

## Mothers' knowledge, attitude, and practice on antibiotic use for upper respiratory tract infections in children; an experience from Iran

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### ABSTRACT

**Background and Objective:** Although most upper respiratory tract infections (URTIs) are caused by viruses, antibiotics are used for most children with URTI symptoms in practice. Therefore this study aimed to assess knowledge, attitude and practice as one of the leading factors of using antibiotics in URTIs among mothers with at least one 6 month-6 year child.

**Materials and Methods:** This cross-sectional study was conducted in 2020. The study population consisted of 406 mothers with children aged 6 months to 6 years who had referred to selected comprehensive health centers in Yazd to vaccinate one of their children. Participants were selected through multi-stage sampling. The data was collected using a validated questionnaire with five parts including demographic, knowledge, attitude, and practice questions related to URTIs and antibiotic use in the last three months. Data were analyzed using IBM SPSS Statistics V22.0 software.

**Results:** A total of 406 mothers participated in the study. Nearly two-third of these participants benefit from a good level of knowledge. Meanwhile, most of them had moderate attitudes (83.7%) and performance levels (67.7%). Most of the 243 (84.5%) mothers reported that they didn't have any arbitrary use of antibiotics for their children's URTIs during the past three months. In addition, 65.3% stated that they never give antibiotics to their child without a doctor's prescription.

**Conclusions:** Although educational interventions to improve the level of knowledge, attitude, and practice in the community especially among parents are necessary, performing more KAP studies on physicians regarding the administration of antibiotics in URTIs as well as provision of valid and indigenous guidelines for the optimal administration of antibiotics may be helpful.

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## Introduction

Most upper respiratory tract infections (URTIs) are caused by viruses (1). Most of the children get these infections about four to six times a year (2), with a 39.3% prevalence were reported in children under 5 years of age (3). These infections are the main cause of absenteeism of children from school and parents from work, which puts a lot of economic burden on the health system and parents (4).

Although URTIs are predominantly viral, antibiotics are prescribed for most children with URTIs symptoms in practice (5, 6). Children under 4 years receive 53% of the total antibiotics prescribed in the pediatric population (7). However antibiotic prescription is medically inappropriate in most of the situations (8).

Improper use of antibiotics leads to some problems such as increased resistance to antibiotics, rates of chronic diseases, costs of health services, side effects, and risk of secondary bacterial infections in children (9-11). Antimicrobial resistance is the most important side effect of antibiotic misuse (12). It is estimated that multi drug resistant infections cause nearly 700000 and 200000 deaths in all ages and newborns, respectively (13). Therefore, antibiotic misuse must be prevented in any possible way. In children, both parents and pediatricians are involved in the occurrence of improper antibiotic use (14-16). Factors related to parents include knowledge, attitudes, beliefs, and expectations about the use of antibiotic, previous experiences of antibiotics use, communication with the doctor and, satisfaction with treatment (17, 18). The results of a comprehensive study demonstrated that parental knowledge about antibiotics has a key role in proper prescription and usage in URTIs (19). Several studies have been conducted to assess the parental knowledge, attitude and practice (KAP) on antibiotics use in URTIs around

the world in both developed and developing countries and they have reached different results. In some studies the level of knowledge was good but it didn't contribute to acceptable attitude and practice (20). In contrast, the participants of some other studies experienced suitable attitudes and practice levels (21). Meanwhile in some circumstances parents bore a poor level in all aspects of KAP (22). These different and sometimes contradictory results necessitate conducting similar studies in places where there is no information in this area. Due to the importance of the subject and the lack of sufficient research in Iran, especially in Yazd, this study was conducted to investigate the knowledge, attitude and, practice of mothers about antibiotic use for URTIs in children.

## Materials and Methods

This analytical cross-sectional study was conducted in 2020 in Yazd (a city located in the center of Iran). The study population consisted of 406 mothers with children aged 6 months to 6 years who had referred to selected comprehensive health centers in Yazd to vaccinate one of their children.

In this study, participants were selected through multi-stage sampling. Considering that Yazd city has 5 municipal districts, the names of the comprehensive health centers in each municipal district were listed. Then, the most populous centers in terms of children aged 6 months to 6 years were selected in each district as a cluster. All centers were selected from three regions that were located in an area with low socio-economic status and higher socio-economic status. Finally, 8 comprehensive health centers and their affiliated health centers were selected and sampling was performed in each center according to the population of children aged 6

months to 6 years (proportion to size).

