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Research Article

DEVELOPMENT AND VALIDATION OF A QUESTIONNAIRE ASSESSING KNOWLEDGE, ATTITUDE, AND PRACTICE TOWARD ANTIBIOTIC USE AMONG PARENTS

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ABSTRACT

Objective: Antibiotics can only treat serious bacterial infections. However, public's misconception, that antibiotics cure every disease including viral infections leads to misuse. Common practices such as irregular intake, self-medication, and obtaining antibiotics without prescription contribute to antimicrobial resistance, which is threatening global health. This study aims to develop and validate appropriate scales to measure parents' knowledge, attitudes, and practices (KAPs) regarding antibiotic use.

Methods: A questionnaire on assessing KAP about antibiotic use was constructed and tested among the parents in Kedah, Malaysia. Reliability and test-retest stability were assessed using Cronbach's alpha and the intraclass correlation coefficient. Factor analysis confirmed construct validity, with items expected to load strongly on single factors. Data were collected June–August 2024 from parents of children ≤12 years.

Results: Reliability testing showed a very high internal consistency and test-retest reliability (all scales score higher than 0.7 on Cronbach's alpha). Exploratory analysis for attitudes revealed four factors, and for practices, two, with good variance accounted for (>70%). Items with loadings <0.4 were eliminated. Kaiser-Meyer-Olkin (KMO) measure > 0.6 and Bartlett's test p<0.001 confirmed data adequacy. Of the 46 young, educated Chinese parents involved, knowledge and attitude scores were moderate according to Bloom's criteria.

Conclusion: The final tool included 17 items of knowledge, 11 of attitude, and 9 of practice, which all showed validity and reliability. Participants had moderate knowledge, a neutral attitude, and practices. Further validation is recommended before wider use.

Keywords: Antibiotics, Pediatrics, Parents knowledge, Questionnaire development, Validity, Reliability

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INTRODUCTION

When used correctly, antibiotics are known to treat life-threatening infectious illness. Among the public, misconceptions about antibiotics as a treatment able to treat infectious diseases originating from any sources of micro-organism are limited to their stigma. These misunderstandings often result in major issues of incorrect use of antibiotics. Skipping doses of antibiotic, not taking the medications at regular intervals, self-medication, getting antibiotic without a prescription, among others, comprise the incorrect usage of antibiotics. Unsuitable use of antibiotics will cause a major public health issue of antibiotic resistance [1]. Antibiotic resistance is merely due to antibiotic usage due to inappropriate use of antibiotic [2]. Known to be a common, worldwide prescribed drug, antibiotic has medicinal use to cure several sorts of infections, mostly from bacteria. Still, people believe that antibiotics are useful for treating both viral and bacterial infections. According to research in Malaysia, 60% of respondents believed that general practitioners would prescribe antibiotics for common cold and cough [3]. Antimicrobial resistance (AMR) is among the main global public health and development risks. In 2019, bacterial AMR directly caused 1. 27 million worldwide deaths; it also contributed to 4.95 million deaths [4].

Through the creation of the Malaysian action plan on AMR (MyAP-AMR), Malaysia's attempts to solve AMR are also evident. Since AMR is not restricted to one industry, the "One Health" approach includes all sectors – human, animal, and environmental health. The first MyAP-AMR in 2017–2021 defined containment plans for AMR and created a coordinating body to supervise such initiatives. Inclusion of environmental and plant health, strengthening AMS programs, and continuing emphasis on infection prevention and control guarantee long-term sustainability of effective antibiotics (MyAP-AMR) [5]. Parental understanding of antibiotics is still not sufficiently researched in Malaysia, therefore creating major knowledge voids on how to properly treat their overuse. Particularly in the pediatric population, parents are the key implementers on sensible and unethical antibiotic usage. Few studies have linked antibiotic overuse among parents with low knowledge, attitude, and practice (KAP). Consequently, this study was carried out with the aims of creating scales to measure parental KAPs toward using antibiotics usage as well as to evaluate the reliability and validity of these scales among parents (both mom and father).

