while the sociodemographic factors that correlate significantly with KAP levels are gender, occupation field, education level, and history of self-medication with antibiotics.

ABSTRAK

Pengetahuan yang tidak memadai tentang penggunaan antibiotik di kalangan masyarakat umum dapat menyebabkan resistensi antibiotik. Karena pandemi COVID-19 dapat mendorong pengobatan sendiri dengan antibiotik, suatu studi tentang tingkat pengetahuan, sikap, dan perilaku (PSP) terkini tentang penggunaan antibiotik selama pandemi COVID-19 perlu dilakukan, termasuk kemungkinan faktor-faktor yang berhubungan. Ini adalah studi potong lintang dengan 420 subjek yang tinggal di DKI Jakarta dan berusia 18 tahun ke atas. Kuesioner KAPAQ yang tervalidasi digunakan pada studi ini. Analisis chi-square digunakan untuk menganalisis korelasi antara tingkat PSP dan kemungkinan faktor-faktor yang berhubungan. Skor PSP sebagian besar subjek dalam penggunaan antibiotik tergolong tinggi. Ditemukan korelasi yang signifikan secara statistik antara pengetahuan dan sikap ($p<0,001$), pengetahuan dan perilaku ($p<0,001$), dan antara sikap dan perilaku ($p<0,001$). Ditemukan korelasi yang signifikan secara statistik antara jenis kelamin dan bidang pekerjaan dengan PSP ($p<0,05$), tingkat pendidikan dengan pengetahuan ($p<0,05$), dan riwayat pengobatan sendiri dengan sikap dan perilaku ($p<0,05$). Usia, status perkawinan, dan riwayat COVID-19 tidak menunjukkan korelasi signifikan secara statistik dengan tingkat PSP. Sebagai kesimpulan, sebagian besar subjek memiliki skor PSP yang tinggi dalam penggunaan antibiotik. Ketiga variabel tersebut juga menunjukkan korelasi signifikan antara satu sama lain, sedangkan faktor sosiodemografi yang berkorelasi signifikan dengan tingkat PSP adalah jenis kelamin, bidang pekerjaan, tingkat pendidikan, dan riwayat pengobatan sendiri dengan antibiotik.

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INTRODUCTION

Antibiotic is a drug used to eradicate a bacterial infection. Antibiotic resistance is a condition when bacteria can resist the antibiotic that is used to effectively eradicate them.[1] the World Health Organization (WHO) reported that antibiotic resistance has always been a global health problem that caused more than 700.000 deaths globally.[2] Many factors leading to high antibiotic resistance incidence such as inadequate public knowledge and awareness regarding antibiotic use and how it works. Inadequate knowledge could lead to incorrect practice of antibiotic use as found in recent studies from Kuwait, Malaysia, Yogyakarta, and Boyolali.[3-8] As a result, efforts to increase public knowledge of antibiotic use have been made as an initial strategy to decrease antibiotic resistance incidence around the world.[9] With increasing knowledge, it is expected that public attitude and practice in antibiotic use could be better as studies found that these three variables are connected and impact each other.[10]

As of March 11th, 2020, WHO announced COVID-19 as a global pandemic, and nearly 650 million cases were reported globally until December 2022, including 7 million cases in Indonesia.[11,12] With COVID-19 as a global pandemic, many aspects of life were affected, including this antibiotic resistance problem.[13] This is because COVID-19 has forced the public to comply with the health protocols such as avoiding public places including health facilities. As a result, this could lead to a decrease in the number of hospital-acquired infections and minimize antibiotic use. However, this situation could also lead to an increasing number of antibiotic self-medication and inaccurate use of antibiotics.[14-18] Hence, a study to reevaluate public knowledge, attitude, and practice in antibiotic use is needed to be carried out as an initial stage to make sure the strategies to reduce antibiotic resistance are still relevant.

MATERIAL AND METHODS

Design and subjects of study

This study is a cross-sectional study with adult subjects, 18 y.o. or above living in Jakarta province. Jakarta was chosen as it was the province with the highest COVID-19 cases in Indonesia.

