



Adaptation and Validation of a Translated Questionnaire Assessing Public Awareness, Knowledge, Attitudes, and Practices Regarding Antibiotic Use in Malaysia

Muhammad Kamil Che Hasan¹, Mohd Khairul Zul Hasymi Firdaus¹, Nik Noor Kaussar Nik Mohd Hatta¹, Thandar Soe Sumaiyah Jamaludin¹, Nur Ain Mahat¹, Zulkhairul Naim Sidek Ahmad², Efta Triastuti³, Kow Fang Fang⁴, Shidqiyyah Abdul-Hamid^{1*}

¹Kulliyyah of Nursing, International Islamic University Malaysia, Kuantan, Pahang, Malaysia

²Faculty of Medicine and Health Sciences, Universiti Malaysia Sabah, Kota Kinabalu, Sabah, Malaysia

³Faculty of Medicine, Universitas Brawijaya, Malang, Indonesia

⁴Hospital Tengku Ampuan Afzan, Kuantan, Pahang, Malaysia

Abstract

Background and aims: Antibiotic misuse is an escalating global health concern, especially in Malaysia, resulting in increased resistance and significant public health challenges. Understanding the public's awareness, knowledge, attitudes, and practices (AKAP) regarding antibiotic use is essential for implementing effective interventions. Therefore, this study aimed to adapt and validate a questionnaire derived from existing tools and translated from English to Malay to assess the AKAP related to antibiotic use among the Malaysian public.

Methods: The questionnaire underwent forward and backward translation to ensure cultural relevance and linguistic accuracy. Content validity was assessed using the content validity index (CVI) based on evaluations conducted by six experts with backgrounds in public health, pharmacy, nursing education, and nursing practice. These experts reviewed the relevance, clarity, and appropriateness of each item. A cross-sectional study was conducted with 50 individuals in Pahang, Malaysia, to evaluate the reliability of the questionnaire. Participants were selected through convenience sampling, emphasizing the inclusion of individuals from diverse age groups, educational backgrounds, and occupations to ensure community representation. Reliability testing was performed using the Kuder-Richardson Formula 20 (KR-20).

Results: The CVI for all the developed questionnaire items indicated strong content validity, with item-level CVI (I-CVI) scores exceeding 0.83 for the translated questionnaire. Additionally, the KR-20 analyses demonstrated good internal consistency, with KR-20 scores greater than 0.7, thereby confirming the questionnaire's suitability for use within the target population.

Conclusion: The adapted Malay-language questionnaire revealed acceptable levels of validity, indicating that it is a valid and reliable instrument for assessing antibiotic use among the Malaysian public, particularly within the Malay-speaking population.

Keywords: Drug resistance, Antimicrobial, Surveys and questionnaires, Reproducibility of results, Health knowledge, Attitude, Practice

*Corresponding Author:

Shidqiyyah Abdul-Hamid,
Email: shidqiyyah@iiu.edu.my

Received: November 30, 2024

Accepted: February 3, 2025

ePublished: June 7, 2025



Introduction

Antibiotic misuse and resistance have emerged as significant global public health issues, jeopardizing the effectiveness of treatments for various infectious diseases.^{1,2} This phenomenon occurs when bacteria adapt to antibiotics, thereby reducing or eliminating their efficacy.¹ The prevalence of resistant bacteria has reached alarming levels worldwide, increasing morbidity, mortality, and healthcare costs.³ In Malaysia, the increasing prevalence of antibiotic resistance has raised concerns among healthcare professionals and policymakers.⁴ Factors contributing to this antibiotic resistance issue include inappropriate prescribing practices, self-

medication, and a lack of public awareness regarding proper antibiotic use.⁵ Consumer abuse of antibiotics, such as the use of these medicines without prescriptions, self-medication, or lack of completing prescribed courses, worsens antibiotic resistance.⁶ Therefore, understanding consumer perspectives is key to addressing knowledge gaps and behaviours contributing to antibiotic misuse. Specifically, understanding the community's awareness, knowledge, attitudes, and practices (AKAP) regarding antibiotics is crucial for designing effective public health interventions.

