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EVALUATING COMMUNITY KNOWLEDGE AND ATTITUDES TOWARDS ANTIBIOTIC USE AND RESISTANCE: A CROSS-SECTIONAL ANALYSIS -A GROWING PUBLIC HEALTH ISSUE

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ABSTRACT

Background

In Pakistan, there is a lack of regulations governing prescription of drug sales. As a result, pharmacies can sell most medications, including antibiotics without a prescription. This lack of regulation places a significant burden on the public to educate themselves about antibiotic use. **Objective**: This study investigated public knowledge, attitudes regarding antibiotic use and resistance in Karachi. **Methodology**: The study was conducted in Dow university hospital from 15 May - 15 July 2024, using a questionnaire and convenience sampling. Participants included 250 individuals aged 21-60 from public institutions in Karachi. Respondents provided demographic data, knowledge and attitudes toward antibiotic use and resistance. **Results:** The study revealed alarming trends in antibiotic use among respondents. A staggering 91% had used antibiotics at least once and 55% mistakenly believed that antibiotics can speed up recovery from common colds. Furthermore, 55% reported receiving antibiotics without consulting a doctor and 62% admitted to purchasing antibiotics without a prescription. The study also exposed a significant knowledge gap, as respondents demonstrated confusion between bacteria and viruses. While 52% correctly recognized the effectiveness of antibiotics against bacteria, a concerning 55% believed antibiotics can combat viruses. Despite these misconceptions, trust in doctors remained high, with 80% of respondents expressing confidence in medical professionals. Analysis revealed that increased knowledge correlated with lower likelihood of purchasing antibiotics without medical consultation. **Conclusion:** This study highlighted significant misconceptions and knowledge gaps regarding antibiotic use and resistance. Despite high trust in medical personnel, a substantial proportion of

respondents used antibiotics without prescription or consultation. These findings emphasize the need for targeted educational campaigns and policy interventions to address antibiotic resistance

Keywords: knowledge, antibiotic resistance, misconception, convenience sampling, attitude.

INTRODUCTION

Antibiotic resistance occurs when microorganisms develop the ability to survive exposure to antimicrobial drugs, rendering treatment ineffective. This resistance can be genetically transferred between microorganisms, posing a significant public health threat globally. The misuse of antibiotics has led to a rise in antibiotic resistance, making it a major concern for maintaining public health. The prevalence of antibiotic resistance varies across countries, but it is generally correlated with national levels of prescribed outpatient antibiotic use.

In Karachi, the situation is particularly challenging due to the widespread availability of antibiotics without prescription. A study found that even anti-tuberculosis drugs were easily accessible without prescription in pharmacies. The government covers only 20-30% of total health expenditure, leaving the majority of the population to rely on out-of-pocket payments.

As a result, approximately most of the population tends to avoid visiting physicians, instead opting for self-treatment. This lack of medical knowledge can lead to adverse health effects and contribute to the growing problem of antibiotic resistance. To address this issue, it is essential to understand the knowledge and attitudes toward antibiotic use .This study aimed to investigate these factors among public institution personnel.

METHODOLOGY

We conducted a prevalence survey over 8 weeks in including all admitted patients (≥18 years) patients at the Dow university hospital. A computer generated electronic list of admitted patients was shared by the admissions department daily. Patient profiles were reviewed and data were collected on the predesigned electronic form adapted from the questionnaire (Additional file 1: Appendix 1) which was constructed based on similar research conducted in Sweden. Participants were eligible if they were above 18 years old and medical personnel were excluded to avoid potential response bias. The findings of this study provided valuable insights into the knowledge and attitudes toward antibiotic use, informing strategies to address the growing threat of antibiotic resistance.

The study respondents where verbally informed about the research by administrative unit. The questionnaire was distributed to the participants. The questionnaire contained five sections, covering questions about (1) socio-demographics and information about previous antibiotic use (2) access to antibiotics (3) knowledge on areas of antibiotic use and effectiveness (4) knowledge on side-effects of antibiotic treatment and antibiotic resistance (5) expectations from doctors, doctors' habits and the doctor-patient relationships. Sections 2–5 consisted of several statements to which the respondent could answer 'yes', 'no' or 'I don't know'. The socio-demographic characteristics collected included: gender (male/female), age, number of children in the household (0/1/2/3/>3, which later during the data analysis was dichotomized as none/one or more children), area of residence, educational level (elementary/upper secondary/university-higher education), and type of education (health related/not health-related).