In the present study, the calculation of sample size was based on moderate and good knowledge/attitude as acceptable knowledge / attitude and good practice as an acceptable practice. In a similar study, 82% of parents had acceptable knowledge, 61% had acceptable attitudes, and 63% had acceptable practices (23). Considering the acceptable attitude of 61% and the following formula, the sample size of 246 was calculated. According to cluster sampling and considering design effect of 1.5 and also 10% attrition rate, the final sample size of 406 was considered for the study.

$$n = \frac{Z_{1-\frac{\alpha}{2}}^2 P(1-P)}{d^2} = \frac{1.96 * 0.61(0.39)}{0.061^2} = 246$$

Data were collected using a related questionnaire that were developed by Nasimfar et al. and its validity and reliability were assessed (Cronbach's alpha = 0.71) (23). This questionnaire consisted of 5 parts. The first part included some questions about age, education, occupation, number of children, and presence of any chronic disease in any child. The second part consisted of 9 questions in the field of knowledge based on three point Likert scale from 0 (I disagree) to 2 (I agree).. Finally, based on the sum score of 9 questions, three levels of low (0-6), medium (7-12), and high (13-18) were considered to assess mothers' overall knowledge.

The third part consisted of 9 questions in the field of attitude based on five point Likert scale (I completely agree, I agree, I have no opinion, I disagree, and I completely disagree). Each question was given a score from 1 (wrong answer) to 5 (correct answer). Finally, overall attitude was determined using sum score of 9 questions, which was categorized based on three levels of weak (9-21), moderate (22-33), and good (34-45).

The fourth part consisted of 9 questions in the field of performance. This part was examined based on five point Likert scale ( "very high", "high", "medium", "low", and "not at all") for two questions, and four point Likert scale ("strongly agree", "agree", "have no opinion", "disagree", and "completely disagree") for 7 questions. Each question was given a score from 1 (wrong answer) to 5 (correct answer). Overall performance was obtained from the aggregation of 9 questions' scores and three levels of weak (9-21), moderate (22-33) and good (34-45) were considered to measure mothers' performance.

In the fifth part, 4 questions were asked including visiting a doctor for a child's upper respiratory tract infection during the last 3 months, the number of antibiotics were prescribed for the child's upper respiratory tract infection during the last three months, arbitrary use of antibiotics for child's upper respiratory tract infection for the past 3 months, and the reason for giving antibiotic to the child without a doctor's advice.

It should be noted that in the third part, two questions were omitted and replaced by relevant questions that were used in Abu Hammour et al work (24). For this reason, the questionnaire was piloted again among 29 mothers. The calculated alpha scores were 0.704 for the knowledge part, 0.739 for the attitude part, and 0.745 for the performance part.

Data were analyzed using IBM SPSS Statistics V22.0 software. Based on the type of the variables in the study, frequency and mean were reported. In addition, we used chi-square test to test the relationship between KAP levels and other parameters including age, job, education, presence of disease in at least one child, number of children, number of visits by doctor during the last three months, number of antibiotics prescribed by the doctor during the last three

months, and arbitrarily use of antibiotics during the last three months. This study was presented in the ethics committee of School of Medicine affiliated to Shahid Sadoughi University of Medical Sciences, Yazd, Iran and was approved according to the approval ethical code IR.SSU.MEDICINE.REC.1397.211.

## Results

In this study, 406 mothers were enrolled. Most of them were 30-40 years old (70%) and were housewives (73.4%). Nearly half of the participants had 2 children (48.8%), and 7.6% of the participants had one child with underlying disease (Table 1).

**Table 1: Demographic characteristics of mothers with at least one 6 month-6 years old child**

Studied variable	Studied group	F (%)
Mothers age	19-29	52(12.8%)
	30-40	284 (70%)
	>40	70 (17.2%)
Education	Illiterate	29 (7.1%)
	Under high school	151 (37.2%)
	High school	122 (30%)
	Academic	104 (25.6%)
Job	Housekeeper	298 (73.4%)
	Employee	108 (26.6%)
Number of children	1	80 (19.7%)
	2	198 (48.8%)
	3	88(21.7%)
	>3	40(9.9%)
Presence of any chronic disease in any child	Yes	31(7.6%)
	No	375(92.4%)

In this study, 4 mothers (1%), were in poor level, 140 (34.5%) mothers were in moderate level, and 262 (64.5%) were in good level of knowledge

about antibiotic use in upper respiratory tract infections. Details of mothers' answers to each question are presented in Table 2.