Procedure

This study used a validated questionnaire named KAPAQ (knowledge, attitude, and practices towards antibiotics questionnaire) which was used in a previous study in Boyolali, Central Java, Indonesia.[6] Ethical approval was obtained from the ethics committee of the Faculty of Medicine, Universitas Indonesia with approval number KET-331/UN2.F1/ETIK/PPM.00.02/2022. As the total population of DKI Jakarta was 7.4 million, with a 95% confidence interval, the minimal sample number was 385. Convenient sampling with Google Forms was conducted to gather data representing the whole population. Each administrative region of DKI Jakarta was represented.

Data analysis

Data analysis was done using IBM SPSS Statistics 26 using Chi-Square analysis. Beforehand, subjects' answers were scored. Knowledge scoring was obtained by giving 1 point to every right answer and 0 point to the wrong answer. Meanwhile, for attitude and practice, 5 points was given to the most appropriate answer and 0 point to the least appropriate answer. The total score for each category was obtained by counting the percentage of subjects' score to the maximum score. The score

was then classified as high, moderate, and low for >70%, 50-70%, and <50%, respectively.[6] Chi square analysis was used to analyze the correlation between knowledge and attitude, knowledge and practice, knowledge and practice, also sociodemographic factors and knowledge, attitude, and practice levels. Sociodemographic factors included in this study are age, gender, marriage status, education level, occupation, COVID-19 history, and history of antibiotic self-medication.

RESULTS

This study included 420 subjects living in Jakarta who fulfilled the criteria. The sociodemographic characteristics are presented in TABLE 1.

TABLE 2 presents subjects' scores in knowledge, attitude, and practice of antibiotic use. The scores were classified into three categories: high, moderate, and low. In all three variables analyzed, the biggest proportion of this study's subjects' scores were considered high.

TABLE 3-5 show subjects' answers to questions about knowledge, attitude, and practice, respectively. As presented in TABLE 3, most subjects gave a correct answer to each question. Subjects only showed inadequate knowledge regarding one antibiotic name, whether antibiotics could treat viral infections, whether antibiotics could be bought online without a prescription, and about antibiotics' side effects.

TABLE 1. Sociodemographic characteristics of subjects (n=420)

Variables	Respondents [n (%)]
Age (yr)	
• 18-25	249 (59.3)
• 26-35	53 (12.6)
• 36-45	43 (10.2)
• >45	75 (17.9)
Gender	
• Male	134 (31.9)
• Female	286 (68.1)
Marriage status	
• Single	266 (63.3)
• Married	154 (36.9)
Education	
• High school	204 (48.6)
• Diploma	51 (12.1)
• Bachelor	149 (35.5)
• Higher education (Master/Doctorate)	16 (3.80
Occupation field	
• Unemployed	186 (44.3)
• Health worker	62 (14.8)
• Non health worker	172 (41.0)
COVID-19 history	
• Have COVID-19 history	166 (39.5)
• No COVID-19 history	254 (60.5)
History of antibiotic self-medication	
• Have antibiotic self-medication history	152 (36.2)
• No antibiotic self-medication history	268 (63.8)

TABLE 2. Subjects KAP score distribution (n=420)

Variables	High (>70%) [n (%)]	Moderate (50-70%) [n (%)]	Low (<50%) [n (%)]
Knowledge	190 (45.2)	134 (31.9)	96 (22.9)
Attitude	230 (54.8)	117 (27.9)	73 (17.4)
Practice	270 (64.3)	103 (24.5)	47 (11.2)

TABLE 3. Subjects knowledge on antibiotic use (n=420)

