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Antimicrobial Resistance: Knowledge, Attitude, and Awareness in the Bali Locals Community

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Artikel Penelitian

Abstract: *Antimicrobial resistance (AMR) concerns may arise as a result of improper antibiotic use. Bacterial resistance to antibiotics, which has been identified by the WHO as one of the most serious threats to public health, can be worsened by a lack of public understanding of proper antibiotic use. The objective of this research was to find out the level of community knowledge, attitudes, and awareness about AMR. A validated questionnaire was adopted to conduct purposeful interviews with locals of Kerobokan Kaja Village during February and March 2023 to conduct the cross-sectional survey. There were 110 total responses (100% response rate). Most respondents (37 [33.3%]) are between the ages of 18 and 27; 56 [50.9%] are women; and 78 [70.9%] have completed secondary school.; (41 [37.3%]) work as private employees; and received minimum wages (41 [37.3%]). The findings indicated that more than half of the population (70 [63.3%]) had adequate knowledge regarding the use of antibiotics, adequate attitudes (64 [58.2%]), and fair awareness of AMR (63 [57.3%]). The results of the Spearman's Rank test reveal a moderately strong correlation between knowledge and AMR awareness (Sig.2-tailed=0.000; p-value <0.05; correlation coefficient=0.583), as well as a moderately strong correlation between attitudes towards AMR awareness (Sig.2-tailed=0.000; p-value<0.05; correlation coefficient=0.427). To combat an increase in AMR, it is important to raise awareness among the general population and change attitudes regarding the value of prudent antibiotic usage.*

Keywords: *antimicrobial resistance, attitudes, awareness, knowledge*

Abstrak: Antibiotik yang tidak digunakan secara bijak dapat memicu timbulnya masalah *Antimicrobial Resistance* (AMR). Kurangnya pemahaman masyarakat terhadap penggunaan antibiotik secara tepat dapat memperburuk kejadian resistensi bakteri terhadap antibiotik, telah diakui oleh WHO sebagai salah satu ancaman paling serius bagi kesehatan masyarakat. Penelitian dilakukan untuk mengetahui pengetahuan, sikap, dan kewaspadaan terhadap AMR pada masyarakat. Survei *cross sectional* dilakukan dengan mewawancarai masyarakat Desa Kerobokan Kaja secara *purposive*, pada bulan Februari-Maret 2023, menggunakan kuesioner yang telah divalidasi. Sejumlah 110 responden berpartisipasi (tingkat respon 100%). Mayoritas responden berada pada rentang usia 18-27 tahun (37 [33.3%]); perempuan (56 [50.9%]); berpendidikan menengah (78 [70.9%]); pegawai swasta (41 [37.3%]), dan berupah minimum (41 [37.3%]. Hasil penelitian menunjukkan, lebih dari separuh masyarakat memiliki pengetahuan tentang penggunaan antibiotik pada kategori cukup (70 [63,3%]); sikap pada kategori cukup (64 [58,2%]); dan kewaspadaan terhadap AMR pada kategori cukup (63 [57,3%]). Hasil uji Rank Spearman menunjukkan, bahwa terdapat hubungan yang cukup kuat antara pengetahuan terhadap kewaspadaan AMR (Sig.2-tailed=0,000; p-value<0,05; coefisien correlasi=0,583), dan terdapat hubungan yang cukup kuat antara sikap terhadap kewaspadaan AMR (Sig.2-tailed=0,000; p-value<0,05; coefisien correlasi=0,427). Perlu dilakukan penyuluhan kepada masyarakat umum untuk meningkatkan pengetahuan dan sikap masyarakat tentang pentingnya penggunaan antibiotik yang bijak untuk menanggulangi peningkatan AMR.

Kata kunci: kewaspadaan, pengetahuan, resistensi antimikroba, sikap

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Introduction

Antibiotics are medications used to treat bacterial infections. Use of antibiotics inappropriately could end up in concerns with resistance. Wise antibiotic use takes into consideration how the emergence and spread of resistant bacteria will affect its efficacy (1). Antibiotic resistance poses a serious threat to health worldwide, has been blamed for nearly 5-mio deaths yearly, and will continue to get worse in the years afterward (2). It is reported that AMR was a factor in 4.95 million deaths in 2019; among those, 1.27 million deaths are directly caused by AMR (2).

The rising incidence of bacterial resistance to antibiotics can be made worse by a lack of public understanding of their appropriate use (3). Antibiotic self-medication is a widespread practice in Asian nations, which has aided in the emergence of antimicrobial resistance, which is now a dreadful reality rather than a danger (4).

