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Original Research Article

Understanding the parental contribution to antimicrobial resistance: a study of pediatric antibiotic practices in South Asian communities

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ABSTRACT

Background: Antimicrobial resistance (AMR) is a growing public-health threat in South Asia. Because community AMR is shaped by parental knowledge, attitudes, and practices (KAP) regarding pediatric antibiotics, we assessed KAP among Pakistani parents and examined socioeconomic differences.
Methods: A cross-sectional survey was administered from January 2024 to June 2025 in pediatric and pediatric-surgery outpatient clinics of five tertiary hospitals. Using multistage stratified random sampling, 425 parents of children aged 0–12 years completed a structured questionnaire spanning knowledge, attitudes, and practice domains.
Results: Only 38.0% demonstrated appropriate knowledge of antibiotic use, while 61.9% incorrectly believed antibiotics treat viral infections. Self-medication with antibiotics was reported by 43.5%, frequently via over-the-counter purchase at pharmacies, and 45.9% stored leftover antibiotics. Lower household income (OR 1.79; 95% CI 1.26–2.55; p=0.003) and lower educational attainment (OR 2.14; 95% CI 1.52–3.00; p=0.001) independently predicted inappropriate antibiotic practices.
Conclusions: Parental awareness and behaviors surrounding pediatric antibiotics in Pakistan are suboptimal, particularly among families with lower income and education. Addressing community-level AMR will require culturally tailored education, strengthened counseling by physicians and pharmacists, and enforcement of regulations limiting non-prescription antibiotic sales. Integrating stewardship messages into routine child-health visits and media campaigns, with monitoring through KAP surveys, may help curb misuse and preserve antibiotic effectiveness.

Keywords: Parental knowledge, Antibiotic misuse, Antimicrobial resistance, Pediatrics, South Asia

INTRODUCTION

Antimicrobial resistance (AMR) is an issue of grave concern, particularly for countries like India, Pakistan, and Bangladesh, which are classified as low- and middle-income countries (LMICs), due to their systemic healthcare, educational, and sociocultural hurdles. South Asia has been flagged as an international hotspot for the misuse and over-prescription of antibiotics, particularly in children.[1,2] Most of the time, mothers and fathers are the caregivers that provide antibiotic treatment to children because there is no restriction to obtaining the medication OTC, weak enforcement of regulations, and rampant fallacies concerning their use.[3,4]

Knowledge, attitudes and practices (KAP) of the general public directly contribute to parental antibiotic misuse and

AMR at community level. This is observed notably in children aged 0-12 years, which is the most susceptible age group that inappropriately receives antibiotics for non-bacterial infections such as viral upper respiratory tract infections and diarrheal diseases.[5]

Recent studies indicate that education level and family income are among the most prominent factors influencing antibiotic misuse behaviours by parents in South Asia. In a multicentric study conducted in India, Pakistan, and Bangladesh, it was found that parents with no or minimal education were 3.5 times more likely to use over-the-counter antibiotics as compared to those with higher education.[6]

Income stratification depict inequities more clearly: Low-income families (India: <INR 10,000/month; Pakistan: <PKR 20,000/month; Bangladesh: <BDT 10,000/month) had the highest rates of self-medication as well as incomplete course of antibiotic treatments.[7,8] Families in the middle-income bracket showed relatively better understanding of medical practices; however, they hoarded antibiotics for future use. In addition, families over the higher income bracket (>INR 30,000/month) exhibited greater trust in prescriptions and full course treatments.[9]

Some misconceptions surrounding the use of antibiotics in South Asia has been studied and found to be prevalent amongst parents. In Pakistan, over 60% of parents believe antibiotics can treat viral infections such as the common cold.[10] Concerning Bangladesh, 58% of participants of the study were unable to differentiate between antibiotics and common medications such as paracetamol or antihistamines.[11] In India, approximately 70% of parents stated that they stop giving the prescribed antibiotics as soon as their child starts feeling better, which means the course was not fully adhered to.[12] These have been associated with urban or rural divides and classes of health literacy, and also the main source of health information, including television, social media, pharmacists, or even family members.[13]