Statements	Correct answer	Subjects with correct answer [n (%)]
Antibiotics identification		
• Amoxicillin is antibiotic	Yes	365 (86.9)
• Supertetra® is antibiotic	Yes	191 (45.5)
• Paracetamol is antibiotic	No	333 (79.3)
Antibiotics role		
• Antibiotics can kill bacteria	Yes	360 (85.7)
• Antibiotics can be used to treat viral infections	No	191 (45.5)
• Colds and flu can be cured without antibiotics	Yes	339 (80.7)
• Antibiotics can reduce fever	No	179 (42.6)
Antibiotics access		
• Antibiotics can be bought online	No	121 (28.8)
• Antibiotics from other people may be taken	No	334 (79.5)
• Antibiotics can be purchased at a pharmacy without a doctor's prescription	No	154 (36.7)
• Antibiotics can be purchased at the grocery shop	No	314 (74.8)
Antibiotics misuse effect		
• Antibiotic resistance	Yes	336 (80.0)
• Antibiotics not to be usable later	Yes	297 (70.7)
• Can cause more severe illness	Yes	272 (64.8)
• Increases costs	Yes	281 (66.9)
Antibiotics side effect		
• Antibiotics can cause allergic reactions	Yes	266 (63.3)
• Antibiotics can kill good bacteria in the intestines	Yes	173 (41.2)
Antibiotics use		
• Antibiotics need to be stored in case of illness in the future	No	277 (66.0)
• Leftover antibiotics can be used again if sick	No	298 (71.0)
• Antibiotics can be stopped if the illness has improved	No	282 (67.1)

In line with the knowledge level TABLES 4 and 5 also showed that most subjects could answer appropriately on attitude and practice statements. In the attitude section, the response to a positive statement should be agreeing to strongly agree while the response to negative statements should be disagreed to strongly disagree. There was only one statement in the attitude section which only 37.5% of subjects correctly responded to. The statement was that the participant would take antibiotics to reduce common cold symptoms. Most subjects agreed and strongly agreed with that statement which was an inappropriate attitude toward antibiotic use. In the practice section, most subjects also showed appropriate responses to each statement. However, more than 30% of subjects answered that they had bought antibiotics without a prescription, gave advice to their relatives, and taken antibiotics to reduce and speed up the healing of their common cold symptoms.

TABLE 4. Subjects attitude on antibiotic use (n=420).

Statements	Subjects with appropriate answers [n (%)]
Positive attitude	
Antibiotic use	
• I will take antibiotics until they run out even though my sick has improved	324 (77.1)
Negative attitude	
Antibiotic resources	
• I hope the pharmacist gives me amoxicillin when I buy it at the pharmacy without a doctor's prescription	234 (55.7)
• If I get sick. I will buy antibiotics at a grocery shop	362 (86.2)
• I am happy when I can buy antibiotics at the pharmacy without a physician's prescription	248 (59.0)
• When I do not get antibiotics from the doctor, I will buy antibiotics at the pharmacy	245 (58.3)
• I will be disappointed when I get treatment, but I do not get antibiotics	276 (65.7)
Antibiotics leftover	
• Using leftover antibiotics will save money because I do not need to see a doctor	313 (74.5)
• I will keep the leftover antibiotics because they are useful in the future	282 (67.1)
• I will give my leftover antibiotics to others to help cure him	336 (80.0)
Antibiotics use	
• If I feel better, I will stop taking antibiotics	276 (65.7)
Hope to antibiotics use	
• When I have a cold, I hope the doctor gives me antibiotics	212 (50.5)
• I will take antibiotics in the hope that antibiotics can speed up the healing of my cold	150 (35.7)

TABLE 5. Subjects practice on antibiotic use (n=420)

