ORIGINAL ARTICLE

Awareness, Knowledge and Attitudes Towards Safe Antibiotic Use among Outpatient Visitors at a Teaching Hospital in Malaysia.

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Abstract

Introduction: Antimicrobial resistance has emerged as a significant issue largely due to the misuse of antibiotics in treating bacterial infections since their introduction. Misuse of antibiotics includes failure to finish the full course and prematurely stopping their antibiotic treatment after symptoms improve. Although antibiotics cannot be self-prescribed in Malaysia, misuse still occurs among consumers. **Purpose:** This study aimed to assess the level of awareness, knowledge and attitude (AKA) on safe antibiotic use among outpatient visitors of a teaching hospital in Pahang, Malaysia. The association between sociodemographic background and AKA score was also explored to identify the knowledge gap within various backgrounds. **Methods:** A total of 206 participants were recruited for this study. The participants were approached at several outpatient departments in a teaching hospital using convenient sampling from May until June 2022 and completed a set of validated questionnaires. The data were analysed using SPSS. **Results:** Only 35.4% of participants obtained a high score in knowledge, while the majority scored moderately. Among the 206 participants, 51.0% had poor awareness of safe antibiotic use. More than half of the participants (63.1%) exhibited a positive attitude towards antibiotic consumption. Education level and medical background were shown to be statistically significant to AKA scores. **Conclusion:** This study highlights that despite moderate knowledge and poor awareness of safe antibiotic use among hospital attendees, a positive attitude towards antibiotics was observed. It is essential to implement public educational campaigns that address knowledge gaps and misconceptions to improve antibiotic safety among the population.

Keywords: *antibiotic, antimicrobial resistance, attitude, awareness, knowledge.*

Introduction

Antibiotics are one of the most commonly prescribed medications to treat a wide range of bacterial and fungal infections [1]. In Malaysia, antibiotics are not recognised as over-the-counter (OTC) drugs. Nonetheless, the national surveillance program continues to keep us informed about emerging and newly identified resistance threats [2]. This raises questions about why the antibiotic resistance rate in our country is still increasing. Antibiotic resistance represents a significant global challenge in healthcare, complicating the treatment of diseases that are commonly manageable. The annual death toll linked to antibiotic and other antimicrobial resistance (AMR) is currently around 7000,000, with projections indicating it could reach 10 million by 2050 if antibiotic use is not controlled [3].

Since their introduction, the misuse of antibiotics in treating bacterial infections has led to the emergence of AMR as a major concern. Misuse includes not finishing the full course of treatment, stopping medication when feeling well, saving some for future use, skipping doses, taking double doses to compensate for the missed ones, and using antibiotics as painkillers [4]. These behaviours indicate a lack of awareness regarding the safe use of antibiotics in the community, which has been a highly contributing factor in the increasing number of antibiotic-resistant cases worldwide.

Evidence shows that a lack of consumer knowledge of correct antibiotic consumption interferes with the government's efforts to curb AMR. Knowledge is the most important aspect of combating misinformation, and focusing on measuring the population's knowledge, awareness, and attitude will provide a clearer picture of the consumers' understanding of antibiotics. Outpatient visitors to healthcare facilities play a pivotal role in the fight against antibiotic resistance, as they are considered healthcare seekers in the hospital setting and may be more inclined to use antibiotics, along with other medications. This study aimed to explore the level of awareness, knowledge, and attitude (AKA) regarding safe antibiotic use among outpatient visitors of a tertiary hospital in Kuantan, Pahang. The association between AKA score and sociodemographic characteristics, the correlation between knowledge and awareness score, and the correlation between knowledge and attitude score were investigated. The findings will provide valuable insights into the current awareness levels among patients, allowing the teaching hospital to identify areas for potential intervention among healthcare workers and within the hospital environment, thereby enhancing patient care and educational efforts. By educating patients, the hospital not only improves individual health outcomes but also contributes to the broader community's understanding of antibiotic use and resistance.

Materials and methods

This quantitative, cross-sectional study was conducted between May and June 2022. A total number of 206 participants were recruited using a convenient sampling method. The participants were approached at several outpatient departments at a teaching hospital. Eligible participants were at least 18 years old, able to understand and read Bahasa Malaysia, and visiting the hospital for various purposes. Those who agreed to take part in the signed a consent form.