Research demonstrates that waiting for fever prescriptions, expecting antibiotics to be prescribed during consultations, informal health advice over doctor guidance, and informal healthcare expectations all shape the antibiotic misuse issue. A 2023 survey carried out in Lahore, Pakistan revealed that to some extent, 46% of parents expected prescriptions regardless of medical advice.[14] Further, a study conducted in rural West Bengal, India found that 42% of parents hoarding antibiotics displayed similar tendencies.[15]

There are rising concerns about the impact of the misuse of antibiotics due to parenting approaches which stem from inappropriate and frequent antibiotic prescriptions for children, as it contributes to an increase in multi-drug-resistant infections, hefty healthcare expenditures, higher hospitalization rates and exacerbates the risk of treatment failure.[16] This kind of community-level misuse which is mostly a result of parental behaviour creates a vicious cycle fuelling AMR.

Most policies related to AMR in South Asia are hospital-centric and, unfortunately, ignore community-driven actions, which places the focus on the behaviour of the population as a whole. There is an urgent need to address the issue of AMR from parental perspectives employing systematic KAP surveys layered by levels of education and income to create tailored public health frameworks.

Considering the socioeconomic status, education level, child health indicators, and the access to healthcare, the objective of this research is to evaluate the South Asian Community's gap in knowledge and participation towards antibiotics in the context of pediatric healthcare. The results are anticipated to inform community-centered antibiotic stewardship plans for South Asian nations.

METHODS

This descriptive-type cross-sectional study has been conducted to determine KAP of parents concerning antibiotic-use among children and their possible role on antimicrobial resistance among south Asian communities. This study was conducted in the paediatric medicine and paediatric surgery outpatient departments of five tertiary care public sector hospitals of Pakistan such as Shaikh Zayed Hospital, Lahore; Jinnah Hospital, Lahore; Nishtar Hospital, Multan; Civil Hospital, Karachi; and Khyber Medical College (KMC) Teaching Hospital, Peshawar. These are the hospitals which were chosen and will give geographically varied distribution of both the urban and semi-urban population in the provinces of Punjab, Sindh, and Khyber Pakhtunkhwa. The period of the research was 2024 January-2025 June.

The patients included in the study were parents or primary caregivers of children age 0 to the age of 12 who were in outpatient department of the said hospitals at the time of the study date. Minimum required sample size was estimated at a 95 percent level of confidence with a 5 percent margin of error and an assumed 50 percent level of prevalence of inappropriate use of antibiotics, arrived at a base sample size of 384 participants.[14] The desired number of subjects in the final sampling was 425 participants (proportionately allocated to the five hospitals) to ensure an expected rate of 10 percent non-response. The multistage stratified random sampling methodology was adopted with stratification in the first stage on the province level, and by a systematic random sampling procedure in the second stage by choosing every third eligible caregiver during the outpatient service time within each of the outpatient departments.

The inclusion criteria consisted of parents or main caregivers of children aged 0 to 12 years of age who can voluntarily participate in the research and elaborate a written informed consent. Only parents who could

understand the questionnaire in English or Urdu were incorporated. Parents or caregivers of a child who was critically ill or hospitalized and persons who were healthcare professionals themselves were excluded, as they could also carry bias. Also, data that were either not completed or not given voluntarily were not incorporated in final analysis.

A pre-tested structured questionnaire that was customized to this study was in use to collect the data. The questionnaire was designed to elicit the comprehensive KAP information and was prepared in both English and Urdu to make the locals understand it despite the different literacy levels.

It comprised some sections, such as sociodemographic data (age, gender and level of education, monthly income of the household, relation to child, the number of children and source of health information), child health data (age, gender, history of chronic diseases, recent illnesses, and history of use of antibiotics), knowledge assessment (awareness of the use of antibiotics and antibiotics resistance and distinction between antibiotics and other medicines), attitudes assessment (the belief of parents that they need to take antibiotics, trusting the doctor advise and behaviour of antibiotics storage), and practices assessment The application of structured questionnaire was interviewer administered to reduce the chances of misinterpretation and enhance data accuracy through well trained research assistants.