Statements	Subjects answer [n (%)]				
	Never	Seldom	Sometimes	Often	Always
Positive practice					
Antibiotics use					
• I take antibiotics until finish	24 (5.7)	22 (5.2)	53 (12.6)	127 (30.2)	194 (46.2)
Negative practice					
Antibiotics resources					
• Grocery shop	319 (76)	50 (11.9)	22 (5.2)	16 (3.8)	13 (3.1)
• Online	279 (66.4)	56 (13.3)	41 (9.8)	30 (7.1)	14 (3.3)
• At the pharmacy without a doctor's prescription	232 (55.2)	45 (10.7)	78 (18.6)	44 (10.5)	21 (5.0)
• Leftover	239 (56.9)	68 (16.2)	42 (10)	50 (11.9)	21 (5.0)
• Midwives	264 (62.9)	50 (11.9)	44 (10.5)	38 (9%)	24 (5.7)
• From other people	295 (70.2)	72 (17.1)	27 (6.4)	16 (3.8)	10 (2.4)
• Nurse	286 (68.1)	60 (14.3)	42 (10.0)	18 (4.3)	14 (3.3)
Antibiotics use					
• When my family is sick, I recommend buying antibiotics	207 (49.3)	81 (19.3)	61 (14.5)	43 (10.2)	28 (6.7)
• I use antibiotics because of advice from other	221 (52.6)	57 (13.6)	78 (18.6)	44 (10.5)	20 (4.8)
• I stop taking antibiotics if my condition improves	168 (40.0)	82 (19.5)	57 (13.6)	67 (16.0)	46 (11.0)
• I take antibiotics to speed up the healing of my cold	128 (30.5)	64 (15.2)	89 (21.2)	84 (20.0)	55 (13.15)
• I take antibiotics to treat runny nose, colds, tired aches, rheumatic pain, and flu	165 (39.3)	68 (16.2)	77 (18.3)	68 (16.2)	42 (10.0)

TABLE 6 presented the correlation between knowledge, attitude, and practice level respectively. It was found that knowledge level is significantly associated with attitude and practice level. In addition to that, practice levels were also found to associate significantly with attitude level. Subjects with knowledge considered high tend to have a better attitude and practice in antibiotic use. It shows that to achieve better practice, a better knowledge and attitude needs to be achieved first.

Based on TABLE 7, we can see that gender ($p<0.001$), education level ($p=0.021$), and occupation field ($p<0.001$) correlate significantly with subjects' knowledge of antibiotic use. Meanwhile, we can see that only gender ($p<0.001$; $p<0.001$) and occupation field ($p>0.001$; $p=0.003$) alongside with antibiotic self-medication history ($p=0.001$; $p=0.005$) that correlate significantly with attitude and practice levels of antibiotic use. From TABLE 7, we could also point out that females have better knowledge, attitude, and practice of antibiotic use than males. Regarding education level and occupation field, subjects with higher education and those who work in health-care related occupation tend to have better knowledge, attitude, and practice of antibiotic use. Other than that, subjects with history of antibiotic self-medication were proven to have lower attitude and practice levels in antibiotic use than those with no history of antibiotic self-medication.

TABLE 6. Correlation between knowledge, attitude, and practice level.

Variable	Attitude [n (%)]				Practice [n (%)]			
	High	Moderate	Low	p	High	Moderate	Low	p
Knowledge								
• High	155 (81.6)	27 (14.2)	8 (4.2)		164 (86.3)	20 (10.5)	6 (3.2)	
• Moderate	57 (42.5)	55 (41.0)	22 (16.4)	< 0.001*	80 (59.7)	42 (31.3)	12 (9.0)	< 0.001*
• Low	18 (18.8)	35 (36.5)	43 (44.8)		26 (27.1)	41 (42.7)	29 (30.2)	
Attitude								
• High					217 (94.3)	13 (5.7)	0 (0.0)	
• Moderate					51 (43.6)	58 (49.6)	8 (6.8)	< 0.001*
• Low					2 (2.7)	32 (43.8)	39 (53.4)	

*Statistically significant (p<0.05)

TABLE 7. Sociodemographic factors associated with knowledge, attitude, and practice of antibiotic use.

