

ANTIBIOTIC USE AND HEALTHCARE-SEEKING PRACTICES AMONG PARENTS OF CHILDREN: THE ROLE OF ANTIMICROBIAL RESISTANCE AWARENESS AND ACCESS TO HEALTHCARE

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Abstract

Antibiotic misuse among children is an important contributor to antimicrobial resistance (AMR), yet parental antibiotic practices are shaped by more than knowledge alone. Parents' perceptions of illness severity, awareness of AMR, previous experiences with antibiotics, healthcare accessibility, cost, waiting time, and trust in healthcare providers may collectively influence whether antibiotics are obtained through appropriate consultation or used without professional guidance. This article examines the relationship between AMR awareness, access to healthcare, healthcare-seeking behaviour, and parental antibiotic-use practices, with particular attention to self-medication and inappropriate antibiotic use. Existing evidence indicates substantial variation in parental antibiotic practices across settings. A systematic review of pediatric antibiotic self-medication found considerable regional variation, while research from Pakistan has documented non-prescription antibiotic use and misconceptions among parents. A recent meta-analysis also found that parental expectations for antibiotics during childhood respiratory infections were common, although substantial heterogeneity existed between studies. The proposed analytical framework integrates the Health Belief Model with healthcare-access and behavioural variables. A cross-sectional survey design is proposed, using descriptive statistics, reliability analysis, bivariate tests, and multivariable logistic regression to identify factors associated with inappropriate antibiotic use. No original empirical dataset is claimed in this manuscript; therefore, numerical findings reported here are explicitly identified as evidence from previously published studies rather than original results. The framework provides a basis for developing context-sensitive antibiotic stewardship interventions targeting parents and caregivers.

1. INTRODUCTION

Antimicrobial resistance (AMR) has become a major global public-health challenge because resistant infections reduce the effectiveness of medicines used to prevent and treat bacterial disease. The World Health Organization (WHO) identifies misuse and overuse of antimicrobials as major drivers of resistance and also recognizes inadequate access to appropriate medicines, diagnostics, and vaccines as contributing factors. WHO currently reports that bacterial AMR was associated with more than 4.7 million deaths globally in 2021, while approximately one in six laboratory-confirmed bacterial infections causing common infections was resistant to antibiotic treatment in 2023 (World Health Organization [WHO], 2026). The Global Antimicrobial Resistance and Use Surveillance System (GLASS) further demonstrates substantial variation in antibiotic consumption between settings, highlighting that antimicrobial stewardship must address both inappropriate use and barriers to appropriate access (WHO, 2025).

The global burden is substantial. The Antimicrobial Resistance Collaborators (2022) estimated that bacterial AMR was associated with approximately 4.95 million deaths in 2019, including 1.27 million deaths directly attributable to resistance. Although AMR is a complex phenomenon involving antimicrobial exposure, microbial evolution, infection prevention, prescribing systems, and health-system conditions, individual antibiotic-use behaviour remains an important component of the broader problem.

Children are particularly relevant to antibiotic stewardship because childhood respiratory and other infectious illnesses are common, while many respiratory infections are self-limiting and do not require antibiotics. Parents and caregivers frequently make decisions concerning whether to seek professional care, where to seek it, whether to request antibiotics, whether to reuse previous prescriptions, and whether to administer medicines available at home. A systematic review found that parental knowledge about respiratory infections, perceptions of illness, education, and previous experiences can influence antibiotic-

related attitudes and behaviour, although greater knowledge does not invariably produce appropriate antibiotic use (Cantarero-Arévalo et al., 2017).

Self-medication represents an important pathway through which inappropriate antibiotic use may occur. Bert et al. (2022), in a systematic review of antibiotic self-medication among children, identified substantial international variation and reported that parental knowledge, perceptions of symptoms, previous antibiotic experience, healthcare accessibility, and socioeconomic circumstances were among factors associated with self-medication.

The problem is also documented in Pakistan. Siddiqui et al. (2014), in a cross-sectional study of 400 parents in Peshawar, examined parental knowledge, expectations, and antibiotic-use practices. More recent research in Islamabad found that 38.6% of surveyed mothers reported purchasing antibiotics without a doctor's prescription, while antibiotic knowledge was significantly associated with practice (Mazhar et al., 2023). Another Pakistani study reported that 21.8% of parents who knew about antibiotics did not visit a physician and instead self-medicated their child, while only 15.2% demonstrated good knowledge of antibiotic resistance (Salam et al., 2023).