METHODS

The tool was developed by the research group, including three pharmacists from a private university, by creating a draft questionnaire. Eighteen items on awareness about antibiotic use (Q1-Q18), 13 on attitude toward antibiotic use (Q19-Q31), and eleven on practice about antibiotic use (Q32-Q42), and general demographics composed the first draft. Published research on antibiotic consumption guided the choice of products. Second, the study team had several group chats on the draft. Item Q17 from knowledge, Q3, Q9 from attitude and Q5, Q8 from practice were ruled out at this point and decided to exclude. Consensus was found that all the remaining items were pertinent to the research goals and, at face value, assess what they are meant to measure. The second draft was then developed with a few demographics – sex, age, race, education, and instructions for respondents. Then the second draft was accepted as the ultimate questionnaire. From the knowledge

section, 17 items were in the final questionnaire: eleven items from attitude and 9 from practice. The second draft was pre-tested to make sure the questions were clear to the target respondents. Finally, the scoring standards for each scale were decided [6]. The percentage of correct answers determined the score for the knowledge scale. The total score divided by the maximum possible score times one hundred determined the scores for attitude and practice scales. Thus, all scales' scores range from 0 to 100, with a higher score representing more or better knowledge on the related items.

Participants and settings

Survey was done among Kedah, Malaysia's general populace – mother and father alike. June–August 2024 marked two occasions for the participants to self-administer the questionnaire at intervals ranging from 4 to 10 days. Parents of children ≤12 were included in the study. The convenience sampling method was used to choose the respondents. Data collectors approached each eligible participant to solicit those who agreed to participate. The study was approved by the Institutional Ethical Committee (AUHEC/FOP/14/10/2024/PhD) and registered in NMRR (ID: NMRRID-23-00492-JQR).

Pre-study sample counts were predicted as follows: extreme groups comparison was intended for the evaluation of the knowledge scale construct. At 0.80 power and 0.05 alpha level, at least 25 respondents were needed in each group to identify a standard effect size of 0.8 between any couple. The sample size per group is 16 divided by the squared standardized effect size [7]. Through exploratory factor analysis (EFA), the attitudes and behavior scale construct was intended to be evaluated. At least 40 persons were required to obtain the sample size based on a rule of thumb of at least 5 responders per item.

Data were examined using SPSS version 21. The proportion of responders selecting each response option to an item defines the frequency of endorsement. Cronbach's alpha and item-partial total correlation coefficients helped to evaluate the homogeneity of the objects in each scale. Intraclass correlation coefficient (ICC) evaluated the test-retest dependability of every scale score. In general, Cronbach's alpha should be at least 0.70 [6]. See the ICC value as follows: 0.00–0.40 poor to fair; 0.41–0.60 moderate; 0.61–0.80 substantial; 0.80–1.00 almost perfect. The length of the interval for test-retest of 4–10 days was determined from a prior study [8]. EFA using the principal factor method evaluated the construct validity of the attitudes and practice scales. Before the research, it was hypothesized for both scales that all objects would load strongly (factor loading ≥0.4) on one factor only. All score estimates were done at a 95% confidence level.

RESULTS

Based on a previously mentioned literature review, one of the writers developed an early form of the tool. Four specialists in clinical pharmacy and pharmacy practice – including a practicing doctor from a private clinic in Kedah, Malaysia assessed the content validity of the tool. The panel met several times to consider the comprehensiveness of the survey, the suitability of the items, and the clarity of the language. Each panel member had to approve every object; should disagreement exist, the item was then ironed until everyone agreed. Paper surveys were given to a convenience sample of those who visited public places, including private pediatric clinics and malls. Those who met the inclusion criteria were given a more thorough explanatory information sheet and a briefing on the goals of the research. Those who agreed to take part then promptly finished the survey and signed a consent form. The main investigator got back all the finished questionnaires for more handling.

Table 1 shows that the items in the KAP were homogeneous, as shown by good Cronbach's alpha value by >0.7, and the test-retest reliability was also in the expected range, which is above 0.7. All three scales of the questionnaire, which is KAP proved to be reliable and consistent, with Cronbach's alpha value being found to have been >0.7.

Table 2 shows the pairwise comparisons of overall knowledge scores showed no significant differences by gender, number of children, or education level. This may reflect a relatively homogeneous sample with similar access to information on antibiotic use, consistent knowledge levels across groups, and small effect sizes. In addition, formal education may not directly translate into health-specific literacy, and parental experience may influence habits rather than evidence-based knowledge. These findings suggest that demographic factors alone may not strongly predict parental antibiotic knowledge, underscoring the need for targeted educational interventions.