Effective tools are essential for accurately and comprehensively assessing AKAP regarding antibiotic

usage within the community, as they provide valuable insights that can inform educational programs and policy decisions. Various questionnaires have been developed to evaluate the components of AKAP related to antibiotics.⁷⁻¹¹ Multiple questionnaires about the use of antibiotics are necessary, as they are tailored to local practices and specific demographic groups, such as occupation, education, or behaviours, including healthcare seeking in tertiary care settings.¹¹ In this study, the researchers are particularly interested in selecting a tool that can comprehensively assess the AKAP elements and is suitable for the Malaysian context. In Malaysia, antibiotics are not classified as over-the-counter medications under the Malaysian Poisons Act, and a prescription from a doctor is required for their purchase, which contrasts with the practice performed in many other countries, including some of those in the Asian region.¹² Thus, selecting an appropriate questionnaire for this study required excluding those involving the direct purchase of antibiotics without a prescription. Accordingly, a questionnaire derived from two existing tools was adapted and validated for this study. The first tool assesses antibiotic awareness, knowledge, and attitude but focuses specifically on secondary school students in Malaysia.¹⁰ The second originates from Ethiopia and addresses AKAP related to antibiotic use.⁷ Combining elements from both instruments allows us to create a more comprehensive questionnaire suitable to our population of interest, the public in Malaysia, ensuring that it is culturally and contextually relevant.

Antibiotic consumption is widespread in Malaysia, even among traditional medicine users. However, the general lack of formal education on antibiotics, particularly in populations without healthcare or medical training, leaves many unaware of issues such as antibiotic resistance. While antibiotic knowledge is crucial, understanding the linguistic and cultural context is equally essential to ensure that survey instruments are accessible and relevant. Kuantan, the capital of Pahang, serves as a representative urban center, and the predominantly Malay-speaking population highlights the importance of cultural and linguistic considerations.¹³ The city also hosts a diverse mix of people from different parts of Malaysia, many of whom have relocated for work or other opportunities. Given that most of the population speaks Malay, translating the questionnaire from English to Malay is critical in making the tool suitable for this population. Furthermore, validating the adapted questionnaire is necessary to ensure its reliability and validity within our population context.¹⁴ Previous research demonstrated that culturally adapted instruments yield more accurate data and contribute to better public health outcomes.¹⁵ Thus, this study seeks to provide a validated tool to effectively assess AKAP regarding antibiotic use in the Malaysian community, ultimately supporting efforts to combat antibiotic misuse and promote responsible usage practices.

Materials and Methods

A comprehensive literature review was conducted to

identify appropriate instruments to assess the public's awareness, knowledge, attitude, and practice regarding antibiotic use. The questionnaire used in this study was adapted from two existing tools published in English. The first tool, developed by Neni et al¹⁰, primarily focuses on attitude, awareness, and knowledge about antibiotic usage, while the second one, developed by Dejene et al,⁷ addresses the knowledge, attitude, and practice components. These two tools were selected because combining them ensured that all relevant domains, including awareness, knowledge, attitude, and practice, were thoroughly covered in a single, comprehensive questionnaire. Notably, the questions in these tools did not include items related to the over-the-counter purchase of antibiotics, which is not in line with Malaysia's regulations. Additionally, both tools were previously validated, ensuring their relevance and reliability. The questions are also clear, simple, and easily understood, making them suitable for a broad public audience regardless of educational or cultural background.

The adapted instrument consists of four sections related to awareness (six items), knowledge (12 items), attitude (nine items), and practice (eight items). The awareness section assessed participants' understanding of antibiotic resistance. In contrast, the knowledge section focused on their familiarity with antibiotics, their appropriate uses, and the consequences of misuse. The attitude section explored respondents' perspectives on antibiotic use, storage, and acquisition. Finally, the practice section addressed participants' current behaviours regarding correct antibiotic use, including seeking medical advice, completing prescribed courses, and checking medication expiry dates.

The adaptation process began with the translation of the original questionnaires into the Malay language. Forward and backward translation procedures were conducted by a group of independent translators who had medical and health backgrounds and were fluent in both Malay and English. Given that English is the second language and serves as the medium of instruction at the university level in Malaysia, it is acceptable for bilingual professionals to produce an accurately translated version of the original questionnaire.¹⁶ Two translators independently translated the original text from English to Malay, and their translations were compared to create a unified version. Another translator then completed a back-translation into English before being reviewed by an expert committee to create a prefinal version of the questionnaire. Cultural adaptation was also undertaken, and terms that might not resonate culturally were replaced with equivalents that better reflected local understanding and beliefs regarding antibiotic use.