Indonesia had a higher level of antimicrobial resistance than other Asia Pacific nations like Australia and New Zealand, according to a regional surveillance program for ESBL and CARB-R (carbapenem resistance) resistance that was conducted in 12 Asia Pacific countries in 2011 including India and Taiwan. It is even higher than the global, Western European, and American averages. Compared to other Asia Pacific nations (48%), Indonesia has the greatest rate of ESBL-producing E. coli resistance (71%). Similarly, the resistance level of the ESBL-producing Klebsiella was 64% as opposed to the 47% detected in the local area (5).

The national development plans for the long-term and mid-term provide direction for the national policy for reducing AMR. Additionally, the Presidential Instruction Number 4 of 2019 Concerning Capacity Building in Preventing, Detecting, and Responding to Disease Outbreaks, Pandemics, Global, and Nuclear, Biological, and Chemical Emergencies mandates the implementation of full implementation in a comprehensive and integrated manner. Cross-sectoral collaboration is required to overcome the difficulty of controlling antimicrobial resistance events because the incidence of antimicrobial resistance is no longer only seen as a stand-alone problem but is also related to various sectors, including public health, animal health (including aquaculture), the supply chain, food, agriculture, and environmental sectors (5).

Method and Materials

This cross-sectional analytic observational study utilized primary data sources acquired through interviews with locals of Kerobokan Kaja Village. The sample in this study was the locals who had consumed antibiotics, met the inclusion criteria, and were willing to be respondents. With a population of 17,771 people, the sample size was calculated using the Slovin formula to ensure that at least 99 samples were collected.

$$n = \frac{N}{1 + N\,(e)2}$$

Materials

The tool contains a questionnaire that has been validated for validity and reliability on 30 respondents. All questions are valid (r-count > 0.349; p-value<0.05). Cronbach's alpha values on the knowledge questionnaire (0.705), attitude (0.894), and AMR awareness (0.806) were all above 0.6, indicating that the data was credible. The knowledge questionnaire contains 8 (eight) dichotomous questions/statements based on the Guttmann Scale, while the AMR attitude and awareness questionnaire contains 9 (nine) dichotomous questions/statements based on the Guttmann Scale. Each correct answer gets one (1); each incorrect response gets zero (0). The total knowledge score is divided into three categories: good >6, fair =5-6, and low <5. The attitude and AMR awareness scores were classified as good >7, sufficient/adequate =5-6, and low <5.

Statistical test

The data were examined using SPSS version 24.0. To assess how considerably the relationships between the ordinal variables correlated, the Spearman Rank was used. The correlation strength shows how strong the correlation is if 1=perfect, 0.76-0.99=very strong, 0.51-0.75=strong, 0.26-0.50=fair, and 0.00-0.25=very low (6).

Ethics

The International Bali University Ethics Committee Number 02.0330/UNBI/EC/II/2023 granted this study on February 20, 2023.

Results and Discussion

Results

Respondent's Characteristics

This study had 110 participants from Kerobokan Kaja Village (100% response rate). **Table 1** shows most respondents aged 18-27 years (37 [33.3%]); female (56 [50.9%]); secondary education (78 [70.9%]); private sectors (41 [37.3%]); and low income (41 [37.3%].

Table 1. Respondent's Characteristics (n=110)

Characteristics	n	%
Age groups (years)		
18-27	**37**	**33.3**
28-37	16	14.4
38-47	19	17.1
48-57	27	24.3
58-67	3	2.7
68-77	8	7.2
Gender		
Male	54	49.1
Female	56	**50.9**
Level of Education		
Low	14	12.7
Middle	**78**	**70.9**
High	18	16.4
Occupation		
Not working	9	8.2
Student	7	6.4
Farmer	10	9.1
Breeder	4	3.6
Housewive	15	13.6
Government staff	15	13.6
Private sectors	**41**	**37.3**
Enterpreneur	18	16.4
Income		
> Minimum	38	34.5
< Minimum	**41**	**37.3**
Not working	31	28.2

Knowledge

Most respondents correctly responded to questions 1, 2, and 3 out of the 8 knowledge-related questions, as indicated in **Table 2**. Most respondents, however, misreported their responses to questions 4, 5, 6, and 7. Some 70.3% of respondents stated that antibiotics were used to treat viral infections; 56.8% for treating colds and coughs; 54.1% can cure sore throat; and 56.8% stopped taking antibiotics when they felt better. This confirms earlier studies on community understanding of antibiotics (7–10). Consequently, that the general public is aware of the proper use of antibiotics, regular information dissemination must be done along with intensified antibiotic campaigns.

Attitude

Table 2 shows half of the respondents had an unwise attitude in statements 2 and 3. For minor symptoms, antibiotics were utilized by 50.9% of respondents. This coincides with nearly all studies pointing to the use of antibiotics for viral infections, such as influenza and influenza-like symptoms, sore throat, and fever (4,7,9,10). Most participants in this study (75.2%) requested a doctor's prescription for antibiotics. It was revealed in another survey that just a small percentage of the community made requests for doctors (9). However, demanding more antibiotics from doctors might contribute to a rise in AMR (8).