Table 3 KMO values for attitude and behavior were found to be above 0.6, demonstrating the sufficiency of the samples. p-value was likewise <0.001. To ascertain the greatest number of components, the Kaiser-criterion (eigenvalue>1) as well as scree plot were investigated. The scale's factor loading for items <0.4 was removed. The attitudes scale has two items (Q6 and Q11), while the practice scale has one item found factor loading <0.4; these are eliminated from the scale. With an eigenvalue more than one, attitude scale has four factors with a total variance of 72.81, which is over 60%. There were two factors with eigenvalue more than one on practice scale with a total variance 71.98%.

Tables 4 and 5 present the exploratory factor analyses performed using Principal Component Analysis (PCA) with Varimax rotation for the attitude and practice sections of the Parent Antibiotic Use Questionnaire. Sampling adequacy was acceptable (KMO=0.638–0.688), and Bartlett's Tests of Sphericity were significant (p<0.001), confirming the suitability of the data for factor analysis. Components with eigenvalues

Table 1: Scale alpha and test-retest intra-class correlation

Scale	Cronbach's alpha	Test retest intra-class correlation coefficient
Knowledge	0.87	0.86
Attitude	0.91	0.89
Practice	0.78	0.74

Table 2: Pairwise comparison of overall Knowledge score with gender, number of children and education

Variable	Mean difference	95% confidence interval	p-value
Mothers' versus Fathers	−1.130	−2.417, 0.156	0.82
1 child versus more than 1 child	2.6	−0.655, 5.855	0.109
Higher education versus lower education	−1.2	−4.44, 2.04	0.42

Table 3: Attitude and practice items with eigenvalues

Attitude (KMO value-0.68) Significant at <0.001		Practice (KMO value-0.63) Significant at <0.001	
Item	**Total eigenvalues**	**Item**	**Total eigenvalues**
1	5.291	1	3.639
2	1.915	2	2.043
3	1.254	3	0.781
4	1.005	4	0.588
5	0.766	5	0.550
6	0.686	6	0.396
7	0.595	7	0.222
8	0.444	8	0.147
9	0.357	9	0.118
10	0.250		
11	0.216		
12	0.148		
13	0.072		

Table 4: Rotated component matrix for parent antibiotic use questionnaire (attitude)

Item No.	Item description	Component 1	Component 2	Component 3	Component 4
9	I can store leftover antibiotic in refrigerator for future use.	0.808	—	—	—
11	I believe respiratory viruses disappear in a week or two even when not treated with antibiotics.	−0.790	—	—	—
6	If I forgot to give an antibiotic dose to my child, I could give the missed dose as soon as I remember.	−0.725	—	—	—
5	I can give antibiotic to my child as a precautionary measure.	0.665	—	—	—
2	I would ask my doctor to prescribe antibiotics for URTI (flu, cough, runny nose, sore throat).	0.605	—	—	—
4	Antibiotics should not be used in children unless necessary.	0.584	—	—	—
10	I believe children with flu-like symptoms recover more quickly with antibiotics.	0.369	—	—	—
13	It is ok to use non-refrigerated antibiotic suspension.	—	0.852	—	—
8	I can only use reconstituted antibiotic suspension for a maximum of 5 days.	—	0.758	—	—
1	I would like to keep antibiotic powder at home in case I need it.	—	0.751	—	—
3	I prefer to give antibiotic to my child only after consulting a doctor.	—	—	0.887	—
7	I always make sure my child completes the entire antibiotic course.	—	—	0.750	—
12	I can share my child's antibiotic with siblings if they need it.	—	—	—	0.862

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. Loadings <0.30 are suppressed for clarity. Rotation converged in 7 iterations.

Table 5: Rotated component matrix for parent antibiotic use questionnaire (practice)

Item No.	Item statement	Factor 1	Factor 2	Factor 3
1	I give antibiotic to my children when they are sick.	0.902	–	–
5	I mix my child's antibiotic with any food or drink.	0.900	–	-
3	I reconstitute antibiotic powder to suspension for my child.	0.853	–	-
7	I stop giving antibiotic to my child when they start recovering.	0.816	–	-
9	I use household spoon to administer drug to my child.	0.671	–	-
10	I forgot to keep my child's antibiotic in refrigerator.	0.911	–	-
2	I purchase antibiotic without doctor's prescription.	0.886	–	-
4	I shake antibiotic suspension before giving to my child.	-	-	0.801
6	I store my child's antibiotic suspension in refrigerator after every use.	–	-	0.780
8	I check the expiry date before giving antibiotic to my child.	–	-	0.661

Extraction method: Principal component analysis. Rotation method: Varimax with Kaiser normalization

>1 were retained, accounting for approximately 72–73% of the total variance. The attitude section yielded four components: Misuse and Misconceptions, Storage and Stability Knowledge, Adherence and Consultation, and Sharing Practices. The Practice section produced three components: Improper Administration, Storage Negligence and Access, and Proper Handling.