To measure the intended variables, this study used a set of validated questionnaires by Neni et al. [5] to explore the participants' level of knowledge, awareness, and attitude towards safe antibiotic use. The questionnaire consisted of 4 parts. Part A included sociodemographic questions, Part B assessed knowledge with 12 items, Part C evaluated awareness with 6 items, and Part D examined attitude with 9 items. The questionnaire was translated from English to Malay using back-to-back translations and validated by a qualified Malay language educator. Prior to the main study, a pilot study was conducted, yielding a Cronbach's Alpha coefficient of 0.82. The data obtained were

analysed using Statistical Package for Social Science (SPSS) version 27. Descriptive statistical analysis was used to measure the frequency and percentage of variables. The Mann-Whitney test was applied to analyse two categorical outcome variables, namely gender and medical background, whereas the Kruskal-Wallis test was employed to examine associations involving more than two categorical outcome variables, including age category, marital status, education level, and household income. A P-value of less than 0.05 was considered statistically significant, and 95% confidence intervals (CIs) were reported for all relevant outcomes.

The ethical approval for this study was obtained from the IIUM Research Ethic Committee (IREC 2022-KON/54). Each participant has been provided with an information sheet informing them about the objectives and confidentiality of the study before obtaining consent to participate.

Results

Of the total 206 respondents, 83 (40.3%) were male and 123 (59.7 %) were female. Their ages ranged from 18 to 72 with a mean age of 33 (SD=13.94). Among them, 29.9% were students, 49% were employed, and 21.4% were unemployed or retired. Regarding the education level, 72.3% reported having tertiary education, 26.7% had graduated from secondary school, and only 1% had completed primary education. Half of the participants (54.4%) reported living in the city, while the other half resided in suburban areas. In terms of household income, 78.6% of respondents came from families earning less than RM 4,850 monthly. Additionally, 30.6% of participants recorded that they had a medical background, while 69.4% had no prior involvement in the healthcare field through their career or education.

Awareness, Knowledge and Attitude (AKA) Score and Level

Based on three domains in AKA, the individual and total median scores of Knowledge, Awareness, and Attitude among the outpatient visitors were presented in Table 1 . Details of the respondents' answers concerning their knowledge, awareness, and attitude are presented in Table 2.

AKA Score Category

From the score, the results are divided into three categories Low, Moderate, and High level of AKA. The findings are presented in Table 3. Overall, it can be said that most of the respondents have moderate to high levels of awareness, knowledge, and attitude regarding antibiotic usage.

Association between AKA Score and Sociodemographic data

Table 4 below shows the association between sociodemographic characteristics (gender, education level, marital status, household income, medical background) and total AKA score. For age, the test indicated no significant association between different age groups and AKA scores ($P = 0.397$). Similarly, there was no statistically significant difference between gender categories and AKA scores ($P = 0.082$). However, concerning education level, the test demonstrated a significant difference in total AKA scores across different education levels ($X2 = 25.71$, $P < 0.001$), with mean rank scores varying notably. The significant difference is between participants with secondary education (Mdn:13) and tertiary 1 (diploma or bachelor's degree) (Mdn:18) and tertiary 2 (master's degree and doctorate) (Mdn:18) (Figure 1). The effect size for this analysis was calculated using Eta-squared ($\eta 2$) and found to be $\eta 2 = 0.112$, indicating a medium effect of education level on AKA scores. Likewise, a medical background revealed a significant difference in AKA scores ($U = 2157$, $P < 0.001$), as they scored higher (Mdn: 21) than people who did not have a medical background (Mdn:15) (Figure 1). The effect size was calculated using the biserial correlation (r) yielding an effect size of 0.521, which indicates a large effect size. Conversely, marital status and

household income did not exhibit a significant difference in AKA scores ($P > 0.05$).

Correlation between Knowledge, Awareness and Attitude

The Spearman correlation test for the knowledge and awareness domain indicates a significant correlation between the two variables ($rs(204) = 0.695$, $P = 0.001$). The positive value of the correlation coefficient between the knowledge score and awareness score signifies a direct and strong association as the coefficient value is more than 0.6. Similarly, in this study, the Spearman correlation coefficient revealed a positive correlation between knowledge and attitude score ($rs(204) = 0.461$, $P = 0.001$). However, with a coefficient value below 0.5, this association is considered moderate.

