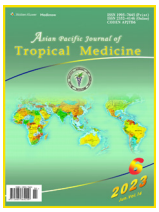

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Behaviour and perception of parents on irrational use of antibiotics in children at primary care level: A cross-sectional study from Turkey

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ABSTRACT

Objective: To investigate the perception of antibiotics, the frequency of inappropriate antibiotic use, and the factors that lead to inappropriate antibiotic use by parents who apply to primary healthcare organizations.

Methods: This cross-sectional study included 973 parents who applied to primary healthcare centers. We analyzed basic concepts related to antibiotics prescribed for their children, antibiotic administration, and antibiotic resistance, as well as parents' knowledge and attitudes towards antibiotic use, and their experiences, practices, and perceptions related to purchasing antibiotics without prescription.

Results: In the past one year, 78.9% of the parents gave antibiotics to their children at least once, and 39.1% gave antibiotics three or more times. Some of the participants (7.1%) reported having forced the physician to prescribe antibiotics and purchased antibiotics without a prescription (13.2%). The knowledge about antibiotics and awareness about antibiotic resistance were found to be more frequent; among parents who had university degrees, higher income levels, two or fewer children, social insurance and negative behaviours were lower in those who received information about antibiotics from healthcare professionals. The probability of taking antibiotics without prescription was lower in that of with higher income level (*OR* 0.460; 95% *CI* 0.219-0.965), and the probability of forcing antibiotic prescription was higher in those with 3 or more children (*OR* 6.94; 95% *CI* 2.37-20.26). The score obtained from the awareness of antibiotic resistance sub-dimension was found to negatively affect the behavior of forcing antibiotic prescription (*OR* 0.852; 95% *CI* 0.732-0.993) but the score obtained from the behaviour sub-dimension was positively affect this behaviour (*OR* 1.136; 95% *CI* 1.011-1.276).

Conclusions: Inappropriate antibiotic use appears to be a problem with negative perception, lack of knowledge and socioeconomic dimension. Studies should be conducted to increase antibiotic knowledge in parents and to expand the scope of social insurance.

Keywords: Antibiotics; Attitudes; Social insurance; Educational activities

1. Introduction

Ideal antibiotic use involves the administration of the right antibiotic by the most appropriate route, at an effective dose, at optimum intervals and for the appropriate duration following the correct diagnosis. The use of antibiotics without the necessary evaluation in terms of diagnosis, in the absence of any infection, incorrect antibiotic selection, inadequate or excessive antibiotic dosage, and inappropriate dose intervals are examples of inappropriate use of antibiotics. Choosing a new generation antibiotic or one with a higher cost instead of a common and

Significance

The important public health problems caused by irrational antibiotic use, such as antibiotic resistance, threaten the entire world. In our region, it is observed that there is a widespread problem of misuse of antibiotics, their excessive use, easy access without a prescription, and other negative behaviors. It has been concluded that the misuse of antibiotics is both due to a lack of knowledge and socio-economic development. It is more likely that significant issues like antibiotic resistance pose a greater threat to developing countries.

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cheaper antibiotic that is known to be effective, using simultaneously more than one antibiotic while it is not needed, and using antibiotics that do not comply with the culture results are also examples of violation of the principles of Rational Use of Antibiotics (RUA)[1]. Inappropriate or excessive use of antibiotics without considering the principles of RUA is defined as Irrational Use of Antibiotic (IRUA). IRUA is a widespread and important public health problem worldwide and can arise from factors related to physicians, patients and their relatives, the healthcare system, and the pharmaceutical industry[2-6]. The physician-related factors in IRUA may consist of lack of education and experience of the physician, communication problems with the patient and patient relatives, inability to manage the demands of the patient/relatives, fear of treatment failure, concern about the development of secondary bacterial infection after viral infections, or time limitation[4,5]. "Misuse of antibiotic treatment" is the failure of patients and their relatives to comply with the prescribed/recommended treatment. Using antibiotics without consulting the physician, discontinuing the use of the drug for the time required to complete the treatment, skipping doses, taking inadequate doses and reusing leftover antibiotics are considered as "poor compliance"[6]. Appropriate antibiotic use and compliance with treatment are strongly associated with the awareness and knowledge about antibiotics of patients and their relatives. Lack of knowledge of parents about infectious diseases, especially respiratory tract infections, inadequate perception of antibiotics, and development of wrong attitudes and behaviours lead to IRUA. Therefore, the aim of this study was to investigate the perception of antibiotics and inappropriate use of antibiotics, including its causes, among parents who applied to primary healthcare institutions.