Forty-six respondents, comprise mother and father, were included in the study. The characteristics of the respondents were shown in Table 6, most of the participants were under the age of 21–30 years (54.3%) with Chinese race (63%) and more than half of the respondents were having bachelor's degree (60.9%).

There was a total of 17 items for knowledge scale. Items 3, 7, and 15 were negative; score given were 1 for no and 0 for yes; the remaining were positive, where yes scores 1 and no scores 0. Respondents had a good understanding on most items, but only items 7, 13, 14, and

Table 6: Participants' characteristics

Variable	n (%)
Age	
21–30 years	25 (54.3)
30–40 years	12 (26.1)
>41 years	9 (19.6)
Gender	
Males	23 (50)
Females	23 (50)
Race	
Chinese	29 (63)
Indian	10 (21)
Malay	6 (13)
Others	1 (2.2)
Education Status	
Secondary	10 (21.7)
Bachelors	28 (60.9)
Post-graduate	8 (17.4)

15 demonstrate moderate knowledge. Classifying the respondents' overall knowledge, which turned out to be 66.5%, Bloom's Cutoff points determined that level to be moderate.

As shown in Table 7, a total of eleven questions in the attitude scale. Items 3, 4, 6, 7 and 10 were positive; scoring was as strongly agree as 5, agree as 4, neutral as 3, disagree as 2 and strongly disagree as 1. Whereas items 1, 2, 5, 8, 9 and 11 are negative ones; scoring for these was provided as strongly disagree as 5, Disagree as 4, neutral as 3, agree as 2, and strongly agree as 1. Average of items 2 and 10 is <2.5, which shows a negative attitude where the other items were above 2.5, showing neutral or positive attitude. Five marks were allotted for every individual question's highest score. Based on bloom's cut-off points, the respondents' average attitude score was 44. 52 out of 65 (68.49%) regarded moderate.

Practice scale consists of nine items as shown in Table 8. Items 3, 5 and 7 were positive; scoring was assigned as very often as 5, often as 4, sometimes as 3, rare as 2 and very rare as 1. Whereas items 1, 2, 4, 6, 8, and 9 are negative ones; scoring for these was given as very rare at 5, rare as 4, sometimes as 3, as often 2 and very often as 1. Average of all the items in this scale was over 2.5. Five marks were designated for every single item as maximum. Based on bloom's cut-off points, the respondents' overall practice score was 32.7 out of 45 (72. 75%), rated as moderate. According to bloom's cutoff point, respondents were having moderate level of KAP as shown in Table 9.

Table 7: Frequency (%) of endorsement for attitude toward antibiotic use

Item	Strongly agree (n, %)	Agree (n, %)	Neutral (n, %)	Disagree (n, %)	Strongly disagree (n, %)
Q1	11 (23.9)	12 (26.1)	8 (17.4)	8 (17.4)	7 (15.2)
Q2	15 (32.6)	13 (28.3)	10 (21.7)	3 (6.5)	5 (10.9)
Q3	1 (2.2)	2 (4.3)	2 (4.3)	28 (60.9)	13 (28.3)
Q4	1 (2.2)	2 (4.3)	10 (21.7)	18 (39.1)	15 (32.6)
Q5	13 (28.3)	11 (23.9)	5 (10.9)	9 (19.6)	8 (17.4)
Q6	26 (56.5)	17 (37.0)	3 (6.5)	0	0
Q7	12 (26.1)	12 (26.1)	16 (34.8)	3 (6.5)	3 (6.5)
Q8	9 (19.6)	11 (23.9)	7 (15.2)	11 (23.9)	8 (17.4)
Q9	12 (26.1)	15 (32.6)	11 (23.9)	3 (6.5)	5 (10.9)
Q10	0	3 (6.5)	4 (8.7)	21 (45.7)	18 (39.1)
Q11	2 (4.3)	9 (19.6)	12 (26.1)	15 (32.6)	8 (17.4)