Discussion

Knowledge of safe antibiotic use

In this study, 66% of the visitors knew that penicillin is an antibiotic but not aspirin (43.7%) and paracetamol (72.8%). This shows that half of the visitors did not know the correct indication for aspirin. However, paracetamol is a more frequently used over-the-counter drug here in Malaysia compared to aspirin, so its use is well understood. Additionally, 79.6% knew that antibiotics are used to treat bacterial infections, while 64.6% also believed that antibiotics are useful for viral infections. This explains why some patients still request for antibiotics when visiting clinics for upper respiratory tract infections, common cold, or viral fevers [6]. The result is consistent with a study conducted in Boyolali, Indonesia, where 73.12% of the respondents answered that antibiotics could be used to treat infections that are caused by viruses Overall, the knowledge level of most hospital visitors in this study was categorized as moderate. Similar findings were reported by Kong et al. [8] and Pauzi et al. [9], who found that the level of knowledge of antibiotics among the majority of adult respondents was moderate. Another study conducted by Neni et al. [5] on high school students, discovered that adolescents aged 13, 14, and 16 also reported moderate levels of knowledge on antibiotics. The moderate knowledge level observed across different studies indicates a broader trend in public understanding of healthcare topics. Given that this moderate level of knowledge towards antibiotics begins as early as secondary school, there is an opportunity for targeted public health education initiatives. By focusing on educating this demographic on safe antibiotic use, there is potential for them to carry this knowledge into adulthood and serve as agents of change within their families and communities. However, previous studies conducted among the general adult population in Kuantan [10] and across Malaysia [11] revealed that a higher proportion of respondents demonstrated good knowledge regarding antibiotics and their usage. The discrepancies observed between these findings and our study may be attributed to the different tools employed to assess knowledge, as well as other contextual factors. Notably, the study among the general public in Kuantan required participants to have prior awareness of antibiotic agents [10], which likely contributed to the elevated reported levels of knowledge and usage. In contrast, our study encompasses a more diverse demographic, including individuals who may lack such awareness.

Furthermore, the population reported in the study by Bhatt et al. (2023) focused on populations residing in the central region of Malaysia, with only a small representation from the east coast, where our study population is [11]. Additionally, their sample predominantly consisted of urban residents, whereas our study reflects a balanced representation of both urban and suburban populations. The geographic differences may thus influence antibiotic knowledge levels, as suggested by findings from another study, which indicates that individuals in urban areas tend to exhibit greater knowledge of antibiotic use [12].

Awareness of Safe Antibiotic Use

From the study, 48.5% of the visitors had heard about the "Antibiotic Resistance" issue, whereas

only 30.6% had ever talked or discussed about it. While more than half (58.7%) of the participants knew that when a person has bacteria resistant to antibiotics, the infection will be challenging to treat, only 18.9% (n=39) of the participants answered correctly when asked if antibiotic resistance is only a problem for people who take antibiotics regularly. Previous studies conducted in Nigeria [13] and Malaysia [5] also reported that respondents believed antibiotic resistance is only a problem for those who take antibiotics regularly. This shows that most people do not know that antibiotic resistance does not primarily occur due to increased antibiotic consumption, but rather from the misuse of prescribed antibiotics.

There is a significant difference in awareness scores between education levels, with participants who have tertiary level of education scoring higher compared to those without tertiary education. Exposure to issues related to antibiotic resistance during tertiary education and literacy towards complicated medical terms (e.g. antibiotic resistance) might be the potential factors in the difference in awareness level and score. This is supported by an article published by Karuniawati et al. [7] which discussed the inadequacy of information acquired during schooling about antibiotics will impact the level of awareness. Overall, the participants in this study showed moderate awareness of safe antibiotic use.

Attitude towards Safe Antibiotic Use

Most hospital attendees in the current study exhibited a positive attitude towards antibiotic use, consistent with findings from previous studies [9,10]. The majority (85.4%) of the respondents answered that they would only take antibiotics when prescribed by a doctor, which is consistent with other studies carried out in Nigeria (86%) [13] and two other studies conducted in Malaysia, which reported rates of 82.4% and 96.5% respectively [5,8]. This is a good sign that the participants know that antibiotics are not over-the-counter drugs and cannot be self-prescribed in Malaysia. Even though 45.1% of respondents in the current study indicated that they would stop taking antibiotics when already feeling well, 70.9% understood that they should finish their antibiotics even though their symptoms disappeared. This suggests a discrepancy between knowledge and behaviour regarding antibiotic use among respondents. Despite the majority of respondents being aware of the correct antibiotic usage protocol, some may still be inclined to prematurely stop their antibiotic treatment. Possible explanations for this observation are that there might be a misconception about the necessity of completing the course, a lack of understanding about its connection to antibiotic resistance, or even convenience. This highlights the need for further education and communication efforts not only to inform individuals about proper antibiotic usage but also to emphasise the broader implications of antibiotic resistance.