These findings suggest that antibiotic use cannot be explained solely by AMR knowledge. Access to healthcare and the way parents navigate healthcare services may be equally important. Consequently, this article focuses on three interconnected dimensions: **AMR awareness, healthcare access, and healthcare-seeking behaviour**, and examines their potential relationship with inappropriate antibiotic use among parents of children.

2. Literature Review

2.1 Parental Antibiotic Use and Self-Medication

Parental decision-making is a critical determinant of antibiotic exposure in children because caregivers frequently control the initial response to childhood illness. Antibiotics may be obtained following a professional consultation, through

pharmacies, from previously prescribed medicines kept at home, or through recommendations from family members and other informal sources.

Bert et al. (2022) systematically reviewed antibiotic self-medication among children and identified evidence from multiple geographical regions. The review demonstrated considerable variability in reported prevalence and identified factors including parental knowledge, symptoms, previous experience with antibiotics, socioeconomic circumstances, and healthcare accessibility. Importantly, the review showed that parental antibiotic self-medication is not a single behavioural phenomenon; it may include starting antibiotics without a prescription, reusing a previous prescription, using leftover antibiotics, or administering antibiotics based on perceived symptoms.

Evidence from Pakistan is consistent with this broader literature. In an Islamabad study of the general public, Aslam et al. (2022) reported antibiotic self-medication in 32.5% of 480 participants. Ciprofloxacin was frequently used for symptoms including coughs, colds, runny nose, flu, sore throat, diarrhoea, and fever. Although this study was not restricted to parents, it illustrates the wider context in which antibiotics can be obtained and used without appropriate clinical assessment.

Among parents specifically, Salam et al. (2023) reported that 21.8% of participants who had knowledge about antibiotics did not visit a physician and instead self-medicated their child. The study also found that 50.8% of parents who had previously visited a physician refilled the previous prescription when illness recurred. Such behaviour indicates the importance of distinguishing between access to information and appropriate clinical decision-making.

2.2 AMR Awareness and Antibiotic Practices

Knowledge about antibiotics and AMR is frequently considered an important prerequisite for appropriate antibiotic use. However, evidence indicates that knowledge alone may not be sufficient to change behaviour.

Cantarero-Arévalo et al. (2017) reviewed evidence from 20 countries and concluded that parental knowledge about respiratory infections and antibiotic use influences attitudes and behaviours, but good knowledge does not necessarily guarantee judicious antibiotic use. Parents may understand that resistance exists while simultaneously perceiving antibiotics as necessary for a particular child's symptoms.

This knowledge-behaviour gap is particularly relevant to AMR awareness. A parent may recognize that inappropriate antibiotic use contributes to resistance at a population level but may not perceive a single antibiotic course, leftover medicine, or an antibiotic obtained without consultation as personally consequential. Evidence from Pakistan supports this concern. Mazhar et al. (2023) found that only 5.28% of 246 mothers surveyed in Islamabad demonstrated good antibiotic knowledge, while 48.37% had poor knowledge. The study also identified a significant association between knowledge and antibiotic-use practice ($p = .002$). However, these findings should not be interpreted as demonstrating causality because the study was cross-sectional.

Salam et al. (2023) similarly found that only 15.2% of participants demonstrated good knowledge of antibiotic resistance. Together, these findings support the need to examine AMR awareness alongside behavioural and structural factors rather than treating awareness as an isolated determinant.

2.3 Healthcare-Seeking Behaviour and Access to Healthcare

Healthcare-seeking behaviour refers to the actions individuals take when responding to illness, including whether and when they seek professional advice, where they seek care, whether they use pharmacies as an alternative to medical consultation, and whether they rely on previous prescriptions or informal advice.

Healthcare access is multidimensional. It may include geographical proximity, affordability, availability of providers, waiting time, transportation, perceived quality, and confidence

in healthcare services. Consequently, a parent may have nominal access to healthcare but still perceive professional consultation as inconvenient, expensive, time-consuming, or unnecessary.

Marsh et al. (2024), in a systematic review of parental decision-making in rural and remote settings, identified child symptoms, external advice, parent-related factors, barriers to healthcare, access to antibiotics, and sociodemographic characteristics as important themes. These findings suggest that antibiotic behaviour is embedded in a broader decision-making environment rather than being determined exclusively by medical knowledge.