Variables	Knowledge (n=420)			p	Attitude (n=420)			p	Practice (n=420)			p
	High [n (%)]	Moderate [n (%)]	Low [n (%)]		High [n (%)]	Moderate [n (%)]	Low [n (%)]		High [n (%)]	Moderate [n (%)]	Low [n (%)]	
Age (yr)												
• 18-25	103 (41.4)	79 (31.7)	67 (26.9)		128 (51.4)	75 (30.1)	46 (18.5)		149 (59.8)	65 (26.1)	35 (14.1)	
• 26-35	23 (43.4)	16 (30.2)	14 (26.4)	0.089	28 (52.8)	17 (32.1)	8 (15.1)	0.539	34 (64.2)	16 (30.2)	3 (5.7)	0.126
• 36-45	22 (51.2)	14 (32.6)	7 (16.3)		27 (62.8)	9 (20.9)	7 (16.3)		32 (74.4)	7 (16.3)	4 (9.3)	
• >45	42 (56)	25 (33.3)	8 (10.7)		47 (62.7)	16 (21.3)	12 (16)		55 (73.3)	15 (20)	5 (6.7)	
Gender												
• Males	39 (29.1)	45 (33.6)	50 (37.3)	<0.001*	49 (36.6)	51 (38.1)	34 (25.4)	<0.001*	65 (48.5)	48 (35.8)	21 (15.7)	<0.001*
• Females	151 (52.8)	89 (31.1)	46 (16.1)		181 (63.3)	66 (23.1)	39 (13.6)		205 (71.7)	55 (19.2)	26 (9.1)	
Marital status												
• Single	111 (41.7)	85 (32.0)	70 (26.3)	0.056	138 (51.9)	81 (30.5)	47 (17.7)	0.236	161 (60.5)	70 (26.3)	35 (13.2)	0.080
• Married	79 (51.3)	49 (31.8)	26 (16.9)		92 (59.7)	36 (23.4)	26 (16.9)		109 (70.8)	33 (21.4)	12 (7.8)	
Education level												
• High school	88 (43.1)	69 (33.8)	47 (23)		107 (52.5)	57 (27.9)	40 (19.6)		124 (60.8)	52 (25.5)	28 (13.7)	
• Diploma	34 (66.7)	8 (15.7)	9 (17.6)		31 (60.8)	11 (21.6)	9 (17.6)		37 (72.5)	9 (17.6)	5 (9.8)	
• Bachelor	58 (38.9)	53 (35.6)	38 (25.5)	0.021*	83 (55.7)	42 (28.2)	24 (16.1)	0.395	96 (64.4)	39 (26.2)	14 (9.4)	0.362
• Masters/ doctorate	10 (62.5)	4 (25.0)	2 (12.5)		9 (56.3)	7 (43.8)	0 (0)		13 (81.3)	3 (18.8)	0 (0.0)	
Occupation field												
• Unemployed	81 (43.5)	62 (33.3)	43 (23.1)		99 (53.2)	58 (31.2)	29 (15.6)		117 (62.9)	49 (26.3)	20 (10.8)	
• Health related	55 (88.7)	5 (8.1)	2 (3.2)	<0.001*	50 (80.6)	8 (12.9)	4 (6.5)	<0.001*	53 (85.5)	7 (11.3)	2 (3.2)	0.003*
• Not health related	54 (31.4)	67 (39)	51 (29.7)		81(47.1)	51 (29.7)	40 (23.3)		100 (58.1)	47 (27.3)	25 (14.5)	
COVID-19 history												
• With history	81 (48.8)	46 (27.7)	39 (23.5)	0.312	102 (61.4)	38 (22.9)	26 (15.7)	0.077	110 (66.3)	33 (19.9)	23 (13.9)	0.115
• No history	109 (42.9)	88 (34.6)	57 (22.4)		128 (50.4)	79 (31.1)	47 (18.5)		160 (63.0)	70 (27.6)	24 (9.4)	
Antibiotic self medication history												
• With history	60 (39.5)	56 (36.8)	36 (23.7)	0.162	72 (47.4)	40 (26.3)	40 (26.3)	0.001*	85 (55.9)	41 (27.0)	26 (17.1)	0.005*
• No history	130 (48.5)	78 (19.1)	60 (22.4)		158 (59)	77 (28.7)	33 (12.3)		185 (69)	62 (23.1)	21 (7.8)	

Notes: analyzed with chi-square analysis; *Statistically significant (p<0.05)