Association between AKA Level and Sociodemographic Characteristics

Education level showed a significant association with AKA level. Kong et al. [8] and Oh et al. [14] also reported that education level has a significant role towards knowledge level on antibiotics. People with higher education levels usually secure more general knowledge compared to those who only received lower formal and informal education which is probably due to exposure in the tertiary level education. Apart from that, having a medical background also impacts AKA score, particularly in the knowledge and awareness domains. This is logical, as individuals whose work or studies are related to healthcare tend to acquire information or insight about antibiotics. A study conducted by Suaifan et al. [15] also shows similar findings, where medical students scored better than non-medical students in their knowledge of antibiotics. The age categories did not show a significant difference in AKA scores. In contrast to other studies that suggest older individuals tend to have more knowledge about antibiotics, our findings do not support this assumption. The discrepancy

may be attributed to the similar characteristics of health-seeking behaviour shared by the population of this study. The purpose of the hospital visit was to have an appointment with the doctor, resulting in most of them having acquired similar knowledge regarding antibiotics compared to the general public outside the hospital. In terms of gender, there is also no significant difference in AKA scores between male and female participants, aligning with the notion that gender does not create a significant gap in general knowledge. Therefore, there is no necessity to tailor educational interventions on antibiotic usage based on gender.

Correlation between Knowledge, Awareness and Attitude of Visitors

We have reported that the results of correlation analysis demonstrated a significant positive correlation between knowledge and awareness, as well as knowledge and attitude. The correlation coefficient indicates a strong positive correlation, suggesting that visitors with higher knowledge scores are more likely to have higher scores in the awareness domain. However, in a study conducted on high school students in Malaysia, the awareness was not correlated to any domain and only knowledge and attitude were significantly associated [5]. Karuniawati et al. [7] also noted that knowledge alone is not sufficient to change behaviour, but it plays a crucial role in shaping beliefs and attitudes toward certain behaviours. In our study, the correlation between knowledge and attitude is moderate.

Regardless of having low awareness and moderate knowledge, most visitors exhibit a positive attitude towards antibiotic use. This suggests that proper education can effectively enhance the correct use of antibiotics among hospital visitors, thereby helping to prevent the adverse consequences of antibiotic misuse, particularly antimicrobial resistance. As for public intervention, future efforts could focus on developing targeted educational strategies such as active public health campaigns and educational programs to address specific knowledge gaps or common misconceptions about antibiotics. Engaging the community through partnerships with local organisations, healthcare providers and related academic institutions can amplify the impact of these educational efforts.

Despite the valuable insights gained from this study, one limitation of this study is the sampling method, which utilised convenient sampling and focused exclusively on individuals attending outpatient clinics at the hospital. While this approach provides valuable insights specific to the hospital context, it may not fully represent the broader local population, limiting the generalisability of the findings. However, the study population consists of diverse characteristics, with approximately equal representation from both urban and suburban areas. The wide age range also ensures a balanced and varied demographic, allowing for a more comprehensive understanding of awareness, knowledge, and attitudes toward antibiotic use across different segments of the community.

Conclusion

This cross-sectional study aimed to assess the level of knowledge, awareness and attitude toward safe antibiotic use among outpatient visitors in a tertiary hospital in Pahang, Malaysia. The study found that overall knowledge among public visitors regarding antibiotics was moderate, while awareness of safe antibiotic use was poor among half of the respondents. Despite this, the attitude towards antibiotics was mostly positive, possibly attributed to routine health education provided by healthcare professionals emphasising the importance of completing the full course of antibiotics. To enhance antibiotic safety, future public interventions should focus on targeted educational campaigns to address knowledge gaps and misconceptions, alongside partnerships with local organisations and healthcare providers. It is hoped that these findings will provide insight into the current perceptions and behaviours of the public regarding safe antibiotic usage.

