Exploring Sociodemographic Factors Influencing Parental Knowledge, Attitude, and Practices towards Antibiotics in Malaysia

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Abstract

Background: Misuse of antibiotics among the general population, particularly parents, contributes significantly to the growing problem of antimicrobial resistance. Understanding parental knowledge, attitudes, and practices (KAP) regarding antibiotic use is essential for guiding public health interventions.

Objective: To explore sociodemographic factors influencing parental knowledge, attitude, and practice towards antibiotics in Malaysia.

Methods: A cross-sectional study was conducted in the state of Kedah, Malaysia, from June 2024 to December 2024. Data collection was conducted both online and in person. A total of 983 parents participated. Overall, knowledge, attitude, and practice scores were categorised according to Bloom's cut-offs: high (80-100%), moderate (60-79%), and low (<60%). Data were analysed using IBM SPSS version 26 and Jamovi version 2.3.28.

Results: The overall median knowledge score was 13 (IQR=8-18), with 70.21% had moderate knowledge. The median attitude score was 32 (IQR=30-34), with 59.09% of participants having a negative attitude. The median practice score was 28 (IQR=24-33), with 61.18% at the moderate practice level. In multivariable regression analysis, adequate knowledge and a positive attitude were found to be associated with gender, race, age, number of children, education, monthly income, and residence. All of the patients' features were associated with good practices except the number of children.

Conclusion: Parental knowledge, attitude, and practice regarding antibiotic use were generally moderate in this convenience sample from Kedah, Malaysia; however, important misconceptions and inappropriate practices persist. These findings provide context-specific evidence that may inform the design of targeted educational interventions for parents with lower educational levels and those residing in rural areas in similar settings, rather than serving as nationally generalizable policy recommendations.

Keywords: *Antibiotics, parents, knowledge, attitude, practice, antimicrobial resistance, Malaysia.*

INTRODUCTION

Antibiotics have transformed modern medicine by effectively treating bacterial infections and reducing illness and death worldwide. However, the rising misuse and overuse of antibiotics have caused a serious increase in antibiotic resistance. This resistance poses a major threat to global public health. Misuse of antibiotics, including overuse and inappropriate prescribing, is a key contributor to this growing problem [1]. It leads to longer hospital stays, higher medical costs, and increased death rates, making it harder to manage infectious diseases [2]. Inappropriate use of antibiotics is often due to factors like lack of knowledge, misconceptions, and wrong attitudes among the public, especially parents who care for children [3]. This study is conceptually guided by the Knowledge-Attitude-Practice (KAP) framework, which posits a sequential relationship in which knowledge influences attitudes, which in turn shape health-related practices. According to this framework, inadequate knowledge may lead to unfavourable attitudes and inappropriate practices, particularly in the context of medication use. In addition, elements of the Health Belief Model support this approach by suggesting that individuals' health behaviours are influenced by their perceptions of susceptibility, severity, benefits, and barriers, as well as by modifying factors such as age, gender, education, income, and place of residence. These sociodemographic characteristics play an important role in shaping access to information, health literacy, risk perception, and decision-making related to antibiotic use. Therefore, examining sociodemographic determinants of parental KAP is theoretically justified and essential for identifying population subgroups at higher risk of inappropriate antibiotic use [4]. Parents play a key role in decisions about antibiotic use for their children, particularly for common illnesses such as upper respiratory infections and fever. These conditions are often viral and self-limiting, so they do not require antibiotic treatment. However, pressure from parents on healthcare providers and self-medication significantly contribute to the misuse of antibiotics in children [5]. Assessing parents' knowledge, attitudes, and practices (KAP) about antibiotic use is essential for understanding behaviours that lead to misuse and for creating targeted educational efforts [6]. Previous

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studies in different settings have shown gaps in parental understanding. Many believe incorrectly that antibiotics work against viral infections and lack awareness of the risks of antibiotic resistance [7]. Additionally, factors such as education level, income, and location have been linked to differences in KAP, underscoring the need for approaches tailored to specific contexts [8]. Despite global efforts to promote sensible antibiotic use, there is limited data in Malaysia regarding parental KAP toward antibiotics. Understanding local parental views and behaviours is important for developing suitable interventions and policies to improve antibiotic use in the community. Compared to previous Malaysian studies, this study provides novel insights by including a larger, more diverse sample of parents across both urban and rural areas of Kedah, Malaysia. In addition, it employs regression modeling to identify sociodemographic predictors of parental knowledge, attitudes, and practices regarding antibiotics, enabling a more detailed understanding of the factors influencing inappropriate antibiotic use. By integrating the KAP framework with elements of the Health Belief Model, the study also provides a theoretically grounded approach to interpreting parental behaviours. Therefore, this study aimed to explore sociodemographic factors influencing parental knowledge, attitudes, and practices regarding antibiotics in Malaysia.