2. Subjects and methods

2.1. Study design and participants

This cross-sectional study was conducted by the researchers of the Çukurova University, Faculty of Medicine, Department of Public Health in the province of Adana, Türkiye in 2022. The study was approved by the Non-Clinical Research Ethics Committee for the study of the Faculty of Medicine, Çukurova University (Approval number:127). The study population consisted of parents with children under the age of 18 living in the Health Education and Research Area (HERA) of the Department of Public Health of the same faculty. The sample size analysis performed by accepting the type 1 error level as 0.05, the power as 95%, the effect size as 0.05, and the prevalence as 69%[7] revealed a minimum sample size of 970 participants. A total of 973 parents were reached at the end of the study. Our application areas consisted of primary healthcare institutions (Family Health Centres, Community Health Centres, Healthy Life Centres) located in one rural and two urban districts. A face-to-face questionnaire was applied to the mothers and fathers who applied to the institution of the HERA mentioned. An informed consent was obtained by using the questionnaire forms, where the aim of the study was stated after guaranteeing that the data collected would be solely used for scientific purposes under strict confidentiality. The questionnaire form was filled out by the people who confirmed these conditions. The convenience sampling method was used to reach the individuals who wanted to fill out the questionnaire. Individuals who were health workers or had a familial relationship with health workers were excluded from the study.

2.2. Data instrument

The questionnaire form consisted of (1) demographic and socioeconomic characteristics of parents, (2) knowledge and attitudes of parents regarding antibiotic use, including basic concepts about antibiotics, indications for antibiotic use, antibiotic administration, antibiotic resistance and other side effects, (3) experiences and practices of parents in purchasing antibiotics without prescription, (4) experiences and practices of parents in self-medicating children with antibiotics, and (5) Parental Perception on Antibiotics (PAPA) Scale questions.

2.3. Parental Perception on Antibiotics (PAPA) Scale

PAPA Scale is a 5-point Likert-type scale developed by Alumran *et al.*[8] in 2014, consisting of five sub-dimensions and 31 items. The sub-dimensions of the scale are (1) knowledge and beliefs, (2) behaviour, (3) information seeking, (4) compliance and (5) awareness of antibiotic resistance. The PAPA Scale score of the individual is calculated by summing the scores obtained from each item. The higher the score obtained from the scale, the better perception of antibiotics the person has. The PAPA Scale score varies between 31 and 155[9]. The Turkish validity and reliability of the scale were conducted by Özdemir *et al*, who reported the Cronbach's alpha internal consistency coefficient as 0.78 and the internal consistency coefficients of the sub-dimensions as 0.84 for knowledge and beliefs, 0.77 for behaviour, 0.83 for information seeking, 0.77 for compliance and 0.46 for awareness of antibiotic resistance sub-dimensions[9].

2.4. Statistical analysis

SPSS 22.0 software was used for data analysis in terms of median, interquartile range, mean, standard deviation, and frequencies. The normality was tested by the Kolmogorov-Smirnov test and comparisons were made by the Mann-Whitney *U* test and binary logistic regression analysis. Three models were created to predict the behaviours of purchasing antibiotics without a prescription, forcing the doctor to prescribe antibiotics, and changing doctors because they did not prescribe antibiotics. The statistical significance was set at $P<0.05$.

3. Results

The mean age of the participants was (38.15±8.13) years, 63.9% were mothers and 51% were university graduates. The proportion of participants with two or fewer children living in the household was 72.0%, and 10.3% had no health insurance. The sociodemographic characteristics of the participants are shown in Table 1.

Table 1. Sociodemographic characteristics of parents.

Variables		*N*	Percentage(%)
Age*		38.15±8.13	
Parent	Mother	622	63.9
	Father	351	36.1
Marital status	Married	928	95.4
	Widowed/divorced	45	4.6
Educational degree	Mother		
	University	480	49.3
	High school and lower	493	50.7
	Father		
	University	513	52.7
	High school and lower	460	47.3
Health insurance	Present	873	89.7
	Absent	100	10.3
Household income	High	306	31.4
	Low	667	68.6
Number of children living in the household	≤2	691	72.0
	>2	269	28.0

*Data were expressed as mean±SD.