Table 1. Median Score of each domain and total AKA score.

Variable	Median (IQR)
Knowledge score	7.00 (4)
Awareness score	2.00 (3)
Attitude score	7.00 (2)
Total AKA score	16.00 (9)

Table 2. Knowledge, Awareness and Attitude Answers Distribution

Questions	**N (%)**	
Knowledge	**Correct (%)**	**Wrong (%)**
Penicillin and amoxicillin are antibiotics. (Yes)	136 (66.0)	70 (34.0)
Aspirin is an antibiotic. (Yes)	90 (43.7)	116 (56.3)
Paracetamol is an antibiotic. (No)	150 (72.8)	56 (27.2)
Antibiotics are useful for bacterial infections (e.g., UTIs). (Yes)	164 (79.6)	42 (20.4)
Antibiotics are useful for viral infections (e.g. flu). (No)	73 (35.4)	133 (64.6)
Antibiotics can reduce stress. (No)	105 (51.0)	101 (49.0)
Antibiotics can kill 'good bacteria' present in humans. (Yes)	61 (29.6)	145 (70.4)
It is okay to stop taking antibiotics when symptoms improve. (No)	116 (56.3)	90 (43.7)
Taking fewer antibiotics than prescribed is healthier than taking the full course. (No)	135 (65.5)	71 (34.5)
Antibiotics can cause allergic reactions. (Yes)	132 (64.1)	74 (35.9)
Antibiotic resistance is a phenomenon whereby a bacterium loses its sensitivity to an antibiotic. (Yes)	133 (64.6)	73 (35.4)
Misuse of antibiotics can lead to a loss of sensitivity of an antibiotic to a specific pathogen. (Yes)	145 (70.4)	61 (29.6)
Awareness		
	Correct (%)	**Wrong (%)**
Have you ever heard about antibiotic resistance? (Yes)	100 (48.5)	106 (51.5)
In particular, have you discussed the problem of antibiotic resistance in class? (Yes)	63 (30.6)	143 (69.4)
Antibiotic resistance occurs when your body becomes resistant to antibiotics and they no longer work as well. (Yes)	129 (62.6)	77 (37.4)
If bacteria are resistant to antibiotics, it can be very difficult or impossible to treat the infection they cause. (Yes)	121 (58.7)	85 (41.3)
Antibiotic resistance is only a problem for people who take antibiotics regularly. (No)	39 (18.9)	167 (81.1)
Bacteria which are resistant to antibiotics can be spread from person to person. (Yes)	68 (33.0)	138 (67.0)
Attitude	**Correct (%)**	**Wrong (%)**
Do you usually take antibiotics for nausea? (No)	177 (85.9)	29 (14.1)
Do you usually take antibiotics for fever? (No)	104 (50.5)	102 (49.5)
Do you usually stop taking antibiotics when you start feeling better? (No)	113 (54.9)	93 (45.1)

Do you only take antibiotics when prescribed by a doctor? (Yes)	181 (87.9)	25 (12.1)
Do you keep leftovers at home because they might be useful in the future? (No)	152 (73.8)	54 (26.2)
Do you use leftover antibiotics when you have a cold, sore throat, or fever without consulting a doctor? (No)	172 (83.5)	34 (16.5)
Do you buy antibiotics without a prescription? (No)	176 (85.4)	30 (14.6)
Have you ever started an antibiotic therapy after simply calling a doctor, without a proper medical examination? (No)	182 (88.3)	24 (11.7)
If symptoms improve before the full course of antibiotics is completed, you can stop taking them. (No)	146 (70.9)	60 (29.1)

Table 3. AKA Score Category Distribution

Variable	**Frequency (n)**	**Percentage (%)**
Low	27	13.1
Moderate	99	48.1
High	80	38.8

Table 4. Association between AKA Score and Sociodemographic Background.

