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Assessment of Parental Knowledge and Practices Following Educational Intervention on Pediatric Respiratory Tract Infections: A Cross-Sectional Study in a Tertiary Care Setting

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ABSTRACT

Background: Respiratory tract infections (RTIs) are a leading cause of childhood morbidity and mortality, particularly in low- and middle-income countries. Despite most RTIs being viral and self-limiting, irrational antimicrobial use remains widespread, driven by parental misconceptions and practices, thereby contributing to antimicrobial resistance (AMR).
Objective: To evaluate parental knowledge, attitudes, and practices (KAP) regarding antimicrobial use in paediatric RTIs and assess the impact of a structured educational intervention.
Methods: A prospective, cross-sectional study was conducted from February to July 2024 among parents of 150 children (aged 0–12 years) admitted with RTIs in a tertiary care centre in Karnataka, India. A validated KAP questionnaire was administered before and after providing a Patient Information Leaflet (PIL) and Drug Information Leaflet (DIL), followed by structured counselling. Data were analysed using paired t-tests and Chi-square tests.
Results: Significant improvements were observed post-intervention: mean knowledge scores increased from 2.34 to 4.62, attitude scores from 2.79 to 3.63, and practice scores from 0.89 to 1.45 (all $p<0.001$). The PIL and DIL were rated highly acceptable and comprehensible by all participants.
Conclusion: A simple, low-cost educational intervention effectively improved parental KAP regarding antimicrobial use in paediatric RTIs, offering a scalable approach to promote rational antibiotic use and mitigate AMR.

Keywords: Respiratory tract infections, antimicrobial resistance, Parental knowledge, educational intervention, Antibiotic use

INTRODUCTION

Respiratory tract infections (RTIs) constitute a major public health burden globally, with children under the age of five being particularly vulnerable. Among these, lower respiratory tract infections (LRTIs) are the leading cause of death from infectious diseases worldwide, and are frequently associated with substantial morbidity and mortality in the paediatric population. The most commonly

encountered LRTIs include bronchitis and pneumonia, with pneumonia alone being the single largest infectious cause of death in children under five, accounting for approximately 15% of all deaths in this age group [1]. In 2019, LRTIs were responsible for approximately 740,180 deaths globally, representing 13.9% of all under-five mortality [2]. The situation in India mirrors the global concern, with acute respiratory infections (ARIs) continuing to pose a substantial health challenge among children. As reported in the National Family Health Survey (NFHS-5, 2019–21), ARIs account for approximately 69% of all morbidity reported in children under five years of age, with a prevalence rate of 2.7% in this population [3]. These statistics underscore the urgent need for effective prevention, early diagnosis, and public health interventions to mitigate the impact of pediatric RTIs, especially in low and middle-income countries.

Despite the fact that most upper respiratory tract infections (URTIs) in children are viral and self-limiting, antibiotics are frequently prescribed, contributing significantly to antimicrobial resistance (AMR). Up to 70% of children with RTIs receive antibiotics globally, even when not clinically indicated [4]. In low- and middle-income countries, this irrational use is exacerbated by over-the-counter availability, lack of awareness, and parental pressure on healthcare providers. In India, studies have shown that antibiotics are prescribed in up to 75% of paediatric acute RTI cases, with independent analyses indicating that more than 60% of these prescriptions being inappropriate, primarily due to diagnostic uncertainty and poor adherence to standard treatment guidelines [5,6]. This alarming trend not only contributes to AMR but also poses a risk of adverse drug reactions and unnecessary healthcare costs.

The irrational use of antibiotics in paediatric respiratory tract infections is often driven by a combination of systemic and behavioural factors involving both healthcare providers and caregivers. Parents frequently lack awareness regarding the appropriate use of antibiotics, with many resorting to self-medication, storing leftover antibiotics, or discontinuing treatment prematurely practices that are further influenced by cultural beliefs, socioeconomic status, and educational background [7,8]. On the other hand, physicians often report prescribing antibiotics unnecessarily due to diagnostic uncertainty or perceived parental pressure, despite clinical guidelines recommending otherwise [9,10]. Studies have shown that expectations and misconceptions such as the belief that antibiotics are effective against viral infections significantly influence prescribing behaviour and parental demands. Such misuse not only undermines treatment outcomes but also accelerates the development of antimicrobial resistance, imposing a broader threat to public health.