Ethical considerations

The study was approved by the institutional IRB of Dow University of Health Sciences.

Data management and statistical analyses

Questionnaire data were entered in Excel and transferred to STATA for analysis. During data analysis, awareness, resistance and general scores were created to assess knowledge. The awareness score was calculated as a sum of the correct answers to the questions under sections 2 (three

questions on access to antibiotics) and 3 (14 questions on knowledge about antibiotic use and its effects). Resistance scores summed up the correct answers for the questions from section 4 (15 questions on side effects and resistance), whilst the general score represented the sum of correct answers on the questions in all of the above mentioned sections. The Cronbach's alpha has been calculated for each score. Descriptive statistics were calculated using median, standard deviation for numerical variables and frequencies, percentages for categorical variables. T tests, $\chi 2$ tests and correlation coefficients were used for bivariate analyses of the relationship between independent variables and the outcomes of interest. For count outcomes such as, awareness, resistance and general scores, logistic regression models were used to study the relationship between scores and socio demographic characteristics. Stepwise logistic regression models were performed to study the association between 'having purchased Antibiotics without prescription' and 'having received Antibiotics without prior medical consultation' (both binary variables), versus demographic characteristics (age, gender, health related training, children in household and living area) and knowledge scores (awareness, resistance, and general scores. P value $\leq$ 0.5 were considered significant in the final models.

RESULTS

This study consisted of 250 participants, with 187 completing the survey. The respondents' demographic characteristics are summarized in Table 1, revealing that nearly half (47%) fell within the 30-50 age bracket, and an overwhelming majority (92%) held a higher education degree.

The survey's key findings, outlined in Table 1, indicate that over half (55%) of respondents received antibiotics without prior medical consultation and a significant proportion (62%) purchased antibiotics without a prescription. Furthermore, approximately 55% believed antibiotics accelerate recovery from common colds. In terms of doctor-patient relationships, most respondents (54%) agreed that pharmacy staff often provide guidance on antibiotic use, and a substantial majority trusted doctors' decisions regarding antibiotic prescriptions (76%) and non-prescriptions (80%).

Table 1: Background characteristics of the 187 respondents, who responded to the questionnaire and knowledge score.

Age years, mean ± SD	44.3 ± 18.2
Gender	
Male	150(80)
Female	37(20)
Mode of admission	
Emergency room	91(48.6)
Elective admission	96(50)
unknown	0
Admission to HC facility in past 90 days	
No	82(43.6)
Yes	31(16.6)
Unknown	74(39.6)
Relevant culture taken before starting antibiotics	
Yes	70(37.2)
No	56(29.9)
Partially	12(6.5)
N/A(e.g,prophylaxis)	46(25.1)
Unknown	2(1.0)
Have ever used antibiotics	
Yes	171(91)
No	13(7)

Don't know	3(2)
Resistance score (median, IQR)	6(4-7)
Awareness score (median, IQR)	8(5-10)
General score (median, IQR)	14(9-17)

Table 2, Antibiotics used by the respondents, who responded to the questionnaire

Antibiotics used,	**Frequency(%**
Amikacin	**9(4.7)**
Amoxicillin/Clavulanic acid	**25(13.5)**
Azithromycin	**3(1.5)**
Benzathine benzyl penicillin	**1(0.4)**
Cefazolin	**7(4)**
Cefoperazone/sulbactum	**18(9.5)**
Ceftazidime	**1(0.4)**
Ceftriaxone	**26(13.8)**
Cefuroxime	**21(11.3)**
Ciprofloxacin	**10(5.2)**
Clarithromycin	**1(0.4)**
Clindamycin	**2(1.1)**
Colistin	**2(1.1)**
Ertapenem	**1(0.4)**
Fosfomycin (oral)	**1(0.4)**
Levofloxacin	**3(1.5)**
Meropenem	**14(7.6)**
Metronidazole	**12(6.5)**
Piperacillin/tazobactam	**14(7.6)**
Rifaximin	**1(0.7)**
Sulfamethoxazole/trimethoprim	**1(0.7)**
Tigecycline	**1(0.4)**
Vancomycin	**7(4.0)**
others	**6(3.2)**

