ORIGINAL ARTICLE

Parental knowledge, attitudes and practices towards antibiotic use in children among staff at Universiti Putra Malaysia

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ABSTRACT

Introduction: Irrational and irresponsible use of antibiotics in children has been reported as one of the major causes of antibiotic resistance. By virtue of that, adequate parental knowledge, attitudes and practices are essential to ensure appropriate use of antibiotics. Therefore, this study was designed to assess the sociodemographic factors, parental knowledge, attitudes and practices regarding antibiotic use among staff at Universiti Putra Malaysia. **Methods:** A cross-sectional study was conducted using a set of validated questionnaires, by recruiting active staff members of UPM with children under the age of six as participants. Pearson, Chi-Square and Fisher Exact tests were used to analyse the association between sociodemographic factors and levels of parental knowledge, attitudes and practices regarding antibiotic use. **Results:** Among 141 participants, 67.4% had moderate knowledge about antibiotics with significant knowledge gaps regarding the use of antibiotics for viral infections and understanding the impacts of antibiotic resistance. 95% had positive attitudes toward antibiotics, emphasising the importance of following prescriptions and recognising the risks of antibiotic abuse while 74.5% demonstrated good practices in antibiotic use where they exercise responsible behaviour in managing their children's antibiotic treatment by completing and adhering to prescribed doses. **Discussion:** Despite positive attitudes and good practices, some unethical behaviours such as self-prescribing antibiotic to children without consulting a doctor and administer antibiotics for viral infection were noted. The findings highlight the need for targeted educational efforts to improve antibiotic stewardship and combat antibiotic resistance.

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INTRODUCTION

The use of antibiotics in modern medicine has saved many lives across the globe and altered the history of bacterial infection-related diseases. This emphasizes the importance of antibiotics as effective drug treatment for infections, disease transmission prevention and reduction of unwanted complications of diseases (1). In Malaysia, antibiotics for systemic use ranked 16th as the most often used drug subgroup, according to Malaysian Statistics on Medicines 2017.

Nonetheless, the rising cases of antibiotic-resistant bacterial infections have recently become a serious public health concern, worldwide. Antibiotic resistance arises when antibiotics are no longer effective in eradicating microorganisms, particularly bacteria. This global issue has not only complicated the treatment of infectious diseases and prolonged hospitalization but more importantly implicated other health-related problems such as increment in morbidity and mortality rates as well as the treatment cost (2, 3).

Poor patient compliance and insufficient regulation on the prescription of antibiotics are among the factors highly associated with the development of antibiotic resistance (4). On top of that, cases of antibiotic resistance emerge because of antibiotic misuse or overuse which is possibly caused by a lack of parental knowledge on the appropriate use of antibiotics for the treatment of common infections in children (5). High incidence of infections in children had caused this paediatric age group to have

the highest prescription of various classes of antibiotics over the years making them particularly vulnerable to antibiotic resistance (6). Previously Teck and colleagues (2016) performed a cross-sectional study on 320 parents who visited a primary health clinic in Kuala Lumpur, Malaysia to evaluate their knowledge, attitudes and behaviours on the use of antibiotics for children with upper respiratory tract infections (URTI). According to the findings, 67% of parents had little understanding of antibiotics including the belief that antibiotics may treat viral illnesses, should be taken for any fever and shorter courses are healthier for their children, resulting in unsatisfactory attitudes and behaviours toward antibiotic usage. The authors also highlighted that the observed level of parental knowledge, attitudes and practices regarding antibiotic use is critical in designing suitable educational campaigns and frameworks to combat antibiotic resistance in Malaysia (7). However, the scope and findings of this study were limited and only focused on parents whose children had URTI which might induce bias and did not accurately reflect the wider population. To overcome this issue, future research should also include all parents of children with any history of infectious diseases. Therefore, the objective of this study was to assess the parental knowledge, attitudes and practices among staff at Universiti Putra Malaysia (UPM) regarding the use of antibiotics in children. Apart from that, we also aimed to explore and understand the association between sociodemographic data, parental knowledge, attitudes and practices towards antibiotic use and to provide insights on antibiotic stewardship to help tackle concerns of antibiotic misuse.