Understanding parents' knowledge, attitudes, and practices (KAP) is essential to identifying the behavioural drivers of antibiotic misuse, and such insights form the basis for designing effective, targeted educational interventions that promote rational antibiotic use in children. In light of the growing threat of antimicrobial resistance and the widespread misuse of antibiotics particularly in developing countries like India, this study aims to address a timely and critical public health concern. Accordingly, assessing parental KAP in the context of antibiotic use for common childhood respiratory tract infections is not only relevant but also vital to guiding future interventions and informing policy decisions**.**

MATERIALS & METHODS

This prospective, cross-sectional, descriptive study was conducted over six months, from February to July 2024, in the Paediatric Ward and Paediatric Intensive Care Unit (PICU) of a tertiary care research centre. Ethical clearance was obtained from the Institutional Ethics Committee prior to the commencement of the study (IERB No: 83-2024). The study population comprised parents or primary caregivers of children

aged 0–12 years, of either gender, admitted with a clinical diagnosis of respiratory tract infection (RTI). Eligible participants were those who could read Kannada or English and provided informed consent for participation in the knowledge, attitude, and practice (KAP) assessment. Participants were recruited consecutively until the desired sample size was reached. Considering an acute respiratory infection (ARI) prevalence in India [1] of 0.3%–5.6%, the minimum required sample size was calculated as 103; however, 150 paediatric patients were enrolled, and the parents of these children formed the study participants. Exclusion criteria included refusal to participate, inability to comprehend the questionnaire, and having a child with significant comorbid conditions or managed solely in the outpatient setting.

Variables included socio-demographic characteristics of parents and their knowledge, attitude, and practice (KAP) scores regarding antibiotic use in childhood respiratory tract infections. Parental KAP regarding antimicrobial use in paediatric RTIs was assessed using a structured, validated questionnaire comprising three domains: knowledge (11 items) assessing awareness of appropriate antimicrobial use, recognition of self-limiting illnesses, and understanding of antimicrobial resistance; attitude (8 items) exploring expectations for antibiotic prescriptions, beliefs about their effectiveness, and the tendency to stock or reuse antimicrobials; and practice (6 items) evaluating behaviours in seeking, administering, and discontinuing antibiotics [23]. All questions were in a closed-ended "Yes/No/Don't Know" format. The questionnaire was available in English and Kannada, translated by an authorised translator and back-translated by a Kannada school teacher to ensure linguistic accuracy. Content validity was confirmed by a multidisciplinary expert panel, and internal consistency was excellent (Cronbach's alpha = 0.936). KAP assessment was conducted both before and after an educational intervention, which involved providing a Patient Information Leaflet (PIL) and Drug Information Leaflet (DIL) in the participant's preferred language, followed by structured counselling on RTI prevention and rational antimicrobial use. A pilot test conducted prior to the main study with 20 participants demonstrated 100% readability for the questionnaire and 90% for the PIL/DIL, confirming their suitability for use in the KAP assessment.

To minimise bias, consecutive sampling was used to reduce selection bias, validated tools ensured measurement reliability, and all interviews were conducted by the same investigator for consistency. Categorical variables were summarised as frequencies and percentages, with associations tested using Chi-square or Fisher's exact tests. Quantitative variables were presented as mean ± standard deviation (SD) and compared using paired t-tests, with a p-value <0.05 considered statistically significant. Data analysis was performed using IBM SPSS Statistics Version 28.