Following translation, the questionnaire was subjected to content validation. A panel of six experts, consisting of public health specialists, pharmacists, nursing educators, and nursing officers, reviewed the bilingual items for relevance, clarity, and appropriateness for the target population. A validation form, using a four-point Likert-

type scale to measure the relevancy of each item, was distributed to the experts. Figure 1 provides a sample of the instructions and rating scale used in the content validation for the experts. The content validity index (CVI) for each item (I-CVI) and scale as a whole (S-CVI) was calculated according to the guidelines provided by Yusoff¹⁷ to quantify the content relevance, with a score above 0.83 considered an acceptable cut-off score for the stated number of experts. Subsequently, a pilot test was conducted with a small sample of the target population to assess the clarity and comprehensibility of the adapted questionnaire. Ten participants were recruited from the community in Kuantan to gather informal feedback on their understanding of the items following expert validation. Feedback was collected through open-ended questions, asking participants if they encountered difficulties understanding the items or had suggestions for improvement. This approach allowed for identifying potential issues with wording or comprehension before further testing.

The required data were collected from a sample of 50 participants recruited using convenience sampling from the public in Kuantan for reliability testing. The participants varied in age, occupation, and educational background, ensuring a diverse community representation. These characteristics were considered to ensure that the findings contribute to validating the applicability and relevance of the questionnaire across different population segments. Informed consent was obtained from all participants, ensuring their right to withdraw from the study at any time and maintaining their confidentiality. Internal consistency was evaluated using the Kuder-Richardson Formula 20 (KR-20), a measure commonly used to assess reliability in instruments with dichotomous outcomes,¹⁸ such as multiple-choice questions with a single correct answer (e.g., 'correct/incorrect'), as in the questionnaires utilized in this study. A score of 0.70 and above indicates acceptable internal consistency, suggesting that the questionnaire's items measure a consistent underlying construct. The resulting score will provide insight into the reliability of the adapted questionnaire for the target population. All data analyses were performed using SPSS, version 27.0.

Results

The questionnaire items underwent content validation by a panel of six experts, with a focus on the relevance and appropriateness of the content. One question from the knowledge section and three from the practice sections were removed because their I-CVI was less than 0.83. The first question pertained to the use of antibiotics for nausea. In contrast, the other three questions were related to animal antibiotic use. The finalized version of the questionnaire consisted of four sections associated with awareness (section A), knowledge (section B), attitude (section C), and practice (section D), containing six, twelve, eight, and five items, respectively.

The questionnaire was subsequently evaluated for its scale-level CVI using the average method (S-CVI/Ave) and the universal agreement method (S-CVI/UA). All four sections' average scale-level CVI (S-CVI) exceeded 0.9 (Table 1). For the universal agreement index (S-CVI/UA), sections A, B, C, and S received scores of 0.67, 0.92, and 1.00, respectively.

Fifty individuals from around Kuantan were enrolled for the reliability study. Most participants were young adults (40%), with a mean age of 42.6 years, and most were female (70%). The educational qualification of the participants was primarily at the secondary school level (52%). Most of them worked in non-healthcare-related fields (44%) (Table 2). The internal consistency of the adapted questionnaire was assessed using the KR-20. The KR-20 values for each section are presented in Table 3. All sections met the acceptable reliability threshold of 0.70, indicating satisfactory internal consistency across the instrument.

Before the reliability test, the questionnaire was pilot-tested among a small sample of the target population to assess its clarity and comprehensibility. All participants could understand the items in the adapted questionnaire without difficulty. Feedback from the participants indicated that the language used in the questionnaire was clear and accessible. No issues were raised regarding the clarity of the individual items. Based on this feedback, the questionnaire was suggested to be well understood by the target population and requires no further wording modifications.

Dear experts,

This questionnaire contains items related to the awareness, knowledge, attitude, and practice of antibiotic usage. We need your expert judgement on the degree of relevance of each item to the measured domain. Please be as objective and constructive as possible in your review and use the following rating scale :

- 1 = the item is **not relevant** to the measured domain.
- 2 = the item is **somewhat relevant** to the measured domain.
- 3 = the item is **quite relevant** to the measured domain.
- 4 = the item is **highly relevant** to the measured domain.