More than half of the parents (66.9%) reported that they had been informed about antibiotics before, with the most prevalent source of information as healthcare professionals (79.3%), while the others stated that relatives, neighbours, social media, TV and newspapers. It was found that 6.3% of the participants had not taken antibiotics prescribed for their children; mostly because they had the belief that antibiotics were harmful. Some of the participants (39.1%) stated that they had given antibiotics to their children more than 3 times in the last year. The most common side effects were reported as allergic reactions and gastrointestinal complaints. Some participants (7.1%) stated that they had forced the doctor to prescribe antibiotics, they had purchased antibiotics without a prescription (13.2%), and they had changed their doctor because he did not prescribe antibiotics (2.7%) (Table 2).

Parents were compared in terms of the PAPA Scale and sub-dimensions scores. The knowledge and beliefs sub-dimension scores were found to be significantly higher in mothers, while the behaviour sub-dimension scores were higher in fathers. In both parents, the behaviour sub-dimension scores of university graduates were found to be significantly lower than those of graduates from high school and lower educational graduates. The other sub-dimensions and total scores were significantly higher in university graduates. The knowledge and beliefs sub-dimension scores were found to be higher in the higher-income group compared to the lower-income group. The total scores, knowledge and beliefs scores of the parents with two or fewer children were significantly higher compared to the parents with more children, while the behaviour scores were lower. The behaviour sub-dimension scores of the parents whose source of information was health professionals were significantly different than the others. The parents with health insurance had significantly higher knowledge and beliefs, compliance, awareness of antibiotic resistance, and total scores, while the behaviour scores were lower than those without any health insurance. The comparisons made for the PAPA Scale scores according to various characteristics are given in Table 3.

Logistic regression analyses were found to be significant in assessing the predictor variables for the behaviours of purchasing antibiotics without a prescription, forcing the doctor to prescribe antibiotics, and changing the doctors because they did not prescribe antibiotics. The predictors for the behaviour of taking antibiotics without a prescription (Model 1) were income, number of children, previous antibiotic-related side effects and behaviour sub-dimension score of the PAPA scale. The probability of taking antibiotics without a prescription was lower in the higher-income group (*OR* 0.460; 95% *CI* 0.219-0.965) and higher in those having history of antibiotic-related side effects (*OR* 2.404; 95% *CI* 1.074 -5.379). Each 1 unit increase in the behaviour sub-dimension score increased the risk of taking antibiotics without a prescription by 1.245 times. The predictors for the behaviour of forcing antibiotic prescription (Model 2) were the number of children, knowledge and beliefs, behaviour and awareness of antibiotic resistance sub-dimensions scores of the PAPA scale. The probability of forcing behaviour for antibiotic prescription increased in those with three or more children (*OR* 6.943; 95% *CI* 2.378-20.269). The risk for this forcing behaviour decreased (*OR* 0.807; 95% *CI* 0.698-0.933) for increase in the knowledge and beliefs sub-dimension score of the PAPA scale, and the risk also for increase in the score obtained from the awareness of antibiotic resistance sub-dimension (*OR* 0.852; 95% *CI* 0.732-0.993). However, the risk increased for increase in the behaviour sub-dimension (*OR* 1.136; 95% *CI* 1.011-1.276). The predictors for changing doctors because he/she did not prescribe antibiotics (Model 3) were parent, income, knowledge and beliefs sub-dimension of the PAPA scale. The behaviour of changing doctors because of not prescribing antibiotics was 6.76 times higher in mothers and 5.04 times higher in those with higher income levels. Increase in the knowledge and beliefs sub-dimension score of the PAPA scale decreased the risk of changing doctors (*OR* 0.740; 95% *CI* 0.623-0.880) (Table 4).

Table 2. Knowledge and behaviour of parents regarding antibiotic use.