RESULT

A total of 150 paediatric patients with respiratory tract infections were included in the study, and their parents were enrolled for the KAP assessment, giving a participation rate of 100%. Among the children, 26 (17.3%) were aged <1 year, 37 (24.7%) were 1–4 years, 35 (23.3%) were 5–8 years, and 52 (34.7%) were 9–12 years, with the highest representation in the 9–12-year age group. Of the study population, 92 (61.3%) were male and 58 (38.7%) females. Exactly half of the participants resided in rural areas, while the remaining half were from urban areas. With respect to parental education, 52% had completed education up to 12th standard, 37.3% up to 10th standard, and 10.7% were graduates. The demographic details of the participants have been mentioned in the [Table No. 1].

Table No.1 DEMOGRAPHIC DETAILS

PARAMETERS	CATEGORIES	NO. OF CASES	PERCENTAGE (%)
Age of child (years)	< 1 year	26	17.3
	1–4 years	37	24.7
	5–8 years	35	23.3
	9–12 years	52	34.7
Sex	Male	92	61.3
	Female	58	38.7
Residence	Rural	75	50
	Urban	75	50
Parental education	Up to 10th standard	56	37.3
	Up to 12th standard	78	52
	Graduate and above	16	10.7
History of previous hospitalization	Yes	60	40
	No	90	60

The parental knowledge, attitude, and practice (KAP) regarding antimicrobial use in childhood respiratory tract infections were assessed, and the findings before and after the educational intervention are presented below.

A striking finding was that only one-fifth of parents initially recognised that antimicrobials should not be given for flu-like symptoms of less than three days; however, following the intervention, this awareness improved significantly. Overall, assessment of parental knowledge revealed considerable improvement, with awareness that most upper respiratory tract infections are self-limiting increasing from 66.7% to 99.3%, while the proportion of parents recognizing that antimicrobials should not be stopped when symptoms improve rose from 19.3% to 80.7%. Similarly, the number of parents identifying antimicrobial overuse as a cause of resistance increased from 54.7% to 81.3%. The mean knowledge score improved significantly from 2.34 ± 1.46 pre-intervention to 4.62 ± 1.34 post-intervention ($p<0.001$) [Table No. 2].

Table No.2. ASSESSMENT OF PARENT'S RESPONSE TO KNOWLEDGE-BASED QUESTIONS

PARENT'S RESPONSE TO KNOWLEDGE BASED QUESTIONS	KNOWLEDGE		
	PRE	POST	% OF IMPROVEMENT
Q1. Do you think Antimicrobials cause side effects?	137	150	8.7
Q2. Can Antibiotics be used to treat viral Infections?	19	44	16.7
Q3. Does the effectiveness of Antimicrobials be reduced if a full course of Antimicrobials is completed?	1	16	10.0
Q4. Should Antimicrobials be given to children with flu-like symptoms less than 3 days?	30	120	60.0
Q5. Should Antimicrobials be given to children with fever with less than 3 days?	93	123	20.0
Q6. Are most Upper Respiratory Tract Infections like common cold, influenza, sore throat are self-limiting diseases?	100	149	32.7
Q7. Should Antimicrobials be given with repeated attacks of Respiratory Tract Infections?	121	129	5.3
Q8. Does all Antimicrobials act against bacterial microbe?	121	138	11.3
Q9. Would you stop giving your child a full course of Antimicrobials if his/her symptoms are improving?	29	121	61.3
Q10. Can Antimicrobials overuse cause antimicrobial resistance?	82	122	26.7
Q11. Does Antimicrobials have the same effect in treatment of same Respiratory Tract Infections?	78	121	28.7

One of the most notable attitude shifts was observed in parents' expectations of treatment outcomes, with only 20.7% initially believing that results should be

assessed after completing the full antibiotic course compared to 98% following the intervention. Parental attitudes towards antimicrobial use overall also shifted significantly post-intervention. The proportion of parents expecting antibiotics for common cold symptoms decreased, while those agreeing to complete the prescribed course increased. The tendency to reuse the same antibiotics for similar symptoms decreased, while recognition of the importance of physician advice improved. The mean attitude score increased from 2.79 ± 0.65 to 3.63 ± 1.60 ($p<0.001$). [Table No. 3]