DISCUSSION

This study shows that the level of knowledge, attitude, and practice level of antibiotic use in DKI Jakarta during the COVID-19 pandemic was considered high. This finding is aligned with other studies including the one which was conducted in Romania during the COVID-19 pandemic.[19] However, a study in Boyolali that used the same questionnaire concluded that the KAP level of antibiotic use in Boyolali was considered moderate.[6] This can be explained by the fact that this study was held in an urban area with more accessible information sites and literation levels than in rural areas.[6,7,19] A good knowledge of antibiotic use found in this study is in line with other studies conducted in different countries including Indonesia itself. The reason for this finding could be the fact that antibiotic resistance awareness campaigns were quite massive and often done by various parties from the government to local communities.[20,21] However, we found that more than 50% of subjects did not know that Superterta was an example of an antibiotic. This could be because Superterta was not used as much as amoxicillin particularly in Jakarta where this study was conducted. Hence, most subjects might feel unfamiliar with it. This study also found that there is a misunderstanding regarding antibiotic's role in curing viral infections. More than 50% of subjects still believed that antibiotics could treat viral infection manifestations which was aligned with other studies in Boyolali, Kuwait, Malaysia, and Romania.[4–6,19] This can be explained by the fact that antibiotic was used during the early COVID-19 pandemic. For that reason, the public might think that antibiotics could help treat viral infection as COVID-19 was because of a virus.

In this study, it is found that only 28.8% of subjects understand that antibiotics could not be purchased online. However, this questionnaire was developed before the pandemic whereas telemedicine and online drug purchasing were not commonly done. In Indonesia, online antibiotic purchasing with a doctor's prescription is allowed due to the current regulation. This could be the reason for subjects misunderstanding towards the question. Other than that, only 36.7% of subjects understand that antibiotics couldn't be purchased without a doctor's prescription. This incorrect practice was due to subjects' previous experience on antibiotic use.[22] This study also found that more than 50% of subjects did not know antibiotics' side effect on killing good bacteria in the intestine which was because of their inadequate knowledge about antibiotics' mechanism of action.

Aligned with the knowledge level, subjects also showed appropriate responses for attitude and practice statements which can be concluded that their attitude and practice level in antibiotic use were considered good. This result was also found in other studies in Romania and Kuwait.[4,19] A noticeable proportion of inappropriate responses were found in the statement that antibiotics could be used to treat common cold symptoms and could be purchased without a doctor's prescription. This is in line with subjects misunderstanding regarding the antibiotic mechanism of actions and regulation in the previous knowledge section. This finding could be an indication that there is a correlation between public knowledge and their attitude and practice in antibiotic use. It is found that knowledge could affect someone's attitude which is then presented in their daily practice of using antibiotics as shown in Table 6. A similar result was also found in other studies in Nepal, Boyolali, and Manado.[6,7,23]

After finding the correlation between knowledge, attitude, and practice level. This study also found which sociodemographic factors correlate

significantly with each knowledge, attitude, and practice level. Gender and occupation field were two factors that correlates significantly with all three variables. It is found that women have better knowledge, attitude, and practice in antibiotic use than men. This was also shown in other studies conducted in several countries.[5-7,24] It could be explained by the role of women in daily life where women tend to take care of their family's health more than men. This could lead to the fact that women have better exposure to information about antibiotic use, which could also explain why subjects who work in health-related jobs have better knowledge, attitude, and practice. Other than those two factors, education level only showed a significant correlation to knowledge level. Subjects who graduated from the diploma level are found to have the best knowledge level. This is because in Indonesia, most health-related jobs require at least diploma level education.[25] Other factors such as antibiotic self-medication history only correlate significantly with attitude and practice level. This finding indicates that people who have a history of antibiotic self-medication might have poor antibiotic use practices despite their adequate knowledge. COVID-19 history showed no significant correlation with whether knowledge, attitude, nor practice in antibiotic use. This is because information about antibiotics as one of the COVID-19 medications during early pandemic days could be accessed by everyone, not limited to those who were infected only. A study from Dahal *et al.*[14] found that those who were infected with COVID-19 and were given antibiotics mostly did not do more research about the medication given to them.[19] This could explain why there was not much difference in knowledge level between those who have been infected with COVID-19 and those who haven't.