Variables		*N*	Percentage (%)
Have you received information about antibiotics before?	Yes	651	66.9
	No	322	33.1
If you have received information, what was its source?	Health worker	516	79.3
	Others (social media, TV, family relatives, neighbours)	135	20.7
Do you take all the medicines prescribed for your child?	Yes	783	80.5
	No	190	19.5
Do you take the antibiotic prescribed for your child?	Yes	912	93.7
	No	61	6.3
If you don't take the prescribed antibiotics for your child, what is the reason?	They may cause allergies	6	9.8
	There are some at home	11	18.0
	They are expensive	9	14.8
	It depends on to the course of the disease	9	14.8
	Because they are harmful	26	42.6
Do you think there is a difference between antibiotics administered by injection and oral routes?	I don't know	364	37.4
	No, there isn't	124	12.8
	Yes, there is	485	49.8
Do you think there is a difference between the original antibiotics and equivalent antibiotics?	I don't know	366	37.6
	Yes, there is	337	34.6
	No, there isn't	270	27.7
Do you ever prefer an equivalent antibiotic?	No	593	60.9
	Yes	380	39.1
If you ever preferred an equivalent antibiotic, what was the reason?	It was cheaper	170	44.7
	It was more effective	79	20.8
	Because I couldn't find the original	126	33.2
	Because there's no difference	5	1.3
Do you think it is harmful to use antibiotics without a doctor's advice?	Yes	761	78.2
	No	78	8.0
	I don't know	134	13.8
What harm do you think antibiotics can do?	They can damage organs and tissues	240	62.3
	They can eliminate beneficial bacteria	17	4.4
	They may cause resistance development	88	22.9
	They may cause allergies	40	10.4
How many times did you give antibiotics to your child in the last year?	2 and less	468	60.9
	At least 3 or more	300	39.1
Has your child ever experienced side effects due to antibiotics?	No	828	85.1
	Yes	145	14.9
What was the side effect, if you ever experienced any?	Weight loss	4	3.6
	Angioedema	3	2.7
	Itching/rash	53	47.7
	Gastrointestinal side effects (like diarrhoea, vomiting etc.)	40	36.0
	Neuropathy	1	0.9
	Tooth problems	10	9.0
Do you ever force the doctor to prescribe antibiotics for your child?	No	904	92.9
	Yes	69	7.1
Have you ever changed doctors because they did not prescribe antibiotics for your child?	No.	947	97.3
	Yes	26	2.7
Do you buy antibiotics for your child from the pharmacy without a prescription?	Yes	128	13.2
	No	845	86.8

Table 3. Comparison of the PAPA scale and sub-dimensions scores according to various characteristics.

Variables			Sub-dimension scores					
			Knowledge and beliefs	Behaviour	Information search	Compliance	Awareness of antibiotic resistance	Total score
Parents		Mother	31 (6.25)	10.0 (7)	23.0 (10)	15 (4.00)	14 (4.00)	93 (10)
		Father	30 (6.00)	11.0 (7)	22.0 (11)	15 (3.00)	14 (4.00)	93 (11)
		P	0.044	0.001	0.110	0.116	0.897	0.268
Education	Mother	University	33 (5.00)	10.0 (6)	24.0 (10)	16 (3.00)	15 (4.00)	95 (9)
		High school and lower grades	29 (6.00)	12.0 (7)	21.0 (9)	14 (3.00)	14 (4.00)	91 (10)
		P	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Father	University	33 (5.00)	10.0 (6)	24.0 (10)	16 (3.00)	15 (4.00)	95 (9)
		High school and lower grades	29 (6.00)	12.0 (6)	21.0 (9)	14 (3.00)	14 (4.00)	91 (10)
		P	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Income		Higher	32 (7.00)	11.0 (7)	21.5 (11)	15 (3.25)	14 (4.00)	94 (9)
		Lower	30 (7.00)	10.0 (6)	23.0 (10)	15 (4.00)	14 (4.00)	93 (11)
		P	0.027	0.160	0.067	0.057	0.838	0.357
Number of children		≤2	31 (7.00)	10.0 (7)	23.0 (10)	15 (4.00)	14 (4.00)	94 (11)
		>2	29 (6.00)	12.0 (7)	22.0 (9)	15 (3.00)	14 (5.00)	92 (10)
		P	<0.001	<0.001	0.057	0.027	<0.001	0.002
Information source	Health worker		32 (6.00)	10.0 (6)	23.0 (10)	16 (3.00)	15(4.75)	95 (10)
	Other		31 (7.00)	10.0 (6)	22.0 (12)	15 (3.00)	14 (5.00)	93 (11)
	P		0.145	0.011	0.088	0.726	0.082	0.161
Marital status	Married		31 (6.00)	10.0 (6)	22.0 (10)	15 (4.00)	14 (4.00)	93 (10)
	Divorced		32 (7.00)	10.0 (7)	23.0 (12)	15 (3.00)	15 (4.00)	94 (11)
	P		0.321	0.614	0.706	0.573	0.494	0.671
Social security insurance	Yes		31 (6.00)	10.0 (7)	22.0 (10)	15 (4.00)	14 (4.00)	94 (10)
	No		28 (4.00)	13.5 (6)	21.0 (8.75)	14 (3.00)	13 (3.00)	89 (8)
	P		<0.001	<0.001	0.006	<0.001	0.003	<0.001
Side effects due to the use of antibiotics in the past	No		30 (6.00)	10 (6)	22.0 (10)	15 (4.00)	14 (4.00)	93 (11)
	Yes		32 (7.00)	10 (6)	23.0 (10)	15 (3.00)	15 (4.00)	95 (8)
	P		0.101	0.108	0.329	0.087	0.168	0.068