Figure 1. Sample Instructions and Rating Scale From the Content Validation Form Provided to the Experts

Table 1. CVI for Awareness, Knowledge, Attitude, and Practice on Antibiotic Use Questionnaire by Six Respondents

Items	Questionnaire (31 Items) Section			
	A	B	C	D
S-CVI/Ave ^a	0.94	0.99	1.00	1.00
S-CVI/UA ^b	0.67	0.92	1.00	1.00

Note. S-CVI: Scale-level content validity index; ^aS-CVI/Ave: Scale-level CVI based on the average method; ^bS-CVI/UA: Scale-level CVI based on the universal agreement method.

Table 2. Participants' Sociodemographic Characteristics for Reliability Study (N = 50)

Sociodemographic Characteristics	N (%)
Age (M: 42.6, SD: 17.97, range: 16-78)	
16-34	20 (40.0)
35-49	11 (22.0)
50-64	9 (18.0)
≥ 65	10 (20.0)
Gender	
Male	15 (30.0)
Female	35 (70.0)
Education	
Secondary school	26 (52.0)
Diploma	7 (14.0)
Bachelor's degree	14 (28)
Master's degree	2 (4.0)
PhD	1 (2.0)
Occupation	
Healthcare students	3 (6.0)
Non-healthcare students	5 (10.0)
Working in the healthcare field	3 (6.0)
Working in the non-healthcare field	22 (44.0)
Unemployed	17 (34.0)

Note. M: Mean; SD: Standard deviation.

Discussion

Cross-cultural translation and validation are essential for creating a valid and reliable instrument that can be effectively used across the various backgrounds of the intended populations.¹⁹ In this study, two established tools^{7,10} were adapted to measure the public's awareness, knowledge, attitude, and practice in Pahang, Malaysia. The simplicity of the questions ensured accessibility, while the tools' inclusion of diverse yet relevant topics provided a comprehensive evaluation of the target population's behaviours and beliefs. This approach helped identify the public's knowledge gaps and misconceptions about antibiotic use, which could inform future educational campaigns. For example, if misconceptions about antibiotic consumption are prevalent, programs could emphasize adherence to prescribed dosages and completing the full course. Additionally, findings could help tailor materials for specific demographic groups, such as digital content for younger audiences and television commercials for older adults.

Table 3. KR-20 Reliability Scores for Each Section of the Adapted Questionnaire

Section	KR-20 Value
Awareness	0.702
Knowledge	0.809
Attitude	0.873
Practice	0.740

Note. KR-20: Kuder-Richardson Formula 20.

During the content validity phase, experts deemed several items inappropriate, particularly those concerning the use of antibiotics in animals. The misuse of antibiotics in veterinary practices can contribute to the development of antibiotic resistance.²⁰ However, since this study aimed to create tools specifically for measuring human antibiotic usage, these items were considered unsuitable. Additionally, as the I-CVI scores for these items were lower than the acceptable threshold of 0.83,¹⁷ they were excluded from the final version of the questionnaire. In general, I-CVI is the most commonly utilized method to measure content validity, as it evaluates the content validity of individual items.²¹ S-CVI, on the other hand, measures overall scale validity. However, these different approaches may yield varying interpretations, complicating conclusions on content validity.²² For example, the awareness component's S-CVI values showed high validity using the average method (0.94) and moderate validity using the universal agreement approach (0.67). Rodrigues et al²¹ noted that the average method may overestimate content validity. In contrast, the universal agreement method could underestimate it, suggesting that the validity likely falls somewhere in between. Recent studies on antibiotic usage questionnaire development have reported similar CVI calculations.²³⁻²⁵ Zainaghi et al²³ found all three CVI values, with their S-CVI/Ave and S-CVI/AU scores, showing notable differences, similar to our findings. Contrarily, other studies only indicated I-CVI and S-CVI/Ave.^{24,25} I-CVI and S-CVI/Ave values in all the studies were reported to exceed the minimum acceptable threshold. The finalized questionnaire demonstrated acceptable value for individual and scale-level content validity indices.