CONCLUSION

In conclusion, the score level of public knowledge, attitude, and practice of antibiotic use in DKI Jakarta during the COVID-19 pandemic were considered high. However, misunderstandings and inappropriate practices regarding antibiotic use were still found and should become a consideration when formulating regulations or campaigns to raise public awareness of antibiotic use and resistance. A significant correlation between knowledge, attitude, and practice in antibiotic use was also found in this study. Sociodemographic factors found to be correlated significantly with the level of knowledge, attitude, and practice in antibiotic use were gender, occupation field, education level, and history of antibiotic self-medication.

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CONFLICT OF INTEREST

None declared.

REFERENCES

1. Patel P, Wermuth HR, Calhoun C, Hall GA. Antibiotics. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024. http://www.ncbi.nlm.nih.gov/books/NBK535443/
2. Interagency Coordination Group on Antimicrobial Resistance. No time to Wait: Securing the future from drug-resistant infections. Interagency Coordination Group on Antimicrobial Resistance; 2019 Apr. (Report to the Secretary-General of the United Nations).
3. Andrajati R, Tilaqza A, Supardi S.

Factors related to rational antibiotic prescriptions in community health centers in Depok City, Indonesia. J Infect Public Health 2017; 10(1):41-8. https://doi.org/10.1016/j.jiph.2016.01.012
4. Awad AI, Aboud EA. Knowledge, attitude and practice towards antibiotic use among the public in Kuwait. PloS One 2015; 10(2):e0117910. https://doi.org/10.1371/journal.pone.0117910
5. Choo SJ, Chang CT, Lee JCY, Munisamy V, Tan CK, Raj JD, *et al*. A cross-sectional study on public belief, knowledge and practice towards antibiotic use in the state of Perak, Malaysia. J Infect Dev Ctries 2018; 12(11):960-9. https://doi.org/10.3855/jidc.10723
6. Karuniawati H, Hassali MAA, Suryawati S, Ismail WI, Taufik T, Hossain MS. Assessment of Knowledge, Attitude, and Practice of Antibiotic Use among the Population of Boyolali, Indonesia: A Cross-Sectional Study. Int J Environ Res Public Health 2021; 18(16):8258. https://doi.org/10.3390/ijerph18168258
7. Nepal A, Hendrie D, Robinson S, Selvey LA. Knowledge, attitudes and practices relating to antibiotic use among community members of the Rupandehi District in Nepal. BMC Public Health 2019; 19(1):1558. https://doi.org/10.1186/s12889-019-7924-5
8. Widayati A, Suryawati S, de Crespigny C, Hiller JE. Knowledge and beliefs about antibiotics among people in Yogyakarta City Indonesia: a cross sectional population-based survey. Antimicrob Resist Infect Control 2012; 1(1):38. https://doi.org/10.1186/2047-2994-1-38
9. Kosiyaporn H, Chanvatik S, Issaramalai T, Kaewkhankhaeng W, Kulthanmanusorn A, Saengruang N, *et al*. Surveys of knowledge and awareness of antibiotic use and antimicrobial resistance in general population: A systematic review. PloS One 2020; 15(1):e0227973. https://doi.org/10.1371/journal.pone.0227973
10. Badran IG. Knowledge, attitude and practice the three pillars of excellence and wisdom: a place in the medical profession. EMHJ - East Mediterr Health J 1995: 1:8-16. https://iris.who.int/handle/10665/116905
11. Cucinotta D, Vanelli M. WHO Declares COVID-19 a Pandemic. Acta Biomed 2020; 91(1):157-60. https://doi.org/10.23750/abm.v91i1.9397
12. WHO. COVID-19 Weekly Epidemiological Update. World Health Organization; 2022. (COVID-19 Weekly Epidemiological Update). Report No.: 123.
13. Nieuwlaat R, Mbuagbaw L, Mertz D, Burrows LL, Bowdish DME, Moja L, *et al*. Coronavirus Disease 2019 and Antimicrobial Resistance: Parallel and Interacting Health Emergencies. Clin Infect Dis 2021; 72(9):1657-9. https://doi.org/10.1093/cid/ciaa773
14. Dahal D, Sundar S, Kullar R, Milevska-Kostova N, Dindial K. Antimicrobial resistance during the COVID-19 pandemic: the missing patient perspective. JAC Antimicrob Resist 2021; 3(1):dlab030. https://doi.org/10.1093/jacamr/dlab030
15. Malik M, Tahir MJ, Jabbar R, Ahmed A, Hussain R. Self-medication during Covid-19 pandemic: challenges and opportunities. Drugs Ther Perspect Ration Drug Sel Use 2020; 36(12):565-7. https://doi.org/10.1007/s40267-020-00785-z
16. Monnet DL, Harbarth S. Will coronavirus disease (COVID-19) have an impact on antimicrobial resistance? Euro Surveill 2020; 25(45):2001886. https://doi.org/10.2807/1560-7917.ES.2020.25.45.2001886
17. Rawson TM, Ming D, Ahmad R, Moore LSP, Holmes AH. Antimicrobial use, drug-resistant infections and