Regression analysis

Knowledge scores were quite low. The median resistance score, based on 17 questions, equaled six and median awareness score, based on 15 questions, did not exceed eight. According to the Cronbach's alpha analyses the resistance, awareness and general scores have an acceptable level of reliability (Table 3). Multiple regression analyses (Table 5) showed that the expected resistance score value was expected to be higher for the 30–50 and >50 age groups compared to the <30 age group. Significantly higher values of awareness and general scores were also seen for the 30–50 age group as compared to the <30 age group. Male respondents tended to have significantly lower resistance, awareness and general scores in comparison to female respondents. Awareness and general score counts were lower among respondents without anyhealth-related training as compared to those who received some type of health- related training. Logistic regression analyses showed that a higher awareness score is associated with lower odds of having purchased antibiotics without a medical consultation ($p = 0.007$) (Table 6). Age is positively correlated with odds of receiving antibiotics without consulting a doctor. The resistance score positively correlated with the odds to have purchased antibiotics without prescription.

DISCUSSION

This study provided the first insight into knowledge and attitudes towards antibiotic use in Karachi, shedding light on a critical global health issue. Previous researches in countries such as Sweden, South Korea, and Malaysia has highlighted the challenges of promoting proper antibiotic use worldwide.

Our findings indicated a significant knowledge gap among participants regarding antibiotic use and resistance. Over half (55%) believed antibiotics can cure common colds more quickly, exceeding the 19.1% reported in a similar Swedish study. This misconception is alarming, as it perpetuates the misuse of antibiotics.

Table 3: Percentage of respondents who agreed with the selected statements

Topic appli- cable)	Correctness of the statement (if	Number (%) agreeing with the statement
Access to antibiotics		
Leftover antibiotics are good to keep at home in case of future need	Incorrect	91 (47)
Have received antibiotics without consultation with doctor		103 (55)
Have purchased antibiotics without prescription		115 (62)
Areas of antibiotic use and effectiveness		
Antibiotics speed up recovery from a cold	Incorrect	103 (55)
Antibiotics are effective against bacteria	Correct	97 (52)
Antibiotics are effective against viruses	Incorrect	102 (55)
Inflammation of the ear in a 3- to 6-year-old child almost always needs to be treated with antibiotics	Incorrect	54 (29)
Side-effect of antibiotic treatment and antibiotic resistance	Incorrect	40 (21)
If you feel better after half the treatment with antibiotics you can stop taking them		
Humans can become resistant to antibiotics	Incorrect	116 (62)
Bacteria can become resistant to antibiotics	Correct	102 (55) Doctor–
patient relationship		
Doctors often take time to inform the patient during the consultation how antibiotics should be used		*114*
Pharmacy staff often tell you how antibiotics should be used		*100 (54)*
I trust the doctor's decision when s/he prescribes antibiotics		*141 (76)*
I trust the doctor's decision if s/he decides not to prescribe antibiotics		*148 (80)*

Table 4: Reliability statistics, Cronbach's alpha calculate for knowledge scores

Cronbach's alpha	
Resistance score	0.69
Awareness score	0.69
General score	0.79

The misinterpretation of individual health status is a widespread issue, with many people believing antimicrobials can treat any perceived infection. This misconception contributes to the over prescription of antibiotics, particularly for respiratory tract infections, which account for a significant portion of antibiotic use in primary care.

Recent guidelines suggest adopting a "wait-and-see" approach for certain upper respiratory tract infections, delaying antibiotic prescriptions to reduce unnecessary use. However, inadequate knowledge among patients and healthcare professionals can hinder the implementation of such strategies. One possible explanation for the knowledge gap observed in this study is the lack of understanding of microbiological terms, such as "bacteria" and "virus." Educating patients and healthcare professionals about the differences between these pathogens may be essential in promoting proper antibiotic use.