Data were expressed as median (IQR), comparision were analized with Mann Whitney *U* test.

4. Discussion

Antibiotics which are used in the treatment of bacterial infections have an important role in reducing mortality and morbidity rates worldwide[10]. A widespread use of antibiotics has been observed since their emergence with a following increase in their overuse and misuse, including in children[11–15]. In this study, the behaviour of parents about irrational use of antibiotics and their perceptions about antibiotics were examined.

In our study the parents were found to give antibiotics to their children at least once in the previous 12 months (78.9%), to force the doctor to prescribe antibiotics although the doctor did not prefer it (7.1%), and to take antibiotics without a prescription (13.2%). The likelihood of buying antibiotics without a prescription was higher in those with low-income levels, and the behaviour of forcing antibiotics to be prescribed was higher in those with 3 or more children. Yu *et al*[16] investigated the antibiotics use preferences of parents in rural China and found that 62% had given their children antibiotics purchased without a prescription. The factors that positively contributed to this behaviour were found to be living in a rural area (*OR* 1.643; 95% *CI* 1.108-2.436), storage of antibiotics at home (*OR* 2.792; 95% *CI* 1.961-3.975), having more than one child (*OR* 2.174; 95% *CI* 1.485-3.183), increase in the age of the child (*OR* 1.146), while adherence to doctor's advice contributed negatively (*OR* 0.639; 95% *CI* 0.451-0.906). In a study conducted by Wang *et al*[7] in Shanghai, one of the richest area of China, it was found that nearly 69% of the parents were prescribed antibiotics by a doctor in the last 6 months, but nearly 42% gave non-prescription antibiotics to their children in the last 12 months. The level of education of parents was found to be a prominent contributing factor to the knowledge of antibiotics. Chang *et al*[17] reported that nearly 48% of parents living in urban China used antibiotics without a prescription in the last 6 months. The factors positively contributing to this were having health insurance (*OR* 1.30; 95% *CI* 1.05-1.61), storing antibiotics at home (*OR* 6.25; 95% *CI* 4.73-8.26), having health worker relatives (*OR* 1.38; 95% *CI* 1.14-1.66), while parents being informed about prescription-only regulations for antibiotic sales (*OR* 0.77; 95% *CI* 0.66-0.91) and child's health

Table 4. Logistic regression analysis for irrational behaviors in the use of antibiotics.