METHODOLOGY

A cross-sectional study was conducted in the state of Kedah, Malaysia, from June 2024 to December 2024, among the public (parents). Ethical approval was obtained from the Institutional Ethical Committee (AUHEC/FOP/27/10/2023/PhD). Participation was voluntary with their consent, anonymous, and confidential. Respondents were informed of their right to withdraw at any stage without any consequence.

Inclusion criteria included parents aged 18 years or above, having at least one child aged 12 years or below, being able to read and understand English or Malay, and providing informed consent. Parents without children under 12 years during the study period were excluded.

A convenience sampling technique was employed. The sample size was calculated using the OpenEpi calculator, assuming a 50% prevalence of correct knowledge about antibiotics, a 5% margin of error, and a 95% confidence level, yielding a minimum required sample size of 384 participants. However, a total of 983 valid responses were included in the final analysis.

Data collection was conducted both online and in person. The online survey was distributed *via* social media groups targeting parents residing in Kedah, Malaysia. Before proceeding the survey, participants were required to fill out the consent form. Only respondents living in Kedah and meeting the inclusion criteria were included in the analysis. Therefore, the study sample is state-specific, and findings should be interpreted as representative of parents in Kedah only. In-person data collection was conducted by distributing printed questionnaires to trained personnel. A convenience sampling technique was employed to recruit participants due to logistical constraints and the dispersed nature of the target population across urban and rural areas of Kedah, Malaysia.

A structured, self-administered questionnaire was developed based on existing literature and reviewed by three general practitioners for content validity. The tool included three domains: knowledge (17 dichotomous items, scored 0 for incorrect and 1 for correct), attitude (11 items, 5-point Likert scale), and practice (9 items, 5-point Likert scale). A pilot test was conducted with 30 respondents to assess clarity and reliability; Cronbach's alpha values exceeded 0.70 across all domains, indicating acceptable internal consistency. The study questionnaire is attached as a supplementary file.

There were a total of seventeen items for the knowledge scale. Items 3, 7, and 15 were negative; scores were 1 for no and 0 for yes; the remaining items were positive, with yes scores 1 and no scores 0. Attitude scale consists of eleven items where 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. The practice scale consists of 9 items, of which 3, 5, and 7 were positive; responses were scored as very often (5), often (4), sometimes (3), rare (2), and very rare (1). Whereas items 1, 2, 4, 6, 8, and 9 are negative ones; scoring for these was given as very rare at 5, rare at 4, sometimes at 3, as often at 2, and very often at 1. Overall, knowledge, attitude, and practice scores were categorised according to Bloom's cut-off categories: high (80-100%), moderate (60-79%), and low (less than 60%) [9].

Data were analysed using IBM SPSS version 26 and Jamovi version 2.3.28. Frequency and percentages were computed for categorical variables. Numerical variables were expressed as medians with interquartile ranges (IQRs). The normality assumption for continuous variables was assessed using the Shapiro-Wilk test. For regression analyses, knowledge, attitude, and practice scores were dichotomised using Bloom's cut-off criteria. Scores ≥60% were classified as adequate knowledge, positive attitude, and good practice, while scores <60% were classified as inadequate knowledge, negative attitude, and poor practice. Binary logistic regression analysis was conducted to identify factors associated with knowledge, attitude, and practice levels. First, crude odds ratios with their 95% confidence interval were computed, followed by the computation of adjusted odds ratios. Variables included in the multivariable models were selected based on a combination of theoretical relevance, prior literature on parental KAP,

and univariate screening (p<0.20). Sociodemographic factors such as age, gender, education, income, and place of residence were included in all models due to their established influence on parental knowledge, attitudes, and practices regarding antibiotics. A p-value < 0.05 was deemed statistically significant for the multivariable regression model.

RESULTS

A total of 983 participants were collected in the study. The majority were female and held a bachelor's degree. Most respondents (71.4%) resided in rural areas, and 59.8% identified as Malay, followed by 27.77% Indian and 12.30% Chinese, as detailed in Table **1**.

Table 1: Socio-demographic characteristics of participants (N=983).