MATERIALS AND METHOD

Research Location and Population

This study was carried out in Universiti Putra Malaysia located in Serdang, Selangor. UPM is one of the research universities in Malaysia and comprises thirteen faculties. The university employs a various background of 1759 academicians (1661 academic staff with PhD) and 4854 non-academic staff. Due to its diverse academic and administrative environment, as well as the availability of potential participants based on the inclusion and exclusion criteria, UPM was selected as the research location.

Sample size estimation

A proper selection of sample size enables researchers to determine statistical significance and derive valuable conclusions from one study. A balance must be achieved between having enough participants to get relevant findings and minimizing unnecessary expenditure and participant exposure. The two-proportion sample size formula (Equation 1) was used in this study to determine the required sample size for comparing two proportions, especially gender as the variable of interest (8).

Equation 1: Formula for two-proportions

$$n = (Z_{\alpha/2} + Z_{\beta})^2 * (p_1(1-p_1) + p_2(1-p_2)) / (p_1-p_2)^2$$

Where,
$Z_{\alpha/2}$: Critical values corresponding to a 95% level of significance = 1.96
Z_{β}: Critical values corresponding to an 80% level of significance, β is 0.2 = 1.96
p_1: sample proportions from population (Male: 0.445)
p_2: sample proportions from population (Female: 0.587)

Based on the formula above, the calculation of sample size was calculated as,

n = (1.96+0.84)2 x (0.445(1-0.445) +0.587(1-0.587)) / (0.445-0.587)2 n
= 191

The calculated sample size for one group was 191 respondents. Since this study involved two proportions, the sample size should be 382 responses. To account for non-response, incomplete data and subjects' unavailability or reluctance to participate, a 10% non-response rate was calculated. Therefore, the final sample size required for this study was 420 individuals. This sample size ensures the statistical validity of the study and the reliability of its findings.

Research Design and Procedures

We conducted a cross-sectional study between April 2023 and August 2023 using simple random sampling to recruit the participants, whereby a subset of participants from the population was randomly selected. All participants in this study must be active staff members of UPM and parents of children under the age of six. If both mother and father are staff members, they could still be included in the study since the objective was on the parent who administers the antibiotics to their children. However, parents with medical backgrounds such as doctors, pharmacists, dietitians and nurses were excluded from the study.

Once the ethical approval was obtained from the Ethic Committee for Research Involving Human Subject (JKEUPM) (Ethic no: JKEUPM-2023-154), potential participants were approached and recruited. The recruiting strategy involved inviting qualified individuals via in-person recruitment. After agreeing to participate, the respondents were given written informed consent and a self-administered survey which only took a few minutes to read and completely answer all questions before submitting their forms. The researcher was presented and available for explanation, if needed. The response rate was calculated by dividing the number of completed responses by the total number of invitations sent. There was no follow-up after the questionnaire was submitted.

The self-administered questionnaires employed in this study were adapted and modified from previous studies (4, 9, 10). To accommodate different language preferences, the questionnaires were provided in both Malay and English languages. It comprised forty-two item survey in four sections: (1) seven questions related to the sociodemographic of participants that include age, gender, number of children, level of education, race and family income, (2) fourteen questions regarding parental knowledge on usage of antibiotics (possible answers: yes/no/unsure in the last 12 months), (3) eleven questions regarding parental attitudes towards antibiotics use (possible answers: agree/disagree/unsure) and (4) ten questions regarding parental practices (possible answers: never/rarely/often/most of the times/ always) towards antibiotics use. A pilot test was run at Universiti Putra Malaysia prior to the actual full-scale research project implementation.

Data Management and Statistical Analysis

All responses were safely stored and updated on the principal researcher's Google Drive account, accessible only by the researcher and supervisory committee to maintain data privacy. Statistical analysis was performed using Statistical Packages for Social Sciences (SPSS) version 29.0. The frequency and percentages for categorical variables were calculated for all sections.
For the knowledge scoring system, one point was given for each correct answer and zero if the wrong answer or unsure was selected. The maximum score was 14, while the minimum score was 0. Scores ranging from 0-4 were classified as poor, 5-9 as moderate and 10-13 considered as good knowledge. For the attitudes, each respondent would get one mark for the correct answer and zero for the wrong or unsure answer. The maximum score for this section would be 11, while 0 would be the minimum score. We categorized attitudes as inadequate if participants scored 0-4 while scores between 5-11 would be categorized as good attitude. As for the parental practices regarding antibiotics use, a 5 Likert score type of questionnaire was employed with a maximum score of 100 and a minimum score of 10. Participants with scores between 0-29 were classified as poor practices, 30-39 indicated moderate practices and above 40 indicated good practices.