Variables	**Statistics**		
	N (%)	**Mean Rank**	***P*-value**
Age			0.397
18-30	120 (58.3)	108.05	
31-59	70 (34.0)	98.41	
>60	16 (7.8)	91.63	
Gender			0.082
Male	83 (40.3)	94.71	
Female	123 (59.7)	109.43	
Education Level			**<0.001***
Primary	2 (1.00)	83.25	
Secondary	55 (26.7)	69.17	
Tertiary 1 (Diploma and Bachelor's degree)	130 (63.1)	115.45	
Tertiary 2 (Master's degree and doctorate)	19 (9.2)	121.26	
Marital Status			0.060
Single	97 (47.1)	106.76	
Engaged	13 (6.3)	107.77	
Married	90 (43.7)	103.67	
Divorced	6 (2.9)	39.00	
Household Income			0.453
<RM 4,580	162 (78.6)	100.79	
RM 4,581 – 10,970	34 (16.5)	114.09	
>RM 10,971	10 (4.9)	111.35	
Medical background			**<0.001***
Yes	63 (30.6)	140.76	
No	143 (69.4)	87.08	

Table 5. Correlation between knowledge with awareness and attitude.

Variables	**Knowledge**	
	rs	***P*-value**
Awareness	0.695	0.001
Attitude	0.461	0.001

rs = correlation coefficient

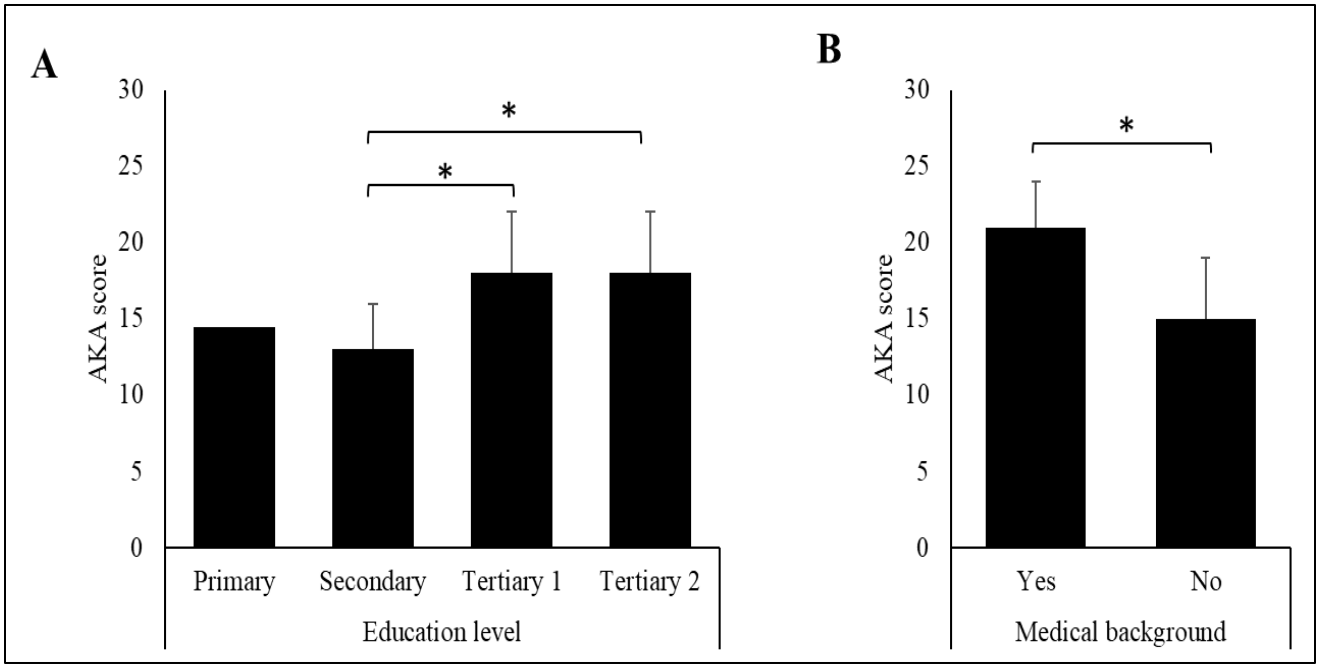

Figure 1. Comparison of Total AKA scores by Education Level and Medical Background. (A) Bar chart (median ± IQR) of total AKA score by education level. Groups were compared using the Kruskal-Wallis test with post-hoc Dunn's multiple pairwise comparison test, revealing higher AKA scores in tertiary education groups compared to secondary education. * indicates $P<0.001$. (B) Bar chart (median ± IQR) of total AKA scores by medical background (yes/no). Groups were compared using the Mann-Whitney U test, showing a higher median AKA scores among participants with a medical background. * indicates $P<0.001$.

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