Variables	Category	Frequency (N)	Percentage (%)
Gender	Male	383	38.96
	Female	600	60.9
Educational level	Secondary	171	17.3
	Bachelors	491	49.8
	Postgraduate	321	32.6
Monthly household income	B40	299	30.4
	M40	497	50.4
	T20	187	19.0
Place of living	Urban	279	28.3
	Rural	704	71.4
Race	Malay	588	59.8
	Indian	273	27.7
	Chinese	121	12.30
	Others	1	0.1
Age (Years)	21-30	231	23.45
	31-40	499	50.6
	>41	253	25.7
Number of children	1	295	29.9
	2	347	35.2
	>2	341	34.6

Table 2: Summary of overall knowledge, attitude and practice level.

Variable	Median Score	Interquartile Range	Overall (%)	Bloom's Cut-Off Point (Category)
Knowledge	13	8 - 18	70.21	80-100% (High)
Attitude	32	30 - 34	59.09	60-79% (Medium or Neutral)
Practice	28	24 - 33	61.18	<60 (Low or Negative)

As shown in Table **2**, the median knowledge score was 13, and 70.21% had moderate knowledge. The median attitude score was 32, and 59.09% were categorised as having a negative attitude. The median practice score was 28, with 61.18% of respondents showing a moderate level of practice.

Table **3** presents the univariate and multivariable associations between patients' features and adequate knowledge, a positive attitude, and good practices. Knowledge of appropriate antibiotic use was significantly associated with several demographic factors. Males had lower odds of adequate knowledge compared to females (aOR=0.61, 95% CI: 0.44-0.85, p=0.003). Compared with Indians, Chinese participants had lower odds of adequate knowledge (aOR=0.28, 95% CI: 0.16-0.47, p<0.001). Younger age (18-30 years), lower education, and urban residence were associated with lower odds of adequate knowledge, whereas having two children and a monthly income of B40 and M40 were associated with higher odds of knowledge.

For attitude, compared with Indians, Chinese (aOR=4.72, 95% CI: 2.68-8.33, p<0.001) and Malay participants (aOR=4.28, 95% CI: 2.76-6.64, p<0.001) had higher odds of a positive attitude. Older age, bachelor's

Table 3: Univariate and multivariable association patients' features with adequate knowledge, positive attitude, and good practice.

Variable	Knowledge				Attitude				Practice			
	Unadjusted OR (95% CI)	p-value	Adjusted OR (95% CI)	p-value	Unadjusted OR (95% CI)	p-value	Adjusted OR (95% CI)	p-value	Unadjusted OR (95% CI)	p-value	Adjusted OR (95% CI)	p-value
Gender (Male)	0.46 (0.35-0.61)	*<0.001	0.61 (0.44-0.85)	*0.003	0.707 (0.54-0.92)	*0.010	0.91(0.66-1.25)	0.570	1.95 (1.50-2.54)	*<0.001	1.36 (0.96-1.93)	0.820
Race[A]												
Race1-Malay	0.64 (0.45-0.90)	*<0.001	1.03 (0.68-1.57)	0.885	7.33 (5.00-0.75)	*<0.001	4.28 (2.76-6.64)	*<0.001	7.39 (5.28-10.33)	*<0.001	6.97 (4.60-10.58)	*<0.001
Race 2 - Chinese	0.15 (0.09-0.24)	*<0.001	0.28 (0.16-0.47)	*<0.001	6.07 (3.69-9.98)	*<0.001	4.72 (2.68-8.33)	*<0.001	8.24 (5.08-13.34)	*<0.001	4.15 (2.39–7.21)	*<0.001
Age groups												
18-30 years	0.75 (0.52-1.07)	0.121	0.54 (0.35-0.82)	*0.004	0.65 (0.45-0.94)	*0.002	0.84 (0.56-1.25)	0.395	1.32 (0.85-2.06)	0.214	1.37 (0.83-2.23)	0.208
>30 years	2.93 (2.08-4.11)	*<0.001	1.48 (0.99-2.22)	0.055	0.50 (0.37-0.69)	*<0.001	0.55 (0.38-0.81)	*0.003	0.13 (0.10-0.20)	*<0.001	0.24 (0.16-0.36)	*<0.001
Number of Children												
1	0.88 (0.63-1.23)	0.456	1.28 (0.86-1.91)	0.215	1.51 (1.081-2.13)	*0.016	0.84 (0.95-2.08)	0.084	1.46 (1.06-2.00)	*0.019	0.85 (0.55-1.31)	0.476
2	1.20 (0.86-1.67)	0.284	1.61 (1.09-2.39)	*0.016	4.84 (3.49-6.70)	*<0.001	3.14 (2.15-4.58)	*<0.001	1.15 (0.85-1.55)	0.366	0.69 (0.46-1.04)	0.831