Variables	Model 1 (R^2=0.288)			Model 2 (R^2=0.324)			Model 3 (R^2=0.298)		
	Taking antibiotics without a prescription			Forcing the doctor to prescribe antibiotics			Changing the doctor because he/she didn't prescribe antibiotics		
	B	*P*	*OR* (95% *CI*)	B	*P*	*OR* (95% *CI*)	B	*P*	*OR* (95% *CI*)
Age (Ref: <35, Risk: ≥35)	-0.012	0.973	0.988 (0.481-2.030)	-0.691	0.191	0.501 (0.178-1.413)	-0.485	0.424	0.616 (0.187-2.024)
Parent (Ref: father, Risk: mother)	-0.222	0.542	0.801 (0.391-1.637)	-0.237	0.612	0.789 (0.316-1.969)	1.911	0.019	6.763 (1.375-33.367)
Mother's education (Ref: university graduate *vs.* Risk: high school and lower)	0.010	0.984	1.010 (0.385-2.650)	0.430	0.500	1.538 (0.440-5.368)	0.988	0.226	2.686 (0.543-13.289)
Father's education (Ref: university graduate *vs.* Risk: high school and lower)	0.786	0.097	2.194 (0.868-5.548)	-0.422	0.460	0.656 (0.214-2.009)	-0.297	0.703	0.743 (0.161-3.433)
Income (Ref: high *vs.* Risk: low)	-0.777	0.040	0.460 (0.219-0.965)	-0.929	0.061	0.395 (0.150-1.043)	1.618	0.009	5.041 (1.489-17.061)
Number of children (Ref: ≤2 *vs.* Risk: >2)	1.245	0.002	3.472 (1.551-7.771)	1.938	<0.001	6.943 (2.378-20.269)	0.417	0.565	1.517 (0.366-6.282)
Information source (Ref: health workers *vs.* Risk: others)	0.086	0.832	1.089 (0.494-2.404)	0.696	0.139	2.007 (0.797-5.049)	0.962	0.110	2.618 (0.804-8.520)
Marital status (Ref: married *vs.* Risk: divorced)	0.342	0.676	1.408 (0.283-7.009)	0.956	0.290	2.600 (0.443-15.272)	0.377	0.745	1.457 (0.150-14.129)
Health insurance presence (Ref: yes *vs.* Risk: no)*	1.204	0.099	3.332 (0.796-13.944)	0.922	0.289	2.514 (0.457-13.828)	-	-	-
Side effect (Ref: no *vs.* risk: yes)	0.877	0.033	2.404 (1.074-5.379)	0.154	0.802	1.167 (0.351-3.878)	1.120	0.089	3.066 (0.844-11.137)
Number of illnesses in the last 1 year	-0.086	0.473	0.918 (0.726-1.160)	0.134	0.328	1.143 (0.874-1.495)	0.034	0.847	1.034 (0.733-1.460)
PAPA scale sub-dimensions									
Knowledge and beliefs	-0.062	0.190	0.940 (0.857-1.031)	-0.214	0.004	0.807 (0.698-0.933)	-0.301	0.001	0.740 (0.623-0.880)
Behaviour	0.219	<0.001	1.245 (1.141-1.359)	0.127	0.032	1.136 (1.011-1.276)	0.067	0.338	1.069 (0.932-1.226)
Information seeking	-0.010	0.780	0.990 (0.922-1.063)	0.041	0.404	1.042 (0.946-1.148)	0.081	0.174	1.085 (0.965-1.219)
Compliance	-0.006	0.933	0.994 (0.855-1.154)	-0.013	0.888	0.987 (0.819-1.188)	-0.035	0.762	0.966 (0.773-1.208)
Awareness of antibiotic resistance	0.044	0.452	1.045 (0.932-1.172)	-0.160	0.040	0.852 (0.732-0.993)	-0.036	0.718	0.965 (0.793-1.174)
Constant	-3.154	0.195	-	3.112	0.392	-	1.846	0.664	-

*This variable is not included in Model 3.

status (*OR* 0.48; 95% *CI* 0.40-0.57) had inverse contribution. In the study conducted by Ding *et al*[18] in the rural China, it was observed that most of the caregivers used antibiotics without a doctor's advice and this behaviour was found to be higher in elderly caregivers and among those with lower educational levels. Pavydė *et al*[19] found that 61.1% of the parents living in Lithuania had inadequate knowledge about antibiotics: especially those with lower educational levels and those living in rural areas had significantly less knowledge about antibiotics. The rate of self-administration of antibiotics without a doctor's advice was 31.0% and was predominant in males and those living in rural areas[19]. Paredes et al reported that 52% of parents gave non-prescription antibiotics to their children in rural Peru. Parents younger than 20 years of age are more likely to have lower knowledge about antibiotics compared to those older than 40 years of age. Parents who self-treated their children with antibiotics were found to be more likely to have purchased antibiotics without a prescription and to have taken antibiotics after the advice of a pharmacist[20].