Table 8: Frequency (%) of endorsement for practice on antibiotic use

Item	Very often	Often	Sometimes	Rare	Very rare
Q1	13 (28.3)	7 (15.2)	14 (30.4)	7 (15.2)	5 (10.9)
Q2	0	0	5 (10.9)	17 (37.0)	24 (52.2)
Q3	2 (4.3)	34 (73.9)	6 (13.0)	4 (8.7)	0
Q4	7 (15.2)	9 (19.6)	8 (17.4)	13 (28.3)	9 (19.6)
Q5	1 (2.2)	28 (60.9)	10 (21.7)	5 (10.9)	2 (4.3)
Q6	11 (23.9)	7 (15.2)	9 (19.6)	12 (26.1)	7 (15.2)
Q7	5 (10.9)	35 (76.1)	5 (10.9)	1 (2.2)	0
Q8	15 (32.6)	11 (23.9)	12 (26.1)	5 (10.9)	3 (6.5)
Q9	0	1 (2.2)	14 (30.4)	13 (28.3)	18 (39.1)

Table 9: Overall, knowledge, attitude and practice of parents toward antibiotic use

Scale	Total score (%)	Mean (SD)	Bloom's Cut-off category
Knowledge	66.5	11.3 (3.312)	Moderate
Attitude	68.18	37.5 (4.43)	Neutral
Practice	72.75	32.73 (4.78)	Moderate

Mean±SD: Knowledge=11.3±3.31, Attitude=37.5±4.43, Practice=32.73±4.78.
SD: Standard deviation

DISCUSSION

A new scale for measuring antibiotic KAP has been created and put through psychometric testing. Since the tool may be utilized to assess the level of KAP, a focused intervention might be created to improve these areas and optimize antibiotic consumption habits.

Statistical analysis was performed with the statistical program Version 21. To evaluate the scale's internal consistency, Cronbach alpha found above 0.7 was used. Cronbach's alpha for the three scales shown in Table 6 is more than 0.75. The internal consistency of the generated elements was assessed using the inter-item correlation matrix and Cronbach's alpha. In addition reviewed and found to be above 0.7, the ICC.

EFA was conducted using the PCA extraction method with Varimax rotation and Kaiser normalization for analyzing both attitude and practice constructs. The principal method of factor analysis was used here instead of the usual normal component factor analysis, as the latter assumes a uniqueness of nil [9]. Uniqueness refers to the percentage of variance for an item not accounted for by the common factors, while 1 minus uniqueness is termed communality. The uniqueness value is a high indicator that the item is poorly explained by the factors. Some items had endorsement rates of <0.2 or more than 0.8, but the negative effect on psychometric properties of both scales was buffered by high mean item-partial total correlations [6].

Descriptive statistics were calculated for participant demographics and other gathered data, including gender, degree of attained age, number of children, race education, monthly income, and knowledge scale. For every participant, the total number of correct answers was determined; higher scores reflected more appropriate antibiotic use and better understanding of them. For the correct assertion, attitude scale points were given as 5- very agree, 4- agree, 3- impartial, 2- disagree, and 1- very disagree. Scores were opposite for the false statement. For correct assertions as well, practice scores were given as 5 – very frequently, 4 – often, 3 - sometimes, 2 – rare, 1 – very rare, and vice versa for incorrect statements.

Research in Bangladesh found many parents misconstrued the appropriate use of antibiotics, especially in differentiating between bacterial and viral infections [10]. The results of our research show 60.86% able to identify bacterial and viral infections. A study observed a general ignorance of the need of finishing antibiotic courses and refraining self-medication [11]. In contrast, 70.86% of our study participants agreed on finishing the course of antibiotics. Behavioral changes were not always certain [12]. The global study on antibiotic usage revealed 66.49%, which falls under moderate according to Bloom's cutoff point. One study found increased unnecessary antibiotic use, some knowledge declined a year later, and self-medication rates for parents remained unchanged, suggesting a limited and short-term impact [13]. Pilot study found significant reductions in antibiotic prescribing for ARIs (25% for pediatric and 22% for adult patients) and better knowledge/attitudes among doctors [14]. Though surprisingly most were not worried about antibiotic resistance, the research revealed parents were hesitant regarding antibiotics, noted overuse, preferred alternatives, and had concerns about side effects [15] and necessitates the need to increase the rationality of antibiotic usage [16]. Our findings showed 88.26% agreed on antibiotics to be taken after consulting with doctor. This study results also indicated similar awareness among participants that antibiotics have adverse effects (73.91%). The Jordanian study found considerable gaps, including 72.4% thought antibiotics should be taken for fever and many self-administrating medicines [17]. My findings say 39.13% of those surveyed believed that antibiotics should not be used for upper respiratory tract infections (URTIs), including sore throat, cold, etc.