The questionnaire's reliability was analyzed using the KR-20 coefficient. The KR-20 values were calculated above 0.7 for all sections, indicating that the questionnaire represents acceptable reliability.²⁶ This finding aligns with the original questionnaires developed by Neni et al,¹⁰ indicating that internal consistency values exceeded 0.7. Other antibiotic questionnaire reliability tests reported values ranging from 0.62²⁴ to a value of 0.95.²³ While there are some variations in these values, they are all considered acceptable, displaying the general reliability of the tools used in antibiotic-related studies. Additionally, acceptable reliability in the current study suggests that the questionnaire can be utilized in future research to assess AKAP regarding antibiotic usage.

Internal consistency reliability is commonly reported in

antibiotic questionnaire studies, mainly using Cronbach's alpha.^{9,10,23-25} KR-20 and Cronbach's alpha are utilized to assess reliability, with KR-20 typically employed for dichotomous outcomes and Likert-scale items.¹⁸ Although Cronbach's alpha can also be applied to dichotomous data, KR-20 is generally preferred. Uyanah and Nsikhe¹⁸ stated that KR-20 and Cronbach's alpha are theoretically and numerically equivalent for dichotomous items, especially as the number of items increases. Given our questionnaire's limited number of items, KR-20 was considered the more appropriate choice for evaluating reliability.

There are several limitations to consider in this study. First, the focus on a specific geographic area may impact the applicability of the findings to other regions. This questionnaire is currently tailored for settings similar to those in Malaysia. Future research should adapt and validate instruments in different geographic and demographic contexts, particularly in regions where antibiotics are available over the counter or where antibiotic-related legislation and education are different. Such considerations will enhance the generalizability of a questionnaire, enabling more robust data collection on global antibiotic use.

Additionally, while the questionnaire has demonstrated validity and reliability, ongoing assessment is recommended as the instrument is utilized in various contexts to ensure its effectiveness. For example, the study sample was selected from a specific region with participants of varying educational backgrounds and healthcare knowledge. The convenience sampling method may not fully capture the broader population's diversity, potentially affecting generalizability. Future research should assess the tool in different populations to further validate its applicability and address potential biases in the sample. Finally, this study primarily serves to establish the validity and reliability of the adapted questionnaire; thus, findings derived from the limited sample size were not reported, as they should not be interpreted as definitive conclusions. Subsequent research is needed to provide more comprehensive data.

Conclusion

Overall, the questionnaire adopted in this study is regarded as a valid and reliable instrument for researchers investigating antibiotic usage among the Malay-speaking population in Malaysia. It captures the key domains of awareness, knowledge, attitude, and practice and is well-suited for use in diverse settings. Moreover, this instrument not only contributes to the field of public health research but also offers a practical and accessible tool for future studies investigating antibiotic misuse and resistance. Future validity and reliability analyses with diverse sample groups are still needed to ensure the instrument's applicability across various demographic contexts.

Acknowledgements

We would like to express our sincere appreciation to the translators and experts for their invaluable support during the adaptation and

validation processes. Furthermore, we extend our gratitude to all trainers and volunteers for their participation and cooperation in this study.

Authors' Contribution

Conceptualization: Muhammad Kamil Che Hasan, Mohd Khairul Zul Hasymi Firdaus, Nik Noor Kaussar Nik Mohd Hatta, Thandar Soe Sumaiyah Jamaludin, and Shidqiyyah Abdul-Hamid.

Data curation: Mohd Khairul Zul Hasymi Firdaus, Nik Noor Kaussar Nik Mohd Hatta, Thandar Soe Sumaiyah Jamaludin, Nur Ain Mahat, Kow Fang Fang, and Shidqiyyah Abdul-Hamid

Formal analysis: Nur Ain Mahat and Shidqiyyah Abdul-Hamid

Funding acquisition: Muhammad Kamil Che Hasan

Methodology: Muhammad Kamil Che Hasan, Mohd Khairul Zul Hasymi Firdaus, Nik Noor Kaussar Nik Mohd Hatta, Thandar Soe Sumaiyah Jamaludin, Nur Ain Mahat, Zulkhairul Naim Sidek Ahmad, Efta Triastuti, and Shidqiyyah Abdul-Hamid.

Project administration: All authors.

Validation: Nur Ain Mahat and Shidqiyyah Abdul-Hamid

Writing—original draft: Muhammad Kamil Che Hasan and Shidqiyyah Abdul-Hamid

Writing—review and editing: Muhammad Kamil Che Hasan, Thandar Soe Sumaiyah Jamaludin, Zulkhairul Naim Sidek Ahmad, Efta Triastuti, and Shidqiyyah Abdul-Hamid

Competing Interests

The authors declare that there is no conflict of interests.