Appropriate statistical analysis such as Pearson, Chi-Square or Fisher exact test was applied to determine the association between 1) sociodemographic data and parental knowledge towards antibiotics use among staff in UPM, 2) sociodemographic data and parental attitudes towards antibiotics use among staff in UPM and 3) sociodemographic data and parental practices towards antibiotics use among staff in UPM.

RESULTS

A total of 141 respondents participated in the study, resulting in a response rate of 33.57%. All respondents completed the set of questionnaires during the data collection period and represented various sociodemographic backgrounds (Table I). More than half of the respondents were female/mothers (64.5%). Most of the respondents were Malay (98.6%) and only 1.4% of the respondents were Chinese. From the data, the majority of parents who participated in this study were within the age range between 30 to 49 years old (78.8%), while 12.1% were 20 to 29 years old and only 9.2% of the respondents were between 50 to 59 years old. As anticipated, about 96.4% of the respondents had completed at least secondary school level. For the monthly family income, more than half of the respondents (53.9%) have an income of more than RM 5000 while 46.1% of them have a salary of less than RM5000.

Table I: Sociodemographic characteristics of the respondents

Sociodemographic	Frequency	%
Gender of respondents		
Male	50	35.5
Female	91	64.5
Race		
Malay	139	98.6
Chinese	2	1.4
Age		
20-29	17	12.1
30-39	63	44.7
40-49	48	34.0
50-59	13	9.2
No of Child		
1	105	74.5
2	28	19.9
>3	8	5.7
Level of education		
No formal education	4	2.8
Primary school	1	0.7
Secondary school	26	18.4
Tertiary education	110	78.0
Family income		
≤ RM 5000	65	46.1
RM 5001 – RM 11000	63	44.7
> RM 11000	13	9.2

Parental Knowledge

About 90.8% of respondents understand that antibiotics are the medication used to kill bacteria. More than half of the parents (56.7%) could correctly identify penicillin as an antibiotic. Interestingly, many of the respondents (62.4%) believed that the main cause of antibiotic resistance is misuse of antibiotics. The assessment also revealed that only 13.5% of respondents scored between 0-4 points indicating poor knowledge and about two-thirds of the respondents (67.4%) showed moderate knowledge (ranging between 5-9 points). A significant association was noted between the parental knowledge level with gender ($p < 0.05$), as shown in Table II.

Table II: The association between sociodemographics and the level of parental knowledge on the use of antibiotics among staff in Universiti Putra Malaysia

Sociodemographic	Knowledge level			2-sided p-value
	Poor, n	Moder-ate, n	Good, n	
Gender of respondents				
Male	12	31	7	0.021*
Female	7	64	20	
Race				
Malay	19	94	26	0.548b
Chinese	0	1	1	
Age				
20-29	4	11	2	0.080b
30-39	9	40	14	
40-49	6	37	5	
50-59	0	7	6	
No of Child				
1	15	71	19	0.779b
2	4	17	7	
>3	0	7	1	
Level of education				
No formal education	1	2	1	0.386b
Primary school	0	0	1	
Secondary school	4	16	6	
Tertiary education	14	77	19	
Family income				
≤ RM 5000	12	45	8	0.110b
RM 5001 – RM 11000	7	39	17	
> RM 11000	0	11	2	

a: chi-square test; b: fisher Exact Test; *: significant by Chi-square test (p<0.05)

Parental Attitudes

The majority of respondents (97.9%) disagreed that antibiotics for their child/children can be obtained from siblings, relatives or friends without having to see a doctor. Only a few of the parents (5.7%) stated that leftover antibiotics are good to be kept at home in case they might need them in the future. Some respondents (29.1%) agreed that antibiotics speed up recovery from a cold, while the majority of parents (67.4%) stated that they would not stop giving antibiotics to their child whenever he or she starts feeling better.