Variable	Knowledge				Attitude				Practice			
	Unadjusted OR (95% CI)	p-value	Adjusted OR (95% CI)	p-value	Unadjusted OR (95% CI)	p-value	Adjusted OR (95% CI)	p-value	Unadjusted OR (95% CI)	p-value	Adjusted OR (95% CI)	p-value
Education												
Secondary	0.24 (0.16-0.36)	*<0.001	0.29 (0.18-0.45)	*<0.001	0.84 (0.58-1.23)	0.388	1.14 (0.74-1.76)	0.549	1.71 (1.16-2.50)	*0.006	1.13 (0.71-1.04)	0.594
Bachelors	1.33 (0.96-1.85)	0.083	1.50 (1.03-2.18)	*0.033	0.30 (0.22-0.40)	*<0.001	0.56 (0.40-0.80)	*0.002	1.04 (0.78-1.38	0.796	1.84 (1.25-2.10)	*0.002
Monthly Income												
B40	1.82 (1.25-2.65)	*0.002	1.93 (1.25-2.98)	*0.003	0.85 (0.58-1.24)	0.408	1.38 (0.90-2.13)	0.136	0.33 (0.21-0.50)	*<0.001	0.43 (0.26-0.72)	*<0.001
M40	3.54 (2.47-5.07)	*<0.001	2.15 (1.42-3.26)	*<0.001	0.16 (1.14-2.29)	*0.006	2.21 (1.47-3.33)	*<0.001	0.18 (0.12-0.27)	*<0.001	0.36 (0.22-0.57)	*<0.001
Residence (Urban)	0.42 (0.31-0.56)	*<0.001	0.69 (0.49-0.97)	*0.035	0.58 (0.43-0.77)	*<0.001	0.42 (0.31-056)	*<0.001	2.81 (2.08-3.79)	*<0.001	1.56 (1.07-2.26)	*0.019

CI: Confidence interval, OR: Odds ratio, A: Other' race category merged with Indian (reference) due to low frequency (n=1), *Singificant at p<0.05

education, and urban residence were associated with lower odds of a positive attitude.

Regarding practice, compared with Indians, Chinese (aOR = 4.15, 95% CI: 2.39-7.21, p < 0.001) and Malay participants (aOR = 6.97, 95% CI: 4.60-10.58, p < 0.001) were more likely to demonstrate good practices. Older age and monthly income of B40 and M40 were associated with lower odds of good practice, while bachelor's education and urban residence were associated with higher odds of good practice.

DISCUSSION

This study examined knowledge, attitudes, and practices (KAP) regarding antibiotic use among parents of children aged 12 years or younger. Overall, the findings show moderate levels of knowledge, relatively negative attitudes, and moderate practices regarding antibiotic use.

The median knowledge score was 13, and 70.21% had a moderate level of knowledge. This aligns with results from similar studies, which also found that parents had only a partial understanding, especially regarding the ineffectiveness of antibiotics for viral infections [10, 11]. Misconceptions, such as using antibiotics for colds and flu, remain common, leading to misuse and resistance [12-14]. This moderate knowledge may reflect limited health literacy or insufficient exposure to targeted public health messages about antimicrobial resistance, particularly in rural communities. Cultural norms and reliance on anecdotal experiences may further reinforce misconceptions.

The median attitude score was 32, with 59.09% were categorised as having a negative attitude. Many parents did not acknowledge the importance of completing antibiotic courses and avoiding self-medication. However, some still saw antibiotics as quick fixes, which may stem from cultural attitudes and practices or access issues. Our findings align with earlier research showing that attitudes tend to improve with higher education and greater exposure to healthcare [15, 16]. These patterns suggest that knowledge alone may not be sufficient to shape attitudes; factors such as personal beliefs, prior healthcare experiences, and trust in providers likely play important roles in shaping parental perceptions.

Despite reasonable knowledge and attitudes, the median practice score was 28, with 61.18% showing a moderate level of practice, indicating gaps in proper behaviour. Some parents reported using leftover antibiotics or seeking prescriptions without consulting a healthcare provider. This knowledge-practice gap is a common problem worldwide and is influenced by health literacy, past experiences, and the healthcare system [17, 18].

The gap between knowledge and practice may reflect structural barriers, such as limited access to healthcare, financial constraints, or convenience-seeking behaviours, which prevent parents from translating knowledge into safe practices.