According to one study, 60.6% had unfavorable attitudes toward antibiotics [18]. 59.9% shown adverse attitudes [19]. The neutral attitude observed in this study should be interpreted cautiously in light of important methodological limitations. The sample size was relatively small and lacked demographic diversity, which may have constrained the variability of attitude scores and produced a more neutral overall mean. In addition, most participants were highly educated, a factor known to influence perceptions and reduce the likelihood of expressing unfavorable or adverse attitudes. This demographic profile differs from the populations in previous studies that reported unfavorable attitudes, which often included more heterogeneous groups with varying educational backgrounds. The presence of a mid-point in the Likert scale may also have encouraged participants to select a neutral option, especially in an online self-administered format where social desirability bias can influence responses. These contextual factors may

collectively explain why this study found a neutral attitude, contrasting with the unfavorable or adverse attitudes reported elsewhere.

Most participants viewed the suitable usage of antibiotics favorably [20]. This differs from results from a tertiary hospital in Jordan, where 1301 parents were polled and a high prevalence of unsuitable attitudes was discovered [17]. A more local study carried out among parents of kindergarten pupils in Kuala Lumpur (n=169) showed that parents mostly had good attitudes toward antibiotic use in URTIs, with educational level and income greatly correlated with attitude scores [21]. Current research revealed neutral attitudes among the responders, 68.18, and moderate practice among parents, 72.75%, toward suitable usage of antibiotics, which was categorized according to Bloom's cut-off point.

Several important limitations must be acknowledged when interpreting the findings of this study. First, the sample size (n=46) was substantially below the recommended threshold for robust EFA. Although an a priori sample size calculation was performed, the final number of participants did not meet commonly cited guidelines, such as the "10 participants per item" rule, which would have required a sample of more than 400 for the original 42-item scale. Therefore, the factor structure identified in this study may be unstable and should be viewed as preliminary. Second, the sample was highly homogenous – predominantly Chinese, young, and highly educated – which does not reflect the broader, multi-ethnic Malaysian parent population and significantly limits the generalizability of the findings. Given these constraints, the present study should be considered a pilot validation restricted to this specific subgroup, and further research with substantially larger and more diverse samples is required to confirm the factor structure and strengthen external validity.

CONCLUSION

The final tool consisted of three measuring scales: Seventeen items on knowledge, eleven items on attitude, and nine on practice scales. For the population under study, all three measures were valid and dependable. It was discovered that participants had a modest level of knowledge about the use of antibiotics and a neutral attitude and practice regarding their use. Before the instrument is widely utilized, more study is needed to determine its validity and reliability.

AUTHORS' CONTRIBUTION

SP – Concept, data collection, data analysis, manuscript
SS – Concept, manuscript
ER – Data collection, manuscript
GPB – Data collection, data analysis, manuscript.

CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest.