In general, the vast majority of the respondents (95%) were found to have good levels of parental attitudes towards antibiotics use for the treatment of infection in children (score range between 5-11). Table III depicted the association between sociodemographics and the level of parental attitudes for all respondents, where no significant association was noted in all sociodemographic characteristics.

Parental Practices

About two-thirds of the respondents (63.8%) would never self-administer antibiotics to their children when sick. There was a significant association between the gender of the respondents with this practice, as shown in Table V. The majority of the parents (91.5%) stated that they never increased the dosage of the antibiotics without authorization to improve its efficacy, where a significant association was noted between this practice and the age (P=0.001) and gender (P=0.032) of respondents. More than half of the parents (52.4%) revealed that they never request doctors to prescribe antibiotics for their children when they bring them to see the doctor. Based on the data, only 0.7% of respondents exhibited poor practices of antibiotic usage (scored between 0 and 29, while the majority of respondents (74.5%) were noted to have good practices of antibiotic usage with scores between 40 and 50. A significant association was found between gender ($p < 0.05$) and parental practices, as shown in Table IV.

Table III: The association between sociodemographics and the level of parental attitudes on the use of antibiotics among staff in Universiti Putra Malaysia

	Attitude level		2-sided p-value
	Poor, n	Good, n	
Gender of respondents			
Male	3	47	0.479b
Female	4	87	
Race			
Malay	7	132	1.0b
Chinese	0	2	
Age			
20-29	2	15	0.487b
30-39	3	60	
40-49	2	46	
50-59	0	13	
No of Child			
1	5	100	0.448b
2	1	27	
>3	1	7	
Level of education			
No formal education	0	4	0.495b
Primary school	0	1	
Secondary school	0	26	
Tertiary education	7	103	
Family income			
≤ RM 5000	6	59	0.125b
RM 5001 – RM 11000	1	62	
> RM 11000	0	13	

a: chi-square test; b: fisher Exact Test; *: significant by Chi-square test (p<0.05)

DISCUSSION

This study measured various domains and aspects regarding knowledge, attitudes and practices of parents who are staff members of Universiti Putra Malaysia towards antibiotics use in paediatric age. In this survey, more than 60% of respondents were women, which was comparable with previous research performed in Turkey (11), Saudi Arabia (12) and China (10). Apart from that, the majority of parents who participated in this study had completed tertiary-level education, such as certificate, degree or postgraduate studies. This was anticipated because some job positions or posts in the university may require at least a diploma-level certification. We also found that most of the respondents are Malay as Malay is the largest ethnic group in Malaysia, hence the

Table IV: The association between sociodemographics and the level of parental practices on the use of antibiotics among staff in Universiti Putra Malaysia

	Practice level			2-sided p-value
	Poor, n	Moderate, n	Good, n	
Gender of respondents				
Male	1	19	30	0.005*b
Female	0	16	75	
Race				
Malay	1	35	103	1b
Chinese	0	0	2	
Age				
20-29	1	4	12	0.356b
30-39	0	14	49	
40-49	0	12	36	
50-59	0	5	8	
No of Child				
1	1	25	79	0.735b
2	0	7	21	
>3	0	3	5	
Level of education				
No formal education	0	1	3	0.538b
Primary school	0	1	0	
Secondary school	0	7	19	
Tertiary education	1	26	83	
Family income				
≤ RM 5000	1	16	48	0.370b
RM 5001 – RM 11000	0	18	45	
> RM 11000	0	1	12	

a: chi-square test; b: fisher Exact Test; *: significant by Chi-square test (p<0.05)

employment ratio in UPM. This data was comparable with findings from a survey done in Kuala Lumpur, Malaysia by Teck et al. (2016) (7).