The number of respondents who still reported that their families were sharing antibiotics was 38.2%, which is significantly less than the 85.2% reported in prior studies (9). The use of antibiotics to prevent the disease from getting worse was carried out by 39.1% of respondents, thus, this study demonstrates an upward trend in the attitude of the community (9). It is of the utmost importance that the authorities set specific intervention strategies into place that convince the general population to employ antibiotics appropriately (3).

AMR Awareness

Table 3 reveals that most of the respondents agreed with statements 1, 2, 3, 4, and 9. Almost all respondents (97.3%) agreed that washing hands regularly helped avoid infection; 92.85% stated that they respected food hygiene standards; and 85.65% keep a safe distance from anyone who are ill.

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Table 2. Respondents' Knowledge and Attitudes

No	Statements	Responses	
		Yes/True n (%)	No/False n (%)
	Knowledge		
1	Immunity is a natural process	110 (100.0)	0 (0)
2	Performed when fever (temperature >37C)	102 (91.9)	8 (7.2)
3	Used for bacterial infections	88 (79.3)	22 (19.8)
4	Used to treat viral infections	78 (70.3)	32 (28.8)
5	Can be applied to treat colds and coughs	63 (56.8)	47 (42.3)
6	Uses involve curing sore throats	60 (54.1)	50 (45.0)
7	Quit taking the antibiotics whilst feel better	63 (56.8)	47 (42.3)
8	Every eight hours is recommended according to the 3x1 guidelines	57 (51.4)	53 (47.7)
	Attitude		
1	Purchase of medications without a prescription	12 (10.9)	98 (89.1)
2	Used for symptoms of slight discomfort	56 (50.9)	54 (49.1)
3	Request an antibiotic prescription from the physician	46 (75.2)	64 (24.8)
4	Feel allowed to use in precautions	19 (17.3)	91 (82.7)
5	Discuss with friends and family	35 (31.8)	75 (68.2)
6	Family sharing of antibiotics	42 (38.2)	68 (61.8)
7	Prevent the illness from growing worse	43 (39.1)	67 (60.9)
8	I am searching for more details	88 (80.0)	22 (20.0)
9	Sources for advice from healthcare professionals	103 (93.6)	7 (6.4)

Table 3. AMR Awareness

	Statements	Yes/True n (%)	No/False n (%)
1	Regular hand washing can minimise infection	108 (97.3)	2 (1.8)
2	Ensure food hygiene standards	103 (92.8)	7 (6.3)
3	Keep a distance towards sick people	95 (85.6)	15 (13.5)
4	Use antibiotics only as prescribed by a healthcare professional	89 (80.2)	21 (18.9)
5	Antibiotic successful completion might reduce AMR	60 (54.1)	50 (45.9)
6	Never keep antibiotics at home	59 (53.2)	51 (45.9)
7	AMR is only an issue in countries abroad	57 (51.4)	53 (47.7)
8	In agriculture, antibiotics are often exploited	61 (55.0)	49 (44.1)
9	Breeders must be wary of animal feed	83 (74.8)	27 (24.3)

A silent pandemic of drug-resistant bacterial infections emerges. To reduce dependence on drug-resistant diseases, health services, particularly in LMICs, need to enhance diagnostic procedures, WASH (water, sanitation, and hygiene), and infection prevention and control (11,12).

Most respondents (80.2%) said they only used antibiotics when doctors prescribed them. This is somewhat different from previous studies where parents gave antibiotics to their children before consulting a doctor. Parents who have done self-medication for their child are more likely to ask for antibiotics, including IV antibiotics, at the consultation (8). More than half of respondents (54.1%) gave a positive response to the statement that successful completion of antibiotics use can reduce AMR. Antibiotics are frequently skipped by people who are unaware of them because they feel better before the prescribed time has passed. People who are unaware of the antibiotics often skip using the antibiotics for the whole advised time on the basis that they feel better.

More than half of respondents (55.05%) felt they realized antibiotics were frequently utilized in agriculture, and 74.85% of respondents agreed breeders were required to be aware of antibiotic-containing feed for livestock. Although it is challenging to figure out the entire scope of the food chain's contribution to AMR to the complicated epidemiology, there is some evidence that there is a connection between AMR in the food chain and humans. Inappropriate use of antibiotics in livestock should be avoided in order to decrease resistance and the risk of antibiotic residues in livestock products (13). Additional steps must be taken to support this effort to reduce AMR, including training medical professionals to support options for therapy, public awareness campaigns to deter antibiotic use, hygienic improvements in healthcare facilities and the food supply, promoting vaccination rates, and the development of novel medications (14).