Similarly, Paulsamy et al. (2023) examined parental health-seeking behaviour, self-medication, antibiotic use, and AMR in Saudi Arabia. Among 650 participating parents, approximately 54% reported self-medicating their children, while 43% were unaware that skipping

antibiotic doses could contribute to AMR. The study also identified several demographic and socioeconomic factors associated with self-medication. Because the study was conducted in a particular regional population using a cross-sectional design, its estimates should not be generalized directly to other countries.

Parental expectations may also affect professional healthcare encounters. Shamim et al. (2023) synthesized 19 studies involving 15,664 participants and estimated that 55.78% of parents expected antibiotics when their children presented with upper respiratory tract infections (95% CI [44.60, 66.41]). However, heterogeneity was extremely high ($I^2 = 99.27\%$), demonstrating that parental expectations differ substantially across settings. The finding therefore supports the importance of context-specific research rather than assuming a universal parental behaviour pattern.

Table 1. Selected empirical evidence relevant to parental antibiotic use

Study	Population/setting	Key evidence	Relevance
Siddiqui et al. (2014)	400 parents, Peshawar, Pakistan	Examined knowledge, expectations, and antibiotic-use practices	Establishes Pakistani evidence on parental antibiotic behaviour
Bert et al. (2022)	Systematic review of pediatric self-medication	Identified substantial international variation and multiple behavioural and contextual determinants	Supports multifactorial model
Aslam et al. (2022)	480 members of Pakistani public	32.5% reported antibiotic self-medication	Provides national context for non-prescription use
Salam et al. (2023)	Parents of children in Pakistan	21.8% of informed participants self-medicated their child; 15.2% had good AMR knowledge	Directly links parental knowledge and behaviour
Mazhar et al. (2023)	246 mothers, Islamabad	38.6% purchased antibiotics without prescription; knowledge was associated with practice ($p = .002$)	Demonstrates knowledge-practice relationship

Paulsamy et al. (2023)	650 parents, Saudi Arabia	About 54% self-medicated children; KAP variables were significantly correlated	Supports examination of health-seeking behaviour
Shamim et al. (2023)	19 studies, 15,664 participants	Pooled parental antibiotic expectation: 55.78%	Demonstrates international variation in expectations
Marsh et al. (2024)	Systematic review, rural/remote settings	Healthcare barriers and antibiotic accessibility emerged as important themes	Supports access-related variables

2.4 Research Gap

Existing literature demonstrates that parental antibiotic practices are associated with knowledge, expectations, previous experiences, demographic factors, and healthcare accessibility. However, three limitations remain.

First, many studies examine knowledge and practice without sufficiently integrating healthcare access. Second, studies of self-medication often examine the behaviour itself without modelling healthcare-seeking behaviour as an intermediate behavioural pathway. Third, substantial heterogeneity between countries and populations makes it inappropriate to assume that findings from one healthcare system apply directly to another.

The proposed study therefore integrates AMR awareness, healthcare access, healthcare-seeking behaviour, and inappropriate antibiotic use within one analytical framework.

3. Conceptual and Theoretical Framework

3.1 Health Belief Model

The Health Belief Model (HBM) provides a useful theoretical basis for understanding parental antibiotic decisions. The model proposes that health behaviour can be influenced by perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy (Rosenstock et al., 1988). Applied to pediatric antibiotic use, parents may perceive a child's illness as severe and therefore believe antibiotics provide substantial benefit. Conversely, awareness that antibiotics are ineffective against viral infections may reduce perceived benefit. Healthcare cost, distance, waiting time, and limited service availability may function as perceived barriers to professional consultation.

The HBM therefore helps explain why two parents with similar levels of AMR knowledge may make different decisions. Behaviour may depend on the interaction between knowledge, perceived risk, perceived benefits, perceived barriers, and confidence in navigating healthcare services.