Ethical Approval

This study was approved by the International Islamic University Malaysia (IIUM) Research Committee (IREC) (approval No. IREC 2024-213). Informed consent forms were obtained from all participants, ensuring their right to withdraw from the study at any time while maintaining their confidentiality.

Funding

The publication of this manuscript was funded by United States Agency for International Development (USAID) through the SEAOHUN 2024 One Health Research and Training Awards. The contents of this manuscript are solely the responsibility of the authors and do not necessarily reflect the views of USAID or the United States Government.

References

1. Mustefa Ame M, Mume D. Review on the global public health issue of antibiotic resistance and potential solutions. *Public Health Open Access*. 2023;7(1):000233. doi: [10.23880/phoa-16000233](https://doi.org/10.23880/phoa-16000233).
2. Morehead MS, Scarbrough C. Emergence of global antibiotic resistance. *Prim Care*. 2018;45(3):467-84. doi: [10.1016/j.pop.2018.05.006](https://doi.org/10.1016/j.pop.2018.05.006).
3. Salam MA, Al-Amin MY, Salam MT, Pawar JS, Akhter N, Rabaan AA, et al. Antimicrobial resistance: a growing serious threat for global public health. *Healthcare (Basel)*. 2023;11(13):1946. doi: [10.3390/healthcare11131946](https://doi.org/10.3390/healthcare11131946).
4. Naeemmudeen NM, Mohd Ghazali NAN, Bahari H, Ibrahim R, Samsudin AD, Jasni AS. Trends in antimicrobial resistance in Malaysia. *Med J Malaysia*. 2021;76(5):698-705.
5. Zahir S, Jahan S, Khan K, Ul Jiyad H, Khan ZA, Akbar Z, et al. The battle against antibiotic resistance: exploring perceptions, misconceptions, attitudes, practices, and awareness factors influencing antibiotic resistance among general and clinical populations: the battle against antibiotic resistance. *Pak J Health Sci*. 2023;24(10):78-84. doi: [10.54393/pjhs.v4i10.1011](https://doi.org/10.54393/pjhs.v4i10.1011).
6. Kilari VB, Oroszi T. The misuse of antibiotics and the rise of bacterial resistance: a global concern. *Pharmacol Pharm*. 2024;15(12):508-23.
7. Dejene H, Birhanu R, Tarekegn ZS. Knowledge, attitude