COVID-19. Nat Rev Microbiol 2020; 18(8):409-10. https://doi.org/10.1038/s41579-020-0395-y
18. Rawson TM, Moore LSP, Castro-Sanchez E, Charani E, Davies F, Satta G, *et al*. COVID-19 and the potential long-term impact on antimicrobial resistance. J Antimicrob Chemother 2020; 75(7):1681-4. https://doi.org/10.1093/jac/dkaa194
19. Pogurschi EN, Petcu CD, Mizeranschi AE, Zugravu CA, Cirnatu D, Pet I, *et al*. Knowledge, Attitudes and Practices Regarding Antibiotic Use and Antibiotic Resistance: A Latent Class Analysis of a Romanian Population. Int J Environ Res Public Health 2022; 19(12):7263. https://doi.org/10.3390/ijerph19127263
20. Khoshgoftar M, Zamani-Alavijeh F, Kasaian N, Shahzamani K, Rostami S, Nakhodian Z, *et al*. The effect of public health educational campaign regarding antibiotic use and microbial resistance on knowledge, attitude, and practice in the Iran. J Educ Health Promot 2021; 10:3. https://doi.org/10.4103/jehp.jehp_629_20
21. Parathon H, Kuntaman K, Widiastoety TH, Muliawan BT, Karuniawati A, Qibtiyah M, *et al*. Progress towards antimicrobial resistance containment and control in Indonesia. BMJ 2017; 358:j3808. https://doi.org/10.1136/bmj.j3808
22. Ferdiana A, Liverani M, Khan M, Wulandari LPL, Mashuri YA, Batura N, *et al*. Community pharmacies, drug stores, and antibiotic dispensing in Indonesia: a qualitative study. BMC Public Health 2021; 21(1):1800. https://doi.org/10.1186/s12889-021-11885-4
23. Kondoj IV, Lolo WA, Jayanto I. Pengaruh tingkat pengetahuan dan sikap terhadap penggunaan antibiotik di apotek kimia farma 396 tuminting kota manado. PHARMACON. 2020; 9(2):294-301. https://doi.org/10.35799/pha.9.2020.29284
24. Gillani AH, Chang J, Aslam F, Saeed A, Shukar S, Khanum F, *et al*. Public knowledge, attitude, and practice regarding antibiotics use in Punjab, Pakistan: a cross-sectional study. Expert Rev Anti Infect Ther 2021; 19(3):399-411. https://doi.org/10.1080/14787210.2021.1823216
25. Kementrian Kesehatan. Profil Kesehatan Indonesia 2021. Jakarta: Kementrian Kesehatan Republik Indonesia; 2021. (Profil Kesehatan Indonesia).