As for the parental knowledge of antibiotic use, our study revealed that the majority of respondents had moderate knowledge, showing a reasonable insight with certain knowledge gaps. These results were aligned with previous studies by Al Hashmi et al. (2021) (13) and Atif et al. (2018) (14) where they also noted many parents had a moderate understanding of antibiotics usage in Lahore, Pakistan and Muscat, Oman despite several studies from various countries such as Tanzania (15), rural China (16) and rural Peru (4) reported poor parental knowledge that may be due to less developed rural area and countries (17). Although two-thirds of the respondents in our study only scored a moderate level of knowledge on antibiotics use, interestingly most of them recognized that antibiotics are drugs that belong to a class of medication that is used to treat specifically bacterial infection. Also, more than half of the parents could recognize penicillin, one of the commonly used antibiotics for the treatment of infections caused by bacteria in children. This suggested that parental knowledge of UPM staff can be enhanced to a good level if they are well-informed by the medical personnel and educated through health promotion and awareness campaigns on antibiotic use.

Table V: The association between sociodemographics and parental practices statements on the use of antibiotics among staff in Universiti Putra Malaysia

	Practice Question	P-value					
		Age	Gender	No of child	Education level	Race	Family income
1	When you take your kid to the doctor, you will request the doctor to prescribe antibiotics for the children.	0.127b	0.076b	0236b	0.302b	1.000b	0.242b
2	Self-administering antibiotic to children when they are sick.	0.199b	0.032b*	0.080b	0.176b	1.000b	0.869b
3	Read the medicine leaflet carefully before you give your child an antibiotic medicine.	0.081b	0.246b	0.590b	0.170b	0.571b	0.889b
4	Have antibiotic at home.	0.230b	0.073b	0.336b	0.398b	0.624b	0.724b
5	To improve efficacy of antibiotic, dosage is raised without authorization.	0.001b*	0.032b*	0.942b	0.299b	1.000b	0.922b
6	Keep an eye on the time to serve antibiotics.	0.001b*	0.085b	0.453b	0.250b	0.226b	0.363b
7	After a few days, I feel no benefit from the drug and alter it without permission.	0.001b*	0.224b	0.885b	0.686b	1.000b	0.581b
8	Reduce or discontinue antibiotics once the disease improves.	0.161b	0.124b	0.351b	0.127b	1.000b	0.913b
9	Taking antibiotics while adding other medicines.	0.060b	0.472b	0.042b*	0.537b	0.421b	0.162b
10	Giving a child an adult antibiotic.	0.008b	0.005b*	1.000b	0.519b	1.000b	0.917b

a: chi-square test; b: fisher Exact Test; *: significant by Chi-square test (p<0.05)

Nevertheless, several parents among the respondents still had minimal knowledge and misconceptions regarding antibiotic use. This is quite concerning as data showed that one-third of the respondents in this study were unaware that inappropriate usage of antibiotics may contribute to the arising cases of antibiotic resistance. According to the present study, healthcare professionals especially doctors and pharmacists, are the primary sources of information who play an important role in educating parents on the proper use of antibiotics. Family members and friends were also noted as secondary sources of knowledge, although less frequent.

With the advancement in information technology, more information regarding antibiotics can also be found online, hence initiative from parents to self-equip themselves with proper knowledge is warranted to ensure a better understanding of antibiotic usage (7). On top of that, a significant association was found between parental knowledge and respondent's gender, similar to a previous study conducted in Henan Province, China (10). This finding suggested typically mother is the person who always cares for sick children, hence emphasizing the significance of focused educational programs to ensure good understanding across genders. A large percentage of parents with positive attitudes was

noted in this study indicating a considerable number of parents who are working at Universiti Putra Malaysia have positive and responsible attitudes regarding antibiotic use. The data of our study was consistent with a previous study which reported that 85% of their respondents had good parental attitudes towards antibiotics use for children with upper respiratory tract infections in Kuala Lumpur (7). These results clearly showed a continuous trend of responsible use of antibiotics among parents in urban areas of Malaysia.

Apart from that, almost all respondents stated that antibiotics for their children can only be obtained from doctors and many of them agreed that their children need to complete the antibiotic course even though the children had started to feel better. These positive attitudes signify that many parents understand the importance of using antibiotics with caution and adhere to the advice given by healthcare experts. By displaying continuous good attitudes toward antibiotic use, parents can help strengthen collective efforts by the global healthcare community to battle the rising cases of antibiotic resistance.