- and practices of residents toward antimicrobial usage and resistance in Gondar, Northwest Ethiopia. *One Health Outlook*. 2022;4(1):10. doi: [10.1186/s42522-022-00066-x](https://doi.org/10.1186/s42522-022-00066-x).
8. Drakul D, Joksimović B, Milić M, Radanović M, Đukić N, Lalović N, et al. Public knowledge, attitudes, and practices towards antibiotic use and antimicrobial resistance in eastern region of Bosnia and Herzegovina in the COVID-19 pandemic. *Antibiotics (Basel)*. 2023;12(8):1274. doi: [10.3390/antibiotics12081274](https://doi.org/10.3390/antibiotics12081274).
 9. Jairoun A, Hassan N, Ali A, Jairoun O, Shahwan M. Knowledge, attitude and practice of antibiotic use among university students: a cross sectional study in UAE. *BMC Public Health*. 2019;19(1):518. doi: [10.1186/s12889-019-6878-y](https://doi.org/10.1186/s12889-019-6878-y).
 10. Neni WS, Subrain G, Shamshir Khan MS, Martinez KP, Auamnoy T. Awareness, knowledge, and attitude (AKA) of government secondary school students on the use of antibiotics in Shah Alam, Malaysia. *Z Gesundh Wiss*. 2020;28(3):347-55. doi: [10.1007/s10389-019-01034-y](https://doi.org/10.1007/s10389-019-01034-y).
 11. Otioku E, Fenny AP, Labi AK, Owusu-Ofori AK, Kurtzhals J, Enemark U. Knowledge, attitudes and practices regarding antimicrobial use and resistance among healthcare seekers in two tertiary hospitals in Ghana: a quasi-experimental study. *BMJ Open*. 2023;13(2):e065233. doi: [10.1136/bmjopen-2022-065233](https://doi.org/10.1136/bmjopen-2022-065233).
 12. Aceijas C, Selvaraj DH. Global availability and use of over the counter antibiotics (OTCA): a systematic literature review. *Acta Sci Dent Sci*. 2019;3(9):92-104. doi: [10.31080/asds.2019.03.0628](https://doi.org/10.31080/asds.2019.03.0628).
 13. Department of Statistics Malaysia (DOSM). OpenDOSM. P.083 Kuantan Kawasanku. 2023. Available from: <https://open.dosm.gov.my>. Accessed October 31, 2024.
 14. Moon Z. Adapting and validating questionnaires. *PsyPag Q*. 2017;1(103):51-5. doi: [10.53841/bpspag.2017.1.103.51](https://doi.org/10.53841/bpspag.2017.1.103.51).
 15. Christian BJ. Translational research - development and cultural adaptation of measures for evaluating care outcomes and quality of care for children and families. *J Pediatr Nurs*. 2022;62:205-7. doi: [10.1016/j.pedn.2021.12.014](https://doi.org/10.1016/j.pedn.2021.12.014).
 16. Bujang MA, Khee HY, Yee LK. A Step-by-Step Guide to Questionnaire Validation Research. Malaysia: Institute of Clinical Research (ICR), National Institutes of Health (NIH); 2022.
 17. Yusoff MS. ABC of content validation and content validity index calculation. *Educ Med J*. 2019;11(2):49-54.
 18. Uyanah DA, Nsikhe UI. The theoretical and empirical equivalence of Cronbach alpha and Kuder-Richardson formula-20 reliability coefficients. *Int Res J Innov Eng Technol*. 2023;7(5):17-23. doi: [10.47001/irjiet/2023.705003](https://doi.org/10.47001/irjiet/2023.705003).
 19. Abubakar A, Dimitrova R, Adams B, Jordanov V, Stefanel D. Procedures for translating and evaluating equivalence of questionnaires for use in cross-cultural studies. *Bull Transilv Univ Braş Ser VII Soc Sci Law*. 2013;6(2):79-86.
 20. Shukuri N, Dugassa J. Review on antibiotic resistance and its mechanism of development. *J Health Med Nurs*. 2017;1(3):1-17.
 21. Rodrigues IB, Adachi JD, Beattie KA, MacDermid JC. Development and validation of a new tool to measure the facilitators, barriers and preferences to exercise in people with osteoporosis. *BMC Musculoskelet Disord*. 2017;18(1):540. doi: [10.1186/s12891-017-1914-5](https://doi.org/10.1186/s12891-017-1914-5).
 22. Polit DF, Beck CT. The content validity index: are you sure you know what's being reported? Critique and recommendations. *Res Nurs Health*. 2006;29(5):489-97. doi: [10.1002/nur.20147](https://doi.org/10.1002/nur.20147).
 23. Zainaghi I, Cilluffo S, Lusignani M. Identification and validation of an instrument to measure physicians' and nurses' knowledge, attitudes, and practices regarding antibiotic resistance and antimicrobial stewardship. *Int J Crit Care*. 2024;18(3):34-50. doi: [10.29173/ijcc89](https://doi.org/10.29173/ijcc89).
 24. Mallah N, Rodríguez-Cano R, Badro DA, Figueiras A, Gonzalez-Barcala FJ, Takkouche B. Development and validation of a knowledge, attitude and practice questionnaire on antibiotic use in Arabic and French languages in Lebanon. *Int J Environ Res Public Health*. 2022;19(2):687. doi: [10.3390/ijerph19020687](https://doi.org/10.3390/ijerph19020687).
 25. Wang L, Liang C, Yu H, Zhang H, Yan X. Reliability and validity evaluation of the appropriate antibiotic use self-efficacy scale for Chinese adults. *BMC Public Health*. 2022;22(1):1344. doi: [10.1186/s12889-022-13729-1](https://doi.org/10.1186/s12889-022-13729-1).
 26. Tavakol M, Dennick R. Making sense of Cronbach's alpha. *Int J Med Educ*. 2011;2:53-5. doi: [10.5116/ijme.4dfb.8dfd](https://doi.org/10.5116/ijme.4dfb.8dfd).