The process of data collection occurred on Monday through Saturday in regular outpatient hours between 8:00 AM and 2:00 PM. Interested persons were reached within the waiting rooms after they had been registered as outpatients. A confidential setting was used in interviewing the participants after signing a written informed consent. The interviews involved about 10 to 12 minutes. Questionnaires handed in were checked each day by specified study supervisors at each site to be complete and consistent.

The data were entered and then organised with the help of IBM statistical package for the social sciences (SPSS) statistics version 26. Statistical descriptions were made, whereby frequency and percentages were determined for categorical variables (level of education, income group, and KAP responses), and the mean, and the standard deviation was determined in case of continuous variables (age). Inferential statistics were also used to investigate the relationships that point to associations among independent variables (education level, income group) and KAP outcomes.

Categorical variables were tested using the Chi-square, and the binary logistic regression was undertaken to determine the predictors of inappropriate antibiotic use practices. During the analysis, a p value below 0.05 was held to be significant.

RESULTS

In this study, 425 parents, and other principal caregivers of the 012 ages were chosen to represent participants providing information across five tertiary care hospitals in Pakistan. The respondents had a mean age of 33.7 (say plus) 7.2 years. Mothers formed the greatest proportion (68.2%), whereas fathers constituted 25.4 percent of the respondents, and other caregivers took 6.4 percent. On the side of education, 29.4 percent (n=125) did not achieve any form of education, 34.1 percent (n=145) were primary level, 22.8 percent (n=97) reached secondary education and 13.7 percent (n=58) were graduates and above. Stratification showed that 41.6 percent of household income fell in low-income category (<PKR 20,000/month), 36.2 percent in the middle-income category (PKR 20,000250,000/month) and 22.2 percent in the high-income category (PKR >50,000/ month). These demographics are summarized in Table 1.

Table 1: Demographic factors of respondents.

Level	N	%
Respondent type		
Mother	290	68.2
Father	108	25.4
Other caregiver	27	6.4
Education level of respondent		
No formal education	125	29.4
Primary	145	34.1
Secondary	97	22.8
Graduate and above	58	13.6
Monthly income of respondents		
Low (<PKR 20,000)	177	41.6
Middle (PKR 20–50k)	154	36.2
High (>PKR 50,000)	94	22.2

Knowledge assessment

On the whole, the levels of the correct knowledge about antibiotic use were 38 per cent only. Precisely, 61.9 percent had a wrong understanding that antibiotics fight viral infections whereas 37.4 were able to correctly define what antimicrobial resistance is.

The stratification based on the education level also revealed a strong difference in the level of knowledge: 22% had correct knowledge out of the persons with no educational background against 68% out of the graduates or higher category ($p<0.001$). Also, 78% of the group of uneducated respondents considered that antibiotics help in the treatment of viral diseases compared to 38% of better-educated citizens.

The level of correct knowledge regarding antibiotics also shows an ascending tendency with the degree of instruction (22 percent among the non-educated and 68 percent among the graduates). Details shown in Table 2.

Attitudes assessment

The misconceptions were mass beliefs on parental attitudes. According to the research, 54.6 percent of the respondents would confess that they have always anticipated that, when their child is ill with fever, doctors should prescribe antibiotics. Close to 69 percent of low-education participants shared this belief compared to 34 percent of graduates ($p<0.001$). In addition, 45.9 percent of the entire respondents said that they kept the leftover antibiotics at home to use in the future. Income stratification also indicated that the proportion of those who practiced this more was in the low-income group (61) than in the high-income group (24) ($p=0.003$).

The degree of trust in physician decision differed significantly according to the education: such as 82 percent of respondents with higher education trusted the decision of the doctor not to write antibiotics, compared with 40 percent of respondents without any education. Experiencing pressure on physicians was mentioned by 54.6 percent, which was also more probable among the low-education (69 percent) and low-income (63 percent) group ($p<0.01$).

Table 2: Parental KAP indicators by education level.