Table No: 3. ASSESSMENT OF PARENT'S RESPONSE TO ATTITUDE-BASED QUESTIONS

PARENT'S ATTITUDE TOWARDS ANTIMICROBIAL USE	ATTITUDE		
	PRE	POST	% OF IMPROVEMENT
Q1. Do you request for Antimicrobials for frequent Respiratory Tract Infection?	71	121	33.33
Q2. Do you expect Antimicrobials to be prescribed by physician if your child suffers from common cold symptoms?	42	103	40.66
Q3. When my child gets a cold, does antimicrobials help him/her to get better more quickly from common cold?	84	121	24.66
Q4. Do you request for Antimicrobials despite a Paediatrician's denial?	90	133	28.66
Q5. Do you keep stocks of Antimicrobials available at home?	45	105	40
Q6. Do you expect immediate results after your child has completed his/her course of antimicrobials?	31	147	77.33
Q7. Do you stop Antimicrobials when your child's condition improves?	108	129	14
Q8. Do you reuse the same Antimicrobial's for similar symptoms?	58	121	42

A striking improvement in parental practice was seen in relation to antibiotic use for common cold, with only 32% initially requesting antibiotics compared to nearly all (99.3%) post-intervention. In terms of practice overall, marked behavioural improvements were observed. Parents reporting that they requested antibiotics when their child had a fever rose from 36.7% to 100%, indicating better awareness of when antimicrobials are appropriate. Likewise, inappropriate practices such as stopping antibiotics when symptoms improved reduced substantially. The mean practice score improved from 0.89 ± 1.24 to 1.45 ± 0.80 ($p<0.001$) [Table No. 4]

Table No.4: ASSESSMENT OF PARENT'S RESPONSE TO PRACTICE-BASED QUESTIONS

PARENT'S PRACTICE BASED QUESTIONS	PRACTICE		
	PRE	POST	% OF IMPROVEMENT
Q1. Have you ever given your child Antimicrobials without medical advice?	52	97	30
Q2. Have you requested for Antimicrobials when your child got fever?	55	150	63.33
Do you consistently ensure that your child never misses a dose of prescribed antimicrobials	116	144	18.66
Q4. Have you requested for Antimicrobials when your child had cold?	48	149	67.33
Q5. Have you stopped the prescribed Antimicrobials when the symptoms improve without completing the full course?	42	121	52.66
Q6. If the physician refused to give Antimicrobials, have you visited another physician?	137	150	8.66

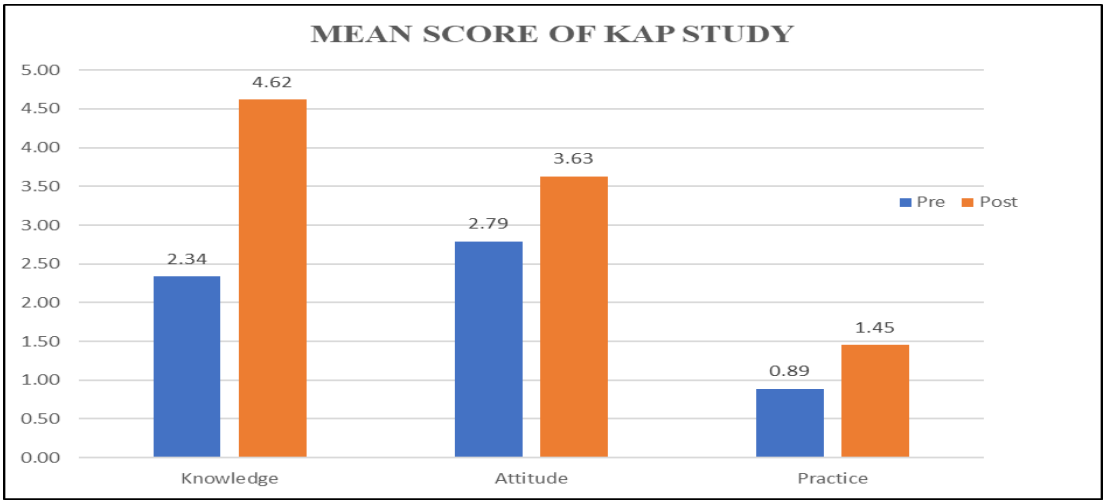

Figure 1. MEAN SCORE OF KAP STUDY.