**Table 2: Mothers' knowledge about antibiotic use by their children**

Mothers' knowledge	Disagree	Not sure	Agree
Antibiotics can cure purulent infections	17(4.2%)	75(18.5%)	314(77.3%)
Most upper respiratory tract infections (such as colds, sore throats, and earaches) are viral in origin and do not require antibiotics and are self-limiting.	124(30.4%)	122(30%)	160(39.4%)
Children with cold symptoms recover sooner by giving antibiotics.	221(54.4%)	69(17%)	116(28.6%)
Amoxicillin is an antibiotic	17(4.2%)	62(15.3%)	327(80.4%)
Antibiotics like acetaminophen can be used to reduce fever and relieve pain	254(62.6%)	57(14%)	95(23.4%)
Excessive and unnecessary use of antibiotics can increase antibiotic resistance	71(17.5%)	69(17%0	266(65.4%)
Antibiotics do not have any side effects	322(79.3%)	59(14.4%)	25(6.1%)
When the course of antibiotic treatment is not completed, its effectiveness in treatment decreases	35(8.8%)	49(12.1%)	322(79.3%)
When antibiotics are newer and more expensive, they are more effective	243(59.9%)	103(25.4%)	60(14.8%)

According to the attitude total score, only 4 mothers (1%) had poor attitude level. Meanwhile, most of them (83.7%) had moderate attitude level. Details of the answers to each question are presented in Table 3.

**Table 3: Mothers' attitude about antibiotic use by their children**

Mothers' attitude	Completely disagree	Disagree	Not sure	Agree	Completely agree
I believe that antibiotics are used a lot and unnecessarily	38(9.4%)	54(13.3%)	78(19.2%)	130(32%)	106(26.1%)
I believe that a doctor who does not prescribe antibiotics according to my expectations should be changed	133(32.8%)	186(45.8%)	57(14%)	17(4.2%)	13(3.2%)
I believe that most upper respiratory tract infections (coughs, earaches, and colds) are cured without antibiotics and are self-limiting	29(7.1%)	113(27.8%)	131(32.1%)	78(19.2%)	55(13.5%)
I believe that the doctor who prescribes a lot of antibiotics should be changed	24(5.9%)	113(27.8%)	140(34.5%)	84(20.7%)	45(11.1%)
I believe that antibiotics should be prescribed when symptoms similar to those of an upper respiratory tract infection (sneezing, runny nose, etc.) occur	87(21.4%)	168(41.4%)	78(19.2%)	49(12.1%)	24(5.9%)
I believe that antibiotics should be stopped when the symptoms of an antibiotic-needed infectious disease are reduced	82(20.2%)	156(38.4%)	86(21.2%)	57(14%)	25(6.2%)
I believe that the use of antibiotics reduces the duration of the common cold	46(11.3%)	103(25.4%)	97(23.9%)	123(30.3%)	37(9.1%)
I think that both pediatricians and parents should receive information regarding proper use of antibiotics	92(22.7%)	80(19.7%)	85(20.9%)	78(19.2%)	71(17.5%)
I believe that visiting by pediatrician is not necessary if my child has only nose drainage	49(12.1%)	108(26.6%)	99(24.4%)	109(26.8%)	41(10.1%)

Considering overall performance score, 17 (4.2%) mothers were in poor, 275 (67.7%) mothers were in moderate and 114 (28.1%) mothers

were in good performance levels. Details of the performance questions are presented in Table 4.

**Table 4: Mothers' practice about antibiotic use by their children**

Mothers' practice	Never	A little	Moderate	Much	Very much
To what extent do you consider the possible side effects of using antibiotics when using it?	13(3.2%)	38(9.4%)	160(39.4%)	110(27.1%)	85(20.9%)
Do you agree that your child's pediatrician doesn't prescribe antibiotics for upper respiratory tract infections such as cough and colds?	53(13.1%)	81(20%)	151(37.2%)	75(18.5%)	46(11.3%)
	Never (0-5%)	Sometimes (5-30%)	Usually (30-70%)	Most of the time (70-95%)	Always (95-100%)
In cases where your child's doctor prescribes antibiotic, do you ask them if antibiotic is necessary?	72(17.7%)	75(18.5%)	72(17.7%)	75(18.5%)	112(27.6%)
Do you ask your doctor directly to prescribe antibiotics for colds?	218(53.7%)	101(24.9%)	44(10.8%)	32(7.9%)	11(2.7%)
If your doctor wants to prescribe antibiotics for your child's colds, do you disagree?	206(50.7%)	77(19%)	73(18%)	33(8.1%)	17(4.2%)
Do you follow your doctor's instructions about taking antibiotics on time and completely?	16 (3.9%)	16 (3.9%)	44 (10.8%)	111 (27.3%)	219 (53.9%)
Do you ask your doctor for antibiotics as a precaution when your child disease has not been diagnosed?	297(73.2%)	50(12.3%)	38(9.4%)	16(3.9%)	5(1.2%)
Do you use the remaining antibiotics of previous prescriptions whenever your child has symptoms similar to an upper respiratory tract infection such as runny nose and cold?	270(66.5%)	67(16.5%)	22(5.4%)	29(7.1%)	18(4.4%)
How often do you thank your child's doctor for not prescribing antibiotics for a cold?	168(41.4%)	114(28.1%)	74(18.2%)	30(7.4%)	20(4.9%)