In our study, it was found that knowledge about antibiotics and awareness about antibiotic resistance were higher in parents who were university graduates, had a high-income level, had two or fewer children, and had social security, while negative behaviours related to antibiotic use were less frequent. Negative behaviours were lower in those who received information about antibiotics from healthcare professionals. In the study conducted by Albayrak *et al.* 15.7% of the parents stated that they used antibiotics in any child with fever, 15% stated that they used antibiotics without a prescription, and 6.3% stated that they forced paediatricians to prescribe antibiotics[21].

In our study, increase in the score from the knowledge and beliefs sub-dimension of the PAPA scale was found to decrease the behaviour of pressuring the doctor for antibiotic prescription (*OR* 0.807; 95% *CI* 0.698-0.933), increase in the score obtained from the awareness of antibiotic resistance sub-dimension to decrease this behaviour too (*OR* 0.852; 95% *CI* 0.732-0.993), while increase obtained from the behaviour sub-dimension to increase the behaviour of pressuring doctors for antibiotic prescription (*OR* 1.136; 95% *CI* 1.011-1.276). The behaviour of changing physicians because they did not prescribe antibiotics was 6.763 times higher in mothers and 5.041 times higher in those with higher income levels.

Rousounidis *et al.*, in the study investigating knowledge, attitudes and practices regarding antibiotic use in children with acute upper respiratory tract infections (URTI) in southern Cyprus, reported one-third of the parents stated that they did not put pressure on their doctors although they expected antibiotic prescription for URTI symptoms. Low parental education was found to be the most important independent risk factor positively associated with antibiotic misuse[22]. In our study, parental education level was not found to be associated with the pressure for antibiotic prescription. However, it was found that an increase in knowledge about antibiotics and positive attitudes towards antibiotic resistance led to a decrease in antibiotic insistence. Approximately 7% of parents have exerted pressure on doctors for antibiotic prescriptions.

In the study conducted in Palestine, Zyoud *et al* reported that 73% of parents preferred antibiotics for the treatment of URTI. Earache (68%) and fever (64%) were the most common reasons for antibiotic use by parents, 62% of parents asked their paediatrician to prescribe antibiotics and only 6% of parents were positive about their paediatrician not prescribing antibiotics[23].

In a study conducted by Panagakou *et al* among Greek parents, 74% of the parents stated that they expected antibiotics to be prescribed when URTI was diagnosed, and 10% of them gave antibiotics to their children without medical advice and 88% of parents believed that unnecessary antibiotic use increased antibiotic resistance[24]. In our study, 42% of parents (n=61) who did not administer the prescribed antibiotics to their children stated that they did not use them because they believed they were harmful. Additionally, 78.2% of parents believed that antibiotics not prescribed by a doctor could cause harm.

After examining nationwide data from 20 countries to assess parental knowledge about the causes of URTI and when to use antibiotics, Cantarero-Arevalo *et al.* found that education, age of parents and children affected attitudes and behaviours. Good knowledge about antibiotics (when and how to use them) was generally associated with living in a Western country and having a high socioeconomic status[25]. The results of our study also support the findings in the literature, indicating that factors such as education, number of children, income level, parental knowledge, and awareness play influential roles.

We state that the study was carried out in a single centre and local data as our limitation therefore cannot be generalized to entire population. According to the results of our study, parents irrational antibiotic use and negative perceptions about antibiotics are a socioeconomic problem in addition to the problem of lack of information about antibiotics. If physicians and other healthcare professionals can provide more information about the necessity/unnecessity of antibiotics, this may be effective in reducing the problem of irrational use of antibiotics. Since it is not possible to acutely solve the problems related to education and income, we think that by expanding the inclusivity of social insurance or removing the barriers to reaching it; irrational practices can be expected to decrease.

Conflict of interest statement

The authors declare that they have no conflict of interest.

Authors' contributions

Conception: B.M., H.D. and T.S.; Methodology: B.M., H.D. and T.S. Formal analysis: B.M., H.D. and T.S. Investigation: B.M. and T.S.; Resources: B.M., H.D. and T.S. Data curation: B.M., H.D. and T.S. Writing: B.M., H.D. and T.S. Original draft preparation: B.M., H.D. and T.S. Writing, review and editing: B.M., H.D. Visualization: B.M., H.D. Project administration: B.M., H.D. All authors have read and agreed to the published version of the manuscript.

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