Statistical analysis confirmed significant improvements across all three domains following the educational intervention. The mean difference in knowledge scores was 2.28 ($p<0.001$), in attitude scores 0.85 ($p<0.001$), and in practice scores 0.56 ($p<0.001$), highlighting the effectiveness of the intervention in improving parental awareness and behaviours as shown in Figure 1, 2 &3. [Table No. 5].

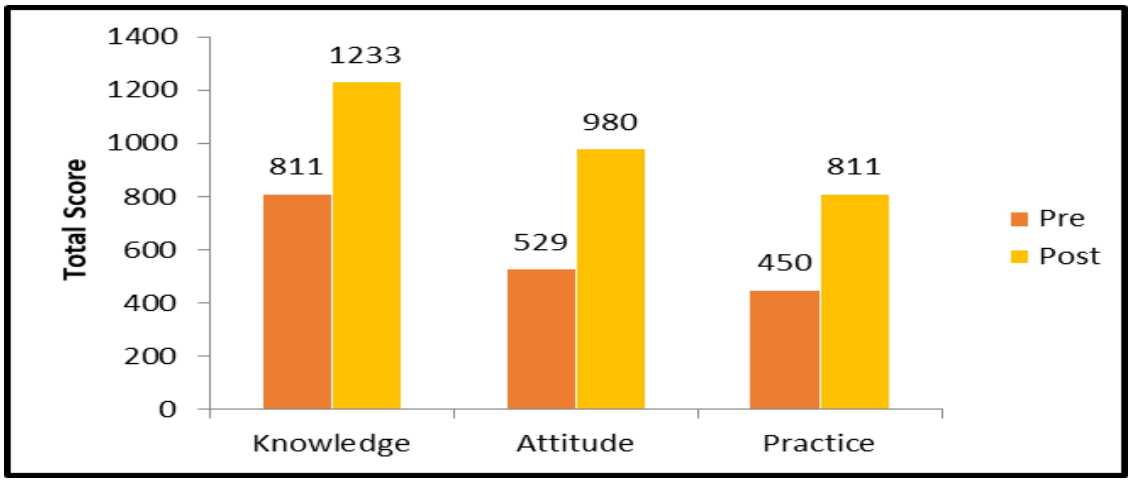

Figure 2. TOTAL SCORE OF KAP STUDY

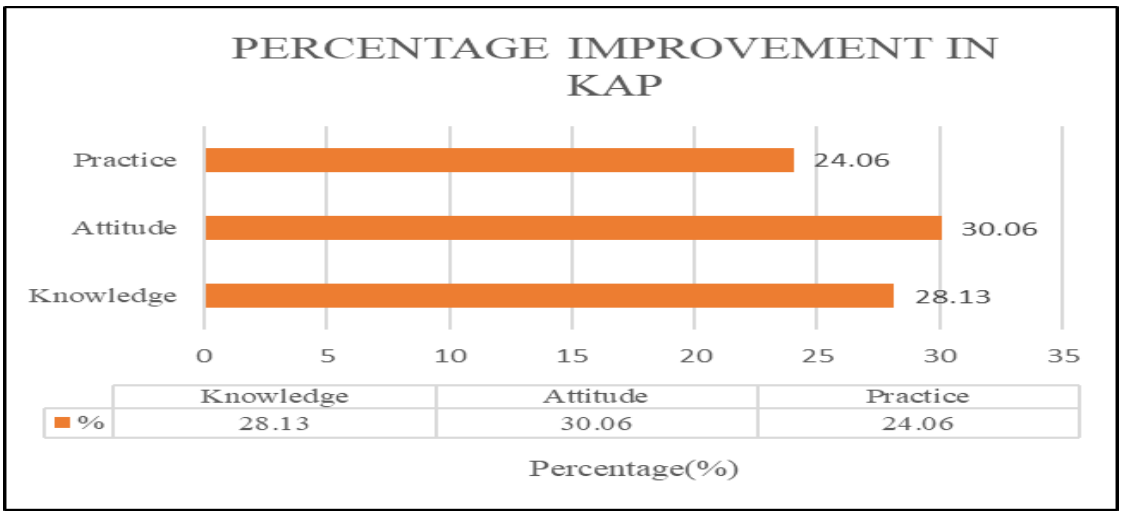

Figure 3. PERCENTAGE IMPROVEMENT IN KAP.

Table No.5: STATISTICAL ANALYSIS OF KAP STUDY

PARAMETERS		NO. OF CASES	TOTAL SCORE	MEAN	SD	MEAN DIFFERENCE	PAIRED t TEST	P VALUE	REMARKS
KNOWLEDGE	PRE	150	811	2.34	1.46	-2.280	-10.439	P<0.001	Significant
	POST	150	1233	4.62	1.34				
ATTITUDE	PRE	150	529	2.79	0.65	-0.845	-4.693	P<0.001	Significant
	POST	150	980	3.63	1.60				
PRACTICE	PRE	150	450	0.89	1.24	-0.560	-3.925	P<0.001	Significant
	POST	150	811	1.45	0.80				

As part of the study, participants were also asked to provide feedback on the Patient Information Leaflet (PIL) and Drug Information Leaflet (DIL) for informational purposes. The responses indicated excellent acceptability, with all parents (100%) rating the leaflets as readable and nearly all (99.3%) finding the pictures easy to understand. While 42.7% of parents considered the language easy, 57.3% rated it as average. Regarding content and design, 58% felt the material was of high quality and 64.6% were satisfied with its layout. Overall, participants reported that the educational materials were useful and comprehensible. [Table No. 6]

Table No.6 PARTICIPANT FEEDBACK ON READABILITY AND DESIGN OF LEAFLET.

PARTICIPANT OPINION QUESTIONNAIRE	EASY		AVERAGE	
	NO.	PERCENTAGE	NO.	PERCENTAGE
Is the language of the leaflet easy to read?	64	42.7	86	57.3
Are the pictures in leaflet easy to understand?	149	99.3	1	0.7
What do you think about the quality of content presented in the leaflet?	87	58	63	42
What do you think about the leaflet design?	82	64.6	45	35.4

DISCUSSION