In this study, mothers' KAP level had significant relationship with education in which higher level of education brought more KAP level for mothers (P value<0.05).. A significant relationship was also found among practice and job, knowledge, and children number. Based on our result,

attitude/practice was significantly correlated with arbitrary use of antibiotics. Details of the mothers' KAP overall score stratified by age, job, education and other baseline characteristics are presented in Table5.

**Table 5: Relationship between some variables and KAP on antibiotic use in URTIs among mothers with children 6 months to 6 years old**

Low & moderate		Knowledge			Attitude			Practice		
		High	P value	Low & moderate	High	P value	Low & moderate	High	P value	
Mother's age	19-29	16 (30.8%)	36(69.2%)	0.213	48(92.3%)	4(7.7%)	0.034	40(76.9%)	12(23.1%)	0.444
	30-40	97(34.2%)	187(65.8%)		232(81.7%)	52(18.3%)		199(70.1%)	85(29.9%)	
	Over 40	31(44.3%)	39(55.7%)		64(91.4%)	6(8.6%)		53(75.7%)	17(24.3%)	
Education	Illiterate	22 (75.9%)	7 (24.1%)	<0.001	25(86.2%)	4(13.8%)	0.001	28(96.6%)	1(3.4%)	<0.001
	Under diploma	66(43.7%)	85(56.3%)		140(92.7%)	11(7.3%)		119(78.8%)	32(21.2%)	
	Diploma	35(28.7%)	87(71.3%)		101(82.8%)	21(17.2%)		87(71.3%)	35(28.7%)	
	College education	21(20.2%)	83(79.8%)		78(75%)	26(25%)		46(44.2%)	58(55.8%)	
Job	housekeeper	112(37.6%)	186(62.4%)	0.139	254(85.2%)	44(14.8%)	0.638	223(74.8%)	75(25.2%)	0.030
	Employed	32(29.6%)	76(70.4%)		90(83.3%)	18(16.7%)		69(63.9%)	39(36.1%)	
Any illness in at least one child	Yes	13(41.9%)	18(58.1%)	0.434	26(83.9%)	5(16.1%)	0.799	21(67.7%)	10(32.3%)	0.59
	No	131(34.9%)	244(65.1%)		318(84.8%)	57(15.2%)		271(72.3%)	104(27.7%)	
Number of children	1	25(31.3%)	55(68.8%)	0.007	67(83.8%)	13(16.3%)	0.162	54(67.5%)	26(32.5%)	0.081
	2	64(32.3%)	134(67.7%)		162(81.8%)	36(18.2%)		137(69.2%)	61(30.8%)	
	3	31(35.2%)	57(64.8%)		77(87.5%)	11(12.5%)		66(75%)	22(25%)	
	4 and more	24(60%)	16(40%)		38(95%)	2(5%)		35(87.5%)	5(12.5%)	
Number of pediatrician visits during past 3 months	0	66(36.7%)	114(63.3%)	0.720	151(83.9%)	29(16.1%)	0.720	123(68.3%)	57(31.7%)	0.333
	1	39(32.5%)	81(67.5%)		102(85%)	18(15%)		91(75.8%)	29(24.2%)	
	2 and more	39(36.8%)	67(63.2%)		91(85.8%)	15(14.2%)		78(73.6%)	28(26.4%)	
No of antibiotic prescription by pediatrician during past 3 months*	0	21(39.6%)	32(60.4%)	0.501	45(84.9%)	8(15.1%)	0.699	35(66%)	18(34%)	0.501
	1	37(31.1%)	82(68.8%)		100(84%)	19(16%)		88(73.9%)	31(26.1%)	
	2 and more	20(37%)	34(63%)		48(88.9%)	6(11.1%)		46(85.2%)	8(14.8%)	
Arbitrary use of antibiotics	Yes	28(44.4%)	35(55.6%)	0.105	59(93.7%)	4(6.3%)	0.032	60(95.2%)	3(4.8%)	<0.001
	No	116(33.8%)	227(66.2%)		285(83.1%)	58(16.9%)		232(67.6%)	111(32.4%)	