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REFERENCE

1. World Health Report. A Safer Future-Global Public Health Security in the 21st Century. Geneva: World Health Organization; 2007.
2. Centers for Disease Control and Prevention. Antibiotic Resistance. Atlanta: CDC; 2015. Available from: https://www.cdc.gov/getsmart/community/about/antibiotic-resistance-faqs.html
3. Lim KK, Teh CC. A cross sectional study of public knowledge and attitude towards antibiotics in Putrajaya, Malaysia. South Med Rev. 2012;5(2):26-33. PMID 23532680
4. Antimicrobial Resistance Collaborators. Global burden of bacterial antimicrobial resistance in 2019: A systematic analysis. Lancet. 2022;399(10325):629-55. doi: 10.1016/S0140-6736(21)02724-0, PMID 35065702
5. Ministry of Health Malaysia. Ministry of Agriculture and Agro-Based Industry Malaysia. Malaysian Action Plan on Antimicrobial Resistance (MyAP-AMR) 2017-2021. Putrajaya, Malaysia: Ministry of Health; 2017.
6. Streiner DL, Norman GR. Health Measurement Scales a Practical Guide to their Development and Use. 4th ed. New York: Oxford University Press; 2008. p. 507.
7. Machin D, Campbell MJ, Tan SB, Tan SH. Sample Size Tables for Clinical Studies. 3rd ed. Oxford, UK: John Wiley and Sons Limited; 2009. p. 314.
8. Marx RG, Menezes A, Horovitz L, Jones EC, Warren RF. A comparison of two time intervals for test-retest reliability of health status instruments. J Clin Epidemiol. 2003 Aug;56(8):730-5. doi: 10.1016/S0895-4356(03)00084-2, PMID 12954464
9. Acock AC. Discovering Structural Equation Modeling using Stata. Texas: Stata Press; 2013. p. 306.
10. Islam MW, Shahjahan M, Azad AK, Hossain MJ. Factors contributing to antibiotic misuse among parents of school-going children in Dhaka City, Bangladesh. Sci Rep. 2024;14(1):2318. doi: 10.1038/s41598-024-52313-y, PMID 38282010
11. El-Din MA. Assessment of parental knowledge, attitudes and practice towards antibiotic use in Egyptian pediatric community, Qalyubia. Egypt J Hosp Med. 2024;94:24.
12. Hansen MB, Rasmussen IS, Marloth T, Jarløv JO, Arpi M, Mogensen D, *et al*. A pre-post intervention study: knowledge among parents about child infections and antibiotic use facilitated by maternal and child health nurses. Nurs Open. 2022;10(2):641-8. doi: 10.1002/nop2.1330, PMID 36097329
13. Ivanovska V, Angelovska B, Van Dijk L, Zdravkovska M, Leufkens HG, Mantel-Teeuwisse AK. Change in parental knowledge, attitudes and practice of antibiotic use after a national intervention programme. Eur J Public Health. 2018 Aug;28(4):724-9. doi: 10.1093/eurpub/ckx240, PMID 29325065
14. Kandeel A, Palms DL, Afifi S, Kandeel Y, Etman A, Hicks LA, *et al*. An educational intervention to promote appropriate antibiotic use for acute respiratory infections in a District in Egypt-pilot study. BMC Public Health. 2019;19 Suppl 3:498. doi: 10.1186/s12889-019-6779-0, PMID 32326918
15. Szymczak JE, Klieger SB, Miller M, Fiks AG, Gerber JS. What parents think about the risks and benefits of antibiotics for their child's acute respiratory tract infection. J Pediatr Infect Dis Soc. 2018;7(4):303-9. doi: 10.1093/jpids/pix073, PMID 28992328
16. Karuniawati H, Anjani RH, Utami K, Ismail WI. Evaluation of quantitative and qualitative use of antibiotics in community health centers, Boyolali District, Indonesia. Int J Appl Pharm. 2024;16(6):61-5.
17. Hammour KA, Jalil MA, Hammour WA. An exploration of parents' knowledge, attitudes and practices towards the use of antibiotics in childhood upper respiratory tract infections in a tertiary Jordanian Hospital. Saudi Pharm J. 2018;26(6):780-5. doi: 10.1016/j.jsps.2018.04.006, PMID 30202217
18. Nshimiyimana M, Habtu M, Manishimwe F, Ndayisenga J, Murekatete A. Parental knowledge, attitudes and practices on antibiotics use for childhood upper respiratory tract infections in Kicukiro District, Rwanda. J Med Nurs Public Health. 2022;5(2):109-30. doi: 10.53819/81018102t5062
19. Paredes JL, Navarro R, Watanabe T, Morán F, Balmaceda MP, Reateguí A, *et al*. Knowledge, attitudes and practices of parents towards antibiotic use in rural communities in Peru: A cross-sectional multicentre study. BMC Public Health. 2022;22(1):459. doi: 10.1186/s12889-022-12855-0, PMID 35255863
20. Qu W, Wang X, Liu Y, Mao J, Liu M, Zhong Y, *et al*. Self-medication with antibiotics among children in China: A cross-sectional study of parents' knowledge, attitudes, and practices. Infect Drug Resist. 2023;16:7683-94. doi: 10.2147/idr.s431034, PMID 38144221
21. Shah NM, Rahim MA. Parental knowledge, attitudes and practices (KAPs) on the use of antibiotics in children for upper respiratory tract infections (URTIs). Int J Pharm Pharm Sci. 2017;9(3):105. doi: 10.22159/ijpps.2017v9i3.15674