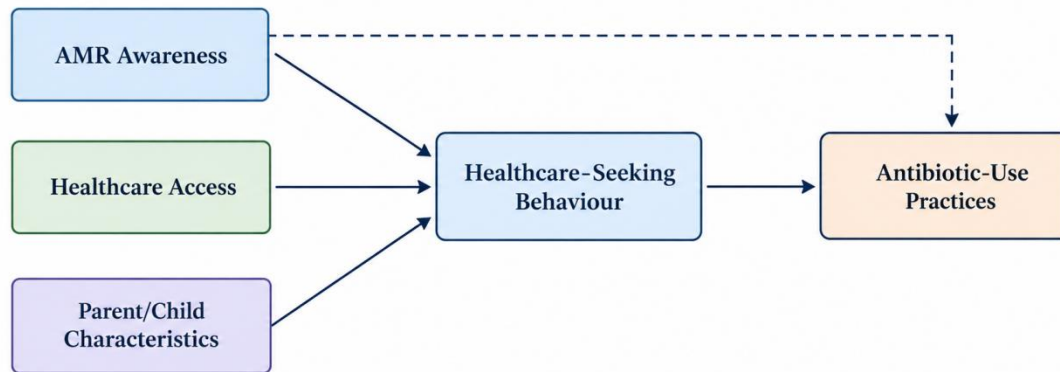


Figure 1. Conceptual framework linking AMR awareness, healthcare access, healthcare-seeking behaviour, and parental antibiotic-use practices

4. Methodology

4.1 Research Design and Population

A quantitative cross-sectional survey design is proposed to investigate antibiotic-use practices among parents or primary caregivers of children. The target population would comprise parents/caregivers who have responsibility for healthcare decisions concerning at least one child. The final sampling frame, geographical setting, sample size, inclusion criteria, and recruitment strategy should be specified before data collection. Sample-size calculation should be based on the expected prevalence of inappropriate antibiotic use, desired precision, confidence level, anticipated non-response, and the number of predictors planned for multivariable analysis.

4.2 Measurement Framework

The questionnaire should contain five principal domains:

AMR awareness: knowledge of antibiotic indications, resistance, antibiotic completion, and consequences of inappropriate use.

Healthcare access: distance, affordability, availability, waiting time, transportation, and perceived accessibility.

Healthcare-seeking behaviour: physician consultation, pharmacy consultation, use of previous prescriptions, delay in consultation, and informal advice.

Antibiotic-use practices: non-prescription use, leftover antibiotics, sharing medicines, premature discontinuation, and antibiotic use for symptoms where antibiotics may not be indicated.

Covariates: parental education, household socioeconomic characteristics, number and age of children, previous antibiotic experience, and relevant demographic characteristics.

Table 2. Proposed variables and operationalisation

Variable	Operationalisation	Measurement
AMR awareness	Correct responses concerning resistance, appropriate indications, and risks of misuse	Composite knowledge score

Healthcare access	Availability, affordability, distance, transportation, waiting time	Likert/composite score
Healthcare-seeking behaviour	Physician consultation, pharmacy use, previous-prescription reuse, delay	Categorical/composite measures
Self-medication	Antibiotic administration without current professional prescription	Binary: yes/no
Inappropriate antibiotic use	Predefined combination of non-prescription use, leftover reuse, sharing, or other prespecified inappropriate practices	Binary outcome
Parental education	Highest completed educational level	Categorical
Socioeconomic status	Household income/appropriate validated socioeconomic indicator	Categorical/continuous
Child characteristics	Age, sex, number of children, recent illness	Categorical/continuous
Previous antibiotic experience	Previous use/prescription for the child	Categorical

The final questionnaire should be pilot-tested before full data collection. Internal consistency can be assessed using Cronbach's alpha where multi-item scales are used. Construct validity should be examined where sample size and instrument development justify exploratory or confirmatory factor analysis.

4.3 Statistical Analysis

The primary outcome should be defined before analysis. A defensible primary outcome would be inappropriate antibiotic use, operationalized according to prespecified criteria rather than retrospectively combining unrelated behaviours. Descriptive statistics should summarize participant characteristics and antibiotic practices

using frequencies and percentages for categorical variables and means with standard deviations or medians with interquartile ranges for continuous variables, depending on distribution.

Bivariate analysis may use chi-square or Fisher's exact tests for categorical variables and appropriate parametric or non-parametric tests for continuous variables. Multivariable logistic regression should then estimate adjusted odds ratios (aORs) and 95% confidence intervals for factors associated with inappropriate antibiotic use.

Potential confounders should be selected based on prior evidence and the conceptual framework rather than solely on statistical significance in bivariate analysis.