Respiratory tract infections continue to be one of the most frequent reasons for antimicrobial use in children, and the results of our study underline the importance of parental awareness in shaping prescribing and consumption patterns [18]. In this prospective, cross-sectional study involving 150 paediatric patients with RTIs and their parents, we found a 100% participation rate with an even distribution between rural and urban backgrounds. Most parents had completed education up to the 12th standard and parents demonstrated poor baseline knowledge regarding the use of antimicrobials in respiratory tract infections (RTIs), which was significantly improved following the intervention. Before the intervention, less than one-fifth of the parents correctly recognized that antibiotics are not useful in treating viral infections; however, this improved to nearly one-third post-intervention. Similarly, awareness that most URTIs such as common cold, influenza and sore throat are self-limiting conditions increased substantially after the educational program. These findings are consistent with previous reports that emphasized URTIs are predominantly viral in origin and should not be treated with antibiotics [13,14]. Zoorob et al. also highlighted that unnecessary use of antimicrobials in viral URTIs contributes to the emergence of resistant strains [10].

Regarding attitudes, our study revealed that more than one-third of parents initially expected physicians to prescribe antibiotics for common cold symptoms; this proportion decreased considerably after intervention. Likewise, nearly one-third of parents

admitted to requesting antibiotics despite pediatricians' denial before the program, though this declined post-intervention. These findings resonate with earlier studies which reported that parental expectations and requests often influence physicians' prescribing behavior [11,19]. However, in line with the study by Barden et al., our results also suggest that some parents primarily seek guidance and reassurance rather than insisting on antibiotic prescriptions [11].