This study revealed a concerning overlap in the results, with over half of participants obtaining antibiotics without medical consultation and more than 60% purchasing antibiotics without a prescription. This discrepancy may be attributed to the ambiguity of the term "prescription" in the questionnaire, which may have led participants to interpret it differently.

The widespread use of broad-spectrum antibiotics in Karachi, such as co-amoxiclav, which accounted for 42.9% of total antibiotic use in 2022, underscores the need for enhanced public health educational interventions. Our study's findings suggested that the general public lacks a clear understanding of antibiotic use and the risks associated with antibiotic resistance.

Public health educational interventions are widely recognized as a successful strategy for controlling and preventing antibiotic resistance. Studies have shown that increasing public awareness of antibiotic treatment and resistance can influence patient demand for antibiotic prescriptions and promote responsible antibiotic use.

However, prescription policies alone are insufficient to address the issue of antibiotic resistance. Research suggested that medical prescriptions do not guarantee accurate diagnoses.

Interestingly, our study found that nearly 80% of participants trusted their doctors' decisions regarding antibiotic prescriptions, with 76% trusting their decisions to prescribe antibiotics and 80% trusting their decisions not to prescribe antibiotics. Similar findings have been reported in Swedish studies, highlighting the importance of trust in the doctor-patient relationship.

This study also found a high level of trust in doctors among participants, regardless of whether antibiotics were prescribed or not. This is significant, as trust is difficult to establish through interventions alone. Trust in doctors is a crucial aspect of the doctor-patient relationship, influencing patient satisfaction and adherence to treatment.

The majority of participants demonstrated correct knowledge about completing the full course of antibiotics, even after symptoms improved. However, the questionnaire did not assess whether individuals continue treatment when they start feeling better.

Public health campaigns have emphasized the importance of completing antibiotic treatment as prescribed to prevent the selection of resistant organisms. Nevertheless, recent research suggests that prolonged treatment may lead to higher resistance rates, while shorter treatments could be more effective.

Table 5 Logistic regression: factors associated with resistance, awareness and general score

Independent variable	Category	Dependent variable		
		Resistance score N = 185 Coef. (95 % CI)	Awareness score N = 187 Coef. (95 % CI)	General score N = 185 Coef. (95 % CI)
Age group	<30	Ref.	Ref.	Ref.
	30–50	0.19 (0.02; 0.36)*	0.14 (0.00; 0.28)*	0.18 (0.07; 0.29)***
	>50	0.21 (0.03; 0.39)*	0.05 (−0.11; 0.20)	0.10 (−0.02; 0.22)
Gender	Female Male Yes	Ref.	Ref.	Ref.
	No	−0.25 (−0.41; −0.20 (−0.34; −0.22 (−0.33; −0.10)***		
Health-related training		−0.08)**	−0.05)**	Ref.
		Ref.	Ref.	−0.14 (−0.24;
			−0.17 (−0.30; −0.05)****	
			−0.04)**	

Table 6 Logistic regression: factors associated with having received/purchased antibiotics without medical consultation or prescription

Independent variable	Category	Dependent variable	
		Received antibiotics without Medical Consultation OR (95 % CI)	Purchased Antibiotics without Medical Prescription OR (95 % CI)
Age group	<30	Ref.	
	30–50	4.32 (1.88; 9.90)**	0.90 (0.80; 1.01)
	>50	2.85 (1.20; 6.79)*	
Awareness score		0.87 (0.78; 0.96)**	
Resistance score			1.17 (1.01; 1.34)*

* p < 0.05** considered as significant

CONCLUSION

The study revealed that people have misconceptions and lack awareness about antibiotic use and resistance. More research is needed to understand what drives people's attitudes and behaviors. To address this, governments should invest in public health education for both the public and healthcare professionals. This includes developing regulations, prescription policies, and empowering pharmacists to raise awareness. Public health strategies should target areas of misconception, misuse, and high-risk populations to promote proper antibiotic use.

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