Table 3. Proposed statistical analysis plan

Research objective	Variables	Analysis	Reported statistic
Describe antibiotic practices	Antibiotic-use variables	Descriptive statistics	n, %, mean $\pm$ SD/median IQR
Assess scale reliability	AMR/access items	Cronbach's alpha	α
Examine bivariate associations	Awareness, access, behaviour, inappropriate use	χ^2 /Fisher's exact; t-test/Mann-Whitney as appropriate	p-value, effect estimate

Examine associations	Awareness/access vs. behaviour	Pearson/Spearman correlation where appropriate	r, p
Identify independent predictors	Inappropriate use + predictors	Multivariable logistic regression	aOR, 95% CI, p
Assess interaction	Awareness × healthcare access	Interaction term	aOR, 95% CI, p
Assess model performance	Final logistic model	Calibration/discrimination assessment	AUC and calibration measures
Robustness	Alternative outcome definitions	Sensitivity analysis	OR/aOR and 95% CI

5. Results and Expected Findings

Because no original survey dataset is provided for this manuscript, this section does not report original participants, p-values, regression coefficients, or effect estimates. Published evidence is presented separately from the expected analytical relationships.

5.1 Published Statistical Evidence

Existing research provides evidence that inappropriate antibiotic practices occur among parents and the wider public.

In Pakistan, Aslam et al. (2022) reported a 32.5% prevalence of antibiotic self-medication among 480 members of the public in Islamabad. Among mothers in Islamabad, Mazhar et al. (2023) reported that 38.6% had purchased antibiotics without a doctor's prescription. Salam et al. (2023) found that 21.8% of parents who reported antibiotic knowledge did not visit a physician and instead self-medicated their child.

International evidence also demonstrates substantial variation. Paulsamy et al. (2023) reported that approximately 54% of participating parents in Saudi Arabia self-medicated their children. In a meta-analysis of 19 studies, Shamim et al. (2023) estimated that 55.78% of

parents expected an antibiotic prescription for childhood upper respiratory tract infections, although heterogeneity between studies was extremely high.

These estimates should not be pooled together as though they measure the same outcome. Self-medication, purchasing without prescription, and expectation of a prescription are conceptually different behaviours and were measured in different populations.

5.2 Proposed Analytical Outcomes

The proposed study is expected to determine whether greater AMR awareness is associated with lower odds of inappropriate antibiotic use after accounting for healthcare access and other relevant covariates. It will also examine whether limited access to healthcare is associated with greater reliance on pharmacies, previous prescriptions, or self-medication.

The analysis should additionally determine whether healthcare-seeking behaviour provides information beyond AMR awareness alone. A parent may have adequate knowledge of AMR but still use non-prescription antibiotics if consultation is perceived as inaccessible or unnecessary.

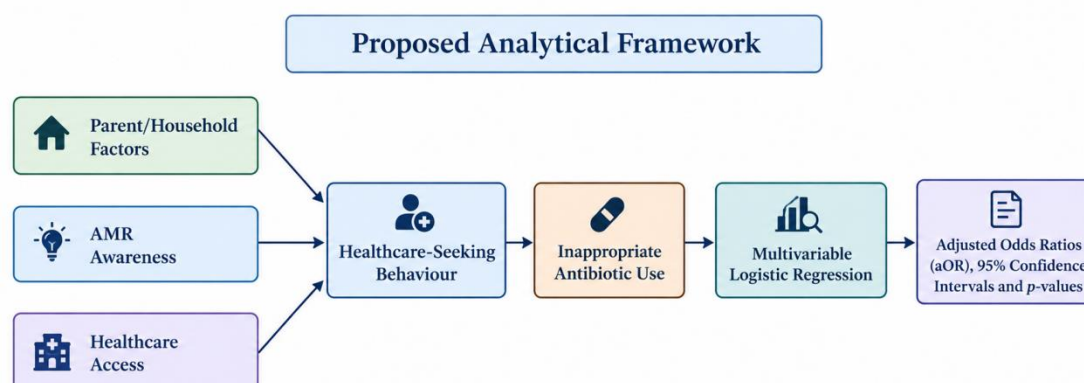


Figure 2. Proposed analytical pathway for determinants of inappropriate antibiotic use

6. Discussion

The literature indicates that parental antibiotic use is shaped by an interaction between individual knowledge, perceptions, healthcare-seeking behaviour, and structural access. The evidence does not support a simple assumption that increasing AMR awareness automatically produces appropriate antibiotic practices.

One important explanation is the knowledge-behaviour gap. Cantarero-Arévalo et al. (2017) found that parental knowledge affected antibiotic-related attitudes and behaviour but did not always result in judicious use. This distinction is important because awareness interventions that communicate only the dangers of AMR may have limited effects if parents simultaneously face barriers to professional healthcare.