As shown in **Table 4**, most of the respondents (58.2%) have moderate knowledge, while 63.3% present a fair attitude, and 65.5% show adequate AMR awareness. The results of the Spearman rank test reveal a slightly strong relationship between knowledge of AMR awareness (Sig.2-tailed=0.000; p-value<0.05; correlation coefficient=0.583) and attitude towards AMR awareness (Sig.2-tailed=0.000; p-value<0.05; correlation coefficient=0.427). The Rank Spearman test shows a strong correlation between knowledge and AMR awareness attitudes; a fair correlation between attitude and AMR awareness (p-value<0.5). Since much of this mortality happens in low-and middle-income countries (LMICs), it is advised to increase awareness of AMR as well as to provide health workers with education and training in this field (12).

Table 4. Knowledge and Attitudes, and AMR Awareness (n=110)

	n	%
Knowledge		
Good	27	24.5
Moderate	**64**	**58.2**
Poor	19	17.3
Attitude		
Good	18	16.4
Fair	**70**	**63.3**
Poor	22	20.0
Awareness		
Good	22	20.0
Adequate	**72**	**65.5**
Poor	16	14.5

	AMR Awareness	
	p-value	**correlation coefficient**
Knowledge	0,000	0,583
Attitudes	0,000	0,427

Conclusion

The community of Kerobokan Kaja Village has sufficient knowledge, attitudes, and awareness about AMR. Exploring the issue of inappropriate antibiotic use requires further research. Although the results of this study cannot be broadened, we encourage that pharmacists actively educate community about the proper use of antibiotics, either in person or through social media campaigns.

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Conflict of Interest

The authors declared that no conflict of interest in this research.

References

1. Aljeldah MM. Antimicrobial resistance and its spread is a global threat. Antibiotics. 2022;11(8):1082.
2. Murray L et al. Global burden of bacterial antimicrobial resistance in 2019: a systematic analysis. Lancet Engl. 2022;399(1035):629–55.
3. Limato R, Lazarus G, Dernison P, Mudia M, Alamanda M, Nelwan EJ, et al. Optimizing antibiotic use in Indonesia: A systematic review and evidence synthesis to inform opportunities for intervention. Lancet Reg Heal _ Southeast Asia. 2022;2(6):13.
4. Widowati IGAR, Budayanti NNS, Januraga PP, Duarsa DP. Self-medication and self-treatment with short-term antibiotics in Asian countries: A literature review. Pharm Educ. 2021 Jul 31;21(2):152–62.
5. Menteri P, Bidang K, Manusia P, Kebudayaan DAN, Indonesia R. Rencana aksi nasional pengendalian resistensi antimikroba. 2024.
6. Cavallo B. Functional relations and Spearman correlation between consistency indices. J Oper Res Soc [Internet]. 2019;71(2):301–11. Available from: https://doi.org/10.1080/01605682.2018.1516178
7. Chanvatik S, Kosiyaporn H, Lekagul A, Kaewkhankhaeng W, Vongmongkol V, Thunyahan A, et al. Knowledge and use of antibiotics in Thailand: A 2017 national household survey. PLoS One. 2019;14(8):1–15.
8. Xu J, Wang X, Sun KS, Lin L, Zhou X. Parental self-medication with antibiotics for children promotes antibiotic over- prescribing in clinical settings in China. Antimicrob Resist Infect Control. 2020;9(150):1–8.
9. Widowati IGAR, Duarsa DP, Nyoman N, Budayanti S, Diantini A, Januraga PP. Modified pharmacy counseling improves outpatient short-term antibiotic compliance in Bali Province. Int J Public Heal Sci. 2022;11(3):1102–11.
10. Bert F, Previti C, Calabrese F, Scaioli G, Siliquini R. Antibiotics Self Medication among Children: A Systematic Review. Antibiotics. 2022;11(11):1–15.
11. Mcdonnell A, Klemperer K. WASHing Away Resistance: Why the UK Should Invest in Water, Sanitation, and Hygiene to Tackle Anti-Microbial Resistance. Center for Global Development. 2022.
12. Dolecek C, Shakoor S, Basnyat B, Okwor T, Sartorius B. Drug-resistant bacterial infections : We need urgent action and investment that focus on the weakest link. PLoS Biol [Internet]. 2022;20(11):e3001903. Available from: http://dx.doi.org/10.1371/journal.pbio.3001903
13. Setiabudy M, Agung A, Indraningrat G, Arya P, Nyoman N, Budayanti S, et al. Detection of antibacterial activity in chicken meat, eggs, drinking water, animal feed and sewage waste in Tabanan, Bali. J Microbiol Infect Dis. 2023;3(1):16–9.
14. Bennani H, Mateus A, Mays N, Eastmure E, Stärk KDC, Häsler B. Overview of evidence of antimicrobial use and antimicrobial resistance in the food chain. Antibiotics. 2020;9(2):49.