A noteworthy positive attitude was observed in relation to reusing leftover antibiotics. The majority of parents in this study reported they would not reuse antimicrobials for similar URTI symptoms. This is encouraging as it reduces the risk of inappropriate use, a problem widely documented in settings where antibiotics are readily available without prescriptions. For instance, in Peru, Ecker et al. found that parental self-medication was common due to easy access to antibiotics [15]. Similarly, Bbosa et al. reported that non-prescription availability often led to incomplete courses, skipped doses and reuse of leftover drugs, thereby aggravating antimicrobial resistance [16].

In terms of practices, nearly one-third of parents initially admitted to giving antimicrobials without medical advice. Furthermore, more than two-thirds reported stopping the medication once their child's symptoms improved, reflecting poor adherence to prescribed regimens. These findings highlight a common misconception that antimicrobial treatment can be discontinued once symptomatic relief occurs [17]. Similar practices were reported by McNulty et al., who noted that the public still holds false beliefs about antibiotics being the first choice for cough and cold, and often do not complete full treatment courses [19]. After the intervention in our study, these practices significantly improved, with a marked reduction in self-medication and premature discontinuation.

Interestingly, we found a moderate negative correlation between knowledge and attitude scores in this study. As knowledge scores improved, attitude scores paradoxically decreased. This is contrary to the findings of Belongia et al., who reported a positive linear relationship, suggesting that better knowledge usually corresponds with more appropriate attitudes and practices [22]. In our setting, this contradiction could be explained by lingering misconceptions and deep-rooted cultural practices regarding antibiotic use, which may persist despite improved knowledge.

Doctors' prescribing behavior has often been reported to be influenced by parental demand [20,21]. However, in agreement with our findings, Panagakou et al. and Barden et al. suggested that many parents consult physicians primarily for reassurance and evaluation rather than for requesting antibiotics [11,12]. This indicates that physicians can play a crucial role in guiding parents toward rational antibiotic use by providing appropriate counseling.

Parents also reported the PIL and DIL to be highly acceptable and useful, reinforcing the effectiveness of simple and structured educational tools. The improvements observed in this study are particularly encouraging when considered against the background of widespread misconceptions such as expecting antibiotics for common colds or discontinuing treatment once symptoms subside. These misconceptions were significantly reduced post-intervention, highlighting the role of counselling and written educational materials in correcting parental beliefs. Comparable findings have been reported globally, where gaps in public understanding contribute to inappropriate antimicrobial use and the growing problem of resistance. Our findings are also consistent with, yet go beyond, those of Rasha A. Salama et al.,[23] who reported lower baseline parental KAP scores. The greater relative improvement observed in our study is likely attributable to the pre–post interventional design and targeted educational material, which directly addressed common gaps in understanding.

The present study has certain limitations. Firstly, the sample size was relatively small and recruited through convenience sampling, which may limit the generalizability of the findings. Secondly, as parents were allowed to complete the questionnaires at home, recall bias and socially desirable responses may have influenced the accuracy of the results. Despite these limitations, the study clearly demonstrates the effectiveness of educational interventions in improving parental knowledge, attitudes and practices regarding antimicrobial use in pediatric RTIs.

CONCLUSION

This study highlights that parental misconceptions and inappropriate practices play a major role in irrational antimicrobial use for childhood respiratory tract infections. The structured educational intervention using patient information and drug information leaflets, coupled with counselling, proved highly effective in significantly improving knowledge, attitudes, and practices among parents. By reducing expectations for unnecessary prescriptions, improving adherence to full antibiotic courses, and discouraging self-medication and reuse of leftover antibiotics, the intervention addressed key drivers of misuse. Although conducted in a single-centre setting, the findings reinforce that simple, low-cost educational strategies can play a vital role in promoting rational antimicrobial use, thereby helping to combat antimicrobial resistance in resource-limited contexts.

Declaration by Authors

Ethical Approval: Approved

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