The Pakistani literature provides a particularly relevant illustration. Salam et al. (2023) reported that some parents self-medicated children despite reporting knowledge about antibiotics. Mazhar et al. (2023) found significant associations between antibiotic knowledge and practice, but their cross-sectional design does not establish that knowledge caused the observed practices. These findings suggest that awareness should be

considered alongside access, previous experience, and healthcare-seeking behaviour.

Healthcare access may operate through several pathways. If consultation is expensive, geographically inconvenient, associated with long waiting times, or perceived as unnecessary for mild symptoms, parents may turn to pharmacies or previous prescriptions. Marsh et al. (2024) identified healthcare barriers and access to antibiotics as important themes in parental decision-making in rural and remote settings. Thus, stewardship interventions that focus exclusively on restricting inappropriate antibiotic demand without addressing access barriers may fail to address some of the underlying determinants of behaviour.

The role of parental expectations also deserves attention. Shamim et al. (2023) found a pooled parental expectation of antibiotics exceeding 50% for childhood upper respiratory infections, but the very high heterogeneity across studies indicates that parental expectations are context dependent. Communication between healthcare professionals and parents is therefore potentially important. Cantarero-Arévalo et al. (2017) reported that parents can respond positively when clinicians clearly explain why an antibiotic

is unnecessary and provide an alternative management or contingency plan.

The proposed model consequently treats healthcare-seeking behaviour as a central behavioural pathway rather than merely another demographic variable. This approach may provide a more useful explanation of why parents with apparently similar levels of knowledge engage in different antibiotic practices.

7. Implications

7.1 Public-Health Implications

AMR awareness campaigns should move beyond general messages about resistance and provide practical guidance on when antibiotics are and are not appropriate. Parents should receive clear information about common childhood illnesses, the difference between bacterial and viral infections, the risks of using leftover antibiotics, and the importance of professional assessment when clinically indicated.

7.2 Healthcare-System Implications

Improving antibiotic stewardship may require interventions that reduce barriers to appropriate consultation. Depending on the healthcare setting, relevant measures may include accessible primary-care services, shorter waiting times, appropriate referral systems, and pharmacist engagement.

7.3 Clinical Communication

Clinicians should recognize that parental requests for antibiotics may reflect concern about the child's illness rather than a deliberate intention to misuse medicines. Clear explanations, safety-netting, and practical advice about symptom management may reduce unnecessary antibiotic expectations (Cantarero-Arévalo et al., 2017; Shamim et al., 2023).

7.4 Policy Implications

Antibiotic stewardship policies should combine regulation with public education and healthcare accessibility. WHO's AWaRe framework provides a broader system for monitoring antibiotic use and supporting stewardship efforts, while GLASS

surveillance demonstrates the importance of monitoring antibiotic consumption patterns across settings (WHO, 2025).

8. Limitations and Future Research

The principal limitation of this manuscript is that it does not contain an original empirical dataset. Consequently, the numerical estimates presented are drawn from previously published studies and cannot be interpreted as findings from the proposed study.

Second, existing studies use different definitions of self-medication, inappropriate antibiotic use, AMR awareness, and healthcare access. Direct comparison between prevalence estimates should therefore be avoided.

Third, much of the available evidence is cross-sectional. Associations between knowledge, access, and antibiotic practices should not automatically be interpreted as causal relationships.

Future research should use validated measures of AMR awareness and healthcare access and should define inappropriate antibiotic use before data analysis. Where feasible, longitudinal designs could examine whether changes in awareness or healthcare access are followed by changes in antibiotic behaviour. Mixed-methods studies could additionally explore why parents choose pharmacies, previous prescriptions, or self-medication when professional healthcare is available.

9. Conclusion

Parental antibiotic use is influenced by a combination of knowledge, perceptions, previous experiences, healthcare-seeking behaviour, and access to healthcare. Existing evidence from Pakistan and other settings demonstrates that non-prescription use and self-medication remain important concerns, while systematic reviews indicate substantial variation across populations.

The proposed framework integrates AMR awareness and healthcare access with healthcare-seeking behaviour to provide a more comprehensive explanation of inappropriate antibiotic use among parents of children. Rather than assuming that awareness alone determines

behaviour, the framework recognizes that parents make antibiotic decisions within specific social and healthcare environments.

A future empirical study using the proposed questionnaire and statistical framework could quantify the independent contributions of AMR awareness, healthcare access, healthcare-seeking behaviour, and demographic characteristics to inappropriate antibiotic use. Such evidence could inform more targeted and context-sensitive antibiotic stewardship interventions.

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