Sociodemographic factors, including education level, gender, income, and place of residence, were significantly associated with KAP scores. Regression analysis confirmed that education and living conditions were strong predictors. Urban residence was associated with higher knowledge and better practices, likely due to greater access to healthcare services and health information. However, it was also linked to lower odds of positive attitudes, which may reflect greater exposure to misinformation, cultural expectations, or busy lifestyles that limit adherence to recommended antibiotic behaviours. This highlights that urban living can have differential effects across KAP domains, underscoring the need for tailored interventions. These findings highlight the importance of tailoring interventions to specific population subgroups. For example, parents with lower levels of education or those living in rural areas may benefit from more accessible, culturally sensitive educational campaigns to promote responsible antibiotic use. Future research should adopt longitudinal study designs to assess changes in parental knowledge, attitudes, and practices over time and to examine temporal relationships better. Interventional studies evaluating the effectiveness of targeted educational or antibiotic stewardship interventions in primary care and

community settings are also recommended. In addition, qualitative studies, such as in-depth interviews or focus group discussions, could provide deeper insights into parental beliefs, cultural influences, and decision-making processes underlying antibiotic use, which are not fully captured through quantitative surveys.

Public Health Implications

These findings point to an urgent need for antibiotic stewardship programs aimed at parents. Culturally appropriate interventions, school-based awareness campaigns, and collaboration with healthcare providers could improve responsible antibiotic use and help reduce antimicrobial resistance. [19, 20] Additionally, understanding the sociodemographic determinants of KAP can help policymakers allocate resources more effectively, ensuring interventions reach the groups most at risk for inappropriate antibiotic use. These findings have direct implications for Malaysian antibiotic stewardship efforts. Moderate knowledge, negative attitudes, and gaps in practice among parents highlight the need to strengthen initiatives such as the Malaysian National Antibiotic Awareness Campaign (MyNAAC) and integrate targeted counselling into routine primary care visits. Healthcare providers can use these insights to identify at-risk groups—particularly parents with lower education or those in rural areas—and deliver tailored education on responsible antibiotic use, reinforce adherence to prescription guidelines, and address common misconceptions. Such measures can enhance the effectiveness of national stewardship policies and support safer antibiotic practices at the community level.

LIMITATIONS

The cross-sectional design precludes causal inference, allowing only associations to be identified.

Self-administered questionnaires may be affected by recall bias and social desirability bias, potentially leading to overreporting of appropriate attitudes and practices. Non-probability sampling and mixed data collection methods (face-to-face and online) may limit generalizability, potentially leading to overrepresentation of parents with better healthcare or digital access. Moreover, a convenience approach may introduce selection bias. Nevertheless, this sampling method enabled efficient data collection from a diverse group of parents and provided valuable exploratory insights into parental knowledge, attitudes, and practices regarding antibiotics.

CONCLUSION

In conclusion, this study demonstrates that parents of young children exhibited moderate levels of knowledge and practice but generally negative attitudes toward appropriate antibiotic use. The observed associations between sociodemographic factors and KAP outcomes suggest that parental antibiotic-related behaviours are influenced by social and contextual characteristics rather than knowledge alone. Importantly, the identified discordance between knowledge, attitude, and practice highlights that awareness does not consistently translate into appropriate behaviour. Given the cross-sectional nature of the study, these findings should be interpreted as associations rather than causal relationships. Nevertheless, the results underscore the need for context-specific, evidence-informed strategies focusing on attitude and behavioural change, alongside education, to support more judicious antibiotic use among parents.

ETHICS APPROVAL

This study was approved to be conducted by the AIMST University Human Ethics Committee (Approval Reference number - AUHEC/FOP/14/10/2024/PhD - Extension-1). All procedures performed in studies involving human participants were conducted in accordance with the ethical standards of the institutional and/or national research committee and the Helsinki Declaration.

CONSENT FOR PUBLICATION

Informed consent was obtained from all the participants.

AVAILABILITY OF DATA

The data of this study are available from the corresponding author and will be provided on reasonable request.

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None.

CONFLICT OF INTEREST

The authors declare that they have no competing interests.

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Declared none.

AUTHORS' CONTRIBUTION

SP: Study concept, Study design, data collection, analysis, interpretation, and manuscript drafting. SS: Study design, critical review, and revision of the initial draft. ER: Study design, critical review, and revision of the initial draft. GPB: Result analysis, interpretation, and revision of the initial draft. All authors have read and approved the manuscript.

GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

During the preparation of this work, the authors used ChatGPT (GPT-4, OpenAI) sparingly to generate language suggestions and perform minor proofreading in some parts of the manuscript. After using this tool/service, the authors reviewed and edited the content as needed and take full responsibility for the content of the published article.

SUPPLEMENTARY MATERIAL

Supplementary material is available on the journal's website.

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