Accountable practices towards antibiotic usage include avoiding sharing prescribed medications with others, never adjusting the prescribed drug dose without prior approval by medical practitioners to enhance its efficacy and never requesting doctors to prescribe antibiotics for their children when they are sick (18). Strict adherence to these principles may help to slow down the emergence of antibiotic-resistant bacteria as inappropriate use of antimicrobial therapy can be halted. The findings of our study revealed that the vast majority of participating UPM staff displayed appropriate practice levels of antibiotic use, aligned with the data reported in earlier studies (10, 11). In contrast to other previous studies that concluded poor parental practices could be due to several factors such as knowledge, socioeconomic status and level of education (4, 15, 17), our findings suggested that a significant proportion of the study population is well-informed regarding the appropriate use of antibiotics and diligently follows the guidelines and recommendations.

Our study also noted that gender has a significant association with the level of parental practices regarding antibiotic use whereby women were found to have better practice levels than men, similar to findings of a previous study conducted among community members of the Rupandehi District in Nepal (19). This observation could be influenced by a variety of factors such as women are traditionally assigned as caregivers within families in most cultures. As primary caregivers, women hold the responsibility to administer medications including antibiotics to their children and/or other family members. The experience and responsibility that they have may lead to prudent and accountable behaviour toward antibiotic use.

This parental knowledge, attitudes and practices distribution among respondents in Universiti Putra Malaysia have provided useful information on the use of antibiotics. Therefore, recognizing the factors that can influence the misuse of antibiotics can help to design appropriate interventions for the prevention of antimicrobial resistance.

Limitation

Several limitations were identified in this study. Firstly, the sample size (141 respondents) in this study may be considered relatively small as this study was only conducted among staff at Universiti Putra Malaysia, an urban centre located in Selangor. This issue might be attributed to several challenges that was faced during the study including the timing of the data collection- the majority of staff were preoccupied with examination or teaching during peak period as well as the eligibility and exclusion criteria for staff to be included as participants, which required staff to be parents of children under the age of six.

Aside from that, general hesitance and/or ignorance of UPM staff to engage in the research or the belief that answering the questionnaire is nuisance might also be the contributing factors leading to low number of participants. As a result, non-response bias may affect the sample's representativeness since a large number of eligible parents did not participate in this study. Therefore, ample duration for data collection and good publicity for this study should be considered to ensure wider coverage, reaching every eligible participant.

The focus on only one institution also reduces the external validity of the findings. Also, it was noted that the study population was mostly Malay (98.6%). Hence, the results of this study may not accurately reflect Malaysia's multi-ethnic diversity and may be insufficient to represent the general population in Malaysia. The demographic bias was mostly due to the participant pool accessible at the institution where the study was performed where vast majority of UPM's staff is Malay. To address this issue, it will be an advantage to expand the study to other higher education institutions located in other states in Malaysia and underrepresented areas with different demographic compositions. Apart from that, it is proposed that the scope of this study should be broadened where bigger scale research should be conducted in several locations (multi-cantered) including urban such as Johor Bahru and rural areas such as Gua Musang in Kelantan to ensure a more ethnically diverse sample population to assess and determine whether the findings are consistent across communities in other settings.

Furthermore, future research could focus on particular knowledge gaps noted in this current study, for example, misunderstandings regarding antibiotic use for viral infection and the impact of antibiotic resistance.

Apart from that, a mixed-methods approach combining qualitative interviews and quantitative surveys would provide in-depth insights into the causes behind particular parental behaviours and attitudes toward the usage of antibiotic in children.

By recognizing these gaps and variations, future health promotion or intervention activities for a wider range of coverage can be planned. This will eventually increase the robustness and pertinency of the findings and allow a better understanding of the health promotion impacts across the Malaysian population.

CONCLUSION

In conclusion, this study highlighted the significance of focused educational interventions for improved parental awareness of antibiotic usage, particularly parental knowledge. While a vast majority of parents who participated in this study displayed reasonable understanding, responsible attitudes and appropriate antibiotic practices, there were some misunderstandings and variances based on sociodemographic characteristics. Educational initiatives can promote good antibiotic stewardship and address the growing problem of antibiotic resistance. By encouraging prudent antibiotic use, we can improve public health outcomes and preserve the efficacy of antibiotics that are essential for successful treatment of bacterial infection especially in younger generations.

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