Education level	Correct knowledge (%)	Belief antibiotics cure viruses (%)	Store leftover antibiotics (%)	Self-medicati-on (%)	Trust in doctor (%)	Pressure doctor for antibiotics (%)	Complete course (%)
No formal	22	78	61	67	40	69	32
Primary	36	62	46	41	57	53	52
Secondary	51	49	35	30	71	46	61
Graduate+	68	38	20	19	82	34	76

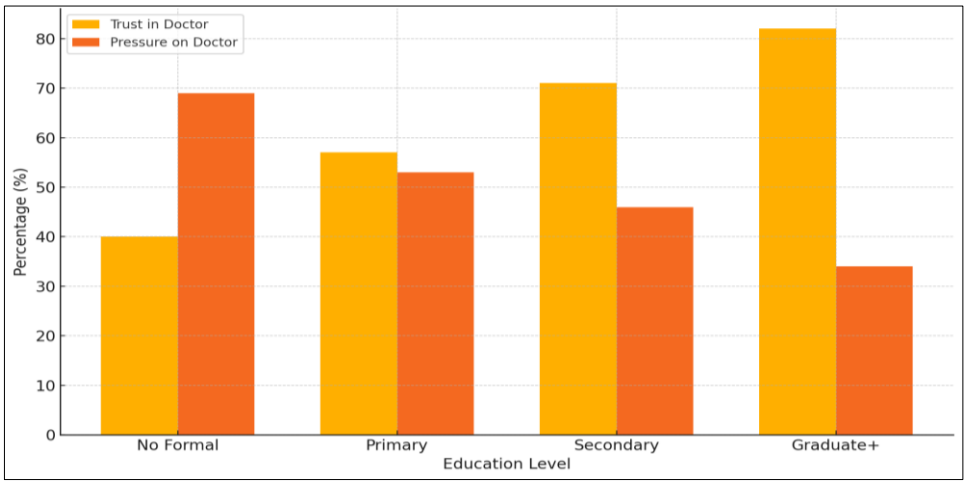

Figure 2: Trust in doctors versus pressure on doctor by education level.

Figure 2 shows the percentage of parental trust of doctors compared to the pressure of antibiotics to doctors, by the level of education. It displays that as the level of education increases so does the level of trust and reduced pressure.

Figure 3 displays the relative part played by individual education groups in total self-medication findings. It makes it clear that most of the self-medication practices are committed by parents who have no education or have received no education at all.

Practices assessment

Regarding the real antibiotic habits, 43.5 percent of the respondents had used antibiotics in the care of their children in the last six months without the prescription of a doctor. Most of the caregivers (67.2) were getting their antibiotics through direct requests to pharmacies whereas 24.5% of the caregivers were using leftover drugs. The percentage of patients achieving consistent full course of prescribed antibiotics came to a low figure of 50.1. The missing use of the course was most significantly related to less education ($p<0.001$) and lower income ($p=0.004$).

Sixty-seven percent of the caregivers that self-medicated were in the low education segment, unlike 19 percent of the graduates. The logistic regression analysis indicated that low educational levels (OR=2.14, 95% CI: 1.523.00, $p=0.001$), and low household income (OR=1.79, 95% CI: 1.263.55, $p=0.003$) were the independent contributors to inappropriate antibiotic use.

Medical information services

When it comes to the sources of healthcare information, 48 percent of the participants claimed to turn to family or

friends, 32 percent turned to social media or television and only 20 percent mostly turned to healthcare professionals whenever seeking information concerning the use of antibiotics. This is particularly high in the case of the low-income and low-education.

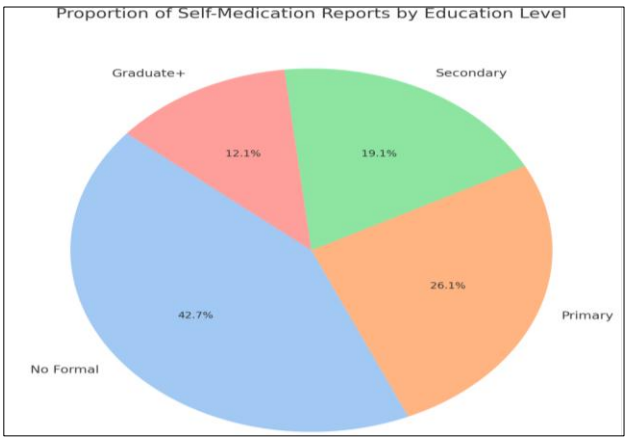

Figure 3: Proportion of self-medication reports by education level.

DISCUSSION

This is a multicentric cross-sectional study that assessed the parental KAP towards antimicrobial antibiotic use and its correlation to AMR in reputed tertiary care hospitals in Pakistan. The results provided significant gaps in knowledge, wrong attitude, and prevalence of self-medication, and that is mainly among low-income and education level parents. These findings correspond to similar tendencies reported in South Asia, which signify the topicality of our findings in the region.

The proportion of parents who displayed proper knowledge regarding the use of antibiotics was 38 percent in our study and 61.9 percent of the parents held the view that antibiotics can be used in treating viral diseases. The confirmatory findings are shared with the study of Islam et al, who shared the identical percentages of similar misconceptions, 63 percent of caregivers in rural Bangladesh believed that same.[18] Similarly, Bhandari et al reported that 61 per cent of caregivers in Nepal did not have accurate knowledge on antibiotic indications.[19] This affirms that the misperceptions towards antibiotic use are common even in South Asian region.

It was found that education was a powerful indicator of knowledge and practices. Parents with no formal education showed correct knowledge in only 22 percent (since parents with graduate level education or above showed correct knowledge in 68 percent, $p<0.001$). This gradient is parallel to the results found in Afghanistan as indicated by Safi et al.[20] In addition, Uddin et al reported a comparable relationship between the low-income level, low education, as well as an antibiotic abuse in Bangladesh.[21] Such results are also supported by Saleem et al, who, in a cross-nation study (Pakistan, India, and Bangladesh), have established that education and income are independent antecedents of parental antibiotic misuse behaviors.[24] This confirms our findings of the logistic regression analysis which showed a significant negative relationship between low education (OR=2.14, 95% CI: 1.523.00) and low income (OR=1.79 95% CI: 1.262.55).

The rate of self-medication in our study was 43.5 percent, which corresponds to the regional studies.[10,18,24] The use of self-medication is generally much lower in countries with higher income levels as was observed in a systematic review by Hakansson and Guldbrandsson that reported pediatric self-medication rates as low as 10-20 percent in Europe.[22] The contrast appends the findings Holmes et al, noting that the drivers of AMR differ substantially between LMICs and high-income countries, with community misuse being predominant in South Asia.[25]

One of the practices of concern in our study was that 45.9 percent of the parents stored the leftover antibiotics. This habit makes it more possible to have immature dosing, and improper reusage which are both crucial issues in the production of AMR. The behavioural patterns were highlighted by Holmes et al in their international review as community-level AMR-triggers that can be changed.[25]

The next important note was a revelation that 54.6 percent of parents confessed to influence physicians in prescribing antibiotics. This conforms to the results of Sun et al on China, where patient-driven demand was detected as the most influential factor affecting unnecessary prescriptions of antibiotics.[23]

In line with these gaps, it is attestable that the reports of those parents who said that they trusted the judgment of physicians in antibiotics prescriptions especially in higher education groups was 58.4 percent. This result implies that possibly the points of leverage include community-based AMR stewardship groundwork in the form of parent imparting and community trust of health care experts.

Public health implications

Important involvements determined in the present research provide consistency with the body of past publications, such as the principles of sample size calculation by Charan and Biswas, which highlights the necessity of the multicentric studies on AMR and KAP within the community context that will be sufficiently powered.[17] Interventions aimed towards educationally stratified public health communication, enhanced regulation of OTC antibiotics, and involvement of community pharmacists should be mentioned.

Limitations

Causality cannot be concluded because the study uses a cross-sectional design, and there is a potential to confound information by self-reports and recall bias or the social desirability phenomena. Furthermore, a focus on the

hospitals in the public sector might not well cover the practices in the scenario of private healthcare.

CONCLUSION

The research proves the fact that parents lack proper knowledge, attitude and practice about the use of antibiotics in children in Pakistan and have close connections to the education and income levels. These socio-demographic factors should have privileged attention in AMR interventions at community level as the same occurs in India and Bangladesh. Future studies ought to be aim at gauging the overall effectiveness of such interventions.

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