\*analysis among children with pediatrician visit during past 3 months

In this study, 180 mothers (44.3%) did not visit a physician for upper respiratory tract infections for their children during the last 3 months, 120 (29.5%) mothers had one visit and 106 (26.1%) mothers had 2 visits or more. Of those who had been visited by a physician in the past three months, 53 (23.4%) ones had not been prescribed any antibiotics, 119 (52.6%) mothers had received antibiotic one time, and the others had received antibiotics 2 or more times.

In this study, 243 (84.5%) mothers reported that they didn't have any arbitrary use of antibiotics for their children's upper respiratory tract infections during the past three months.

Most of the mothers (65.3%) stated that they never give antibiotics to their children without doctor's prescription. Among mothers with antibiotic arbitrary use, the most important reasons were not having enough time or money to visit by the physician (14.8%); similarity of symptoms to previous conditions leading to antibiotic prescription by the physician (13.1%), and not taking into account child's disease serious (5.2%).

## Discussion

In the present study, the majority of individuals had high knowledge, moderate attitude and performance, and poor KAP. In a similar study by Nasimfar et al., poor KAP was more prevalent (23). Since participants in the present study were almost from a normal population, the presence of higher level of KAP can give hope that mothers in the Yazd community may be ready to accept not to give antibiotics to their children in upper respiratory tract viral infections.

In the present study, 35% of mothers reported that they used antibiotics arbitrarily without doctor's prescription in some circumstances. Self-medication with antibiotics has been shown

to increase the risk of antibiotic resistance (25). Studies have also shown that people who self-medicate with antibiotics are more likely to discontinue treatment early and not follow the dosage guidelines (26). Therefore, arbitrary use of antibiotics is not acceptable under any circumstances and necessary education on its risks should be provided to the community, especially parents with young children.

Likewise, the majority of mothers (84.5%) stated that they had not arbitrarily taken any antibiotics for their children's URTs during the last three months. Meanwhile, about two-thirds of mothers stated that they would never give antibiotics to their child without doctor's prescription. In addition, more than half of mothers declared that they did not ask their doctor to prescribe antibiotics for their child's URTs and only 4.4% of mothers asked doctor for prescribing antibiotic as a precaution before definite diagnosis. However, half of participants stated that they would not disagree with doctor if he wanted to prescribe antibiotics for the common cold. Despite above findings; in 77.8% of cases who were visited by a physician during last three months, antibiotic was prescribed for the child's URTs. According to the literature, using antibiotic for upper respiratory tract infections in children under 5 years of age is alarmingly high in Iran. The reasons for extra utilization are related to the patient and parents, such as belief in antibiotic usefulness for all infections and insistence on prescribing by the doctor, as well as factors related to the doctor such as not having enough time to explain no need to prescribe an antibiotic for upper respiratory tract infections and prescribing antibiotics as a precaution to protect patient's health (27).

According to the results of this study and recent studies on the rate of antibiotic prescription in Iran (28), it is assumed that prescribing antibiotics

for URTIs including colds in the study population is more attributable to over-prescription than to arbitrary use. Therefore, it may be necessary to do more KAP studies on physicians regarding the administration of antibiotics in URTIs and to design and implement interventions to improve the attitude and practice of them if necessary. In addition, valid and indigenous guidelines for the optimal administration of antibiotics should be provided to physicians and they should be required to comply with the guidelines (24, 29). Of course, it should also be noted that despite the existence of appropriate guidelines, physicians may still prescribe antibiotics for URTIs. One of the main reasons for this event is that physicians are worried about the occurrence of severe and irreversible complications if the antibiotic is not prescribed. Therefore, it seems that the patient's symptoms have a more fundamental role in prescribing antibiotics by a physician than paying attention to whether the disease is viral or not (30). Therefore, it seems that using combination of complete examination of and assessment of patient's condition based on an appropriate guideline can play an effective role in timely and optimal administration of antibiotic in URTIs.

In this study, one-third of people believed that most upper respiratory tract infections (cough, earache, and cold) didn't improve without antibiotics. Also, in some similar studies most of the people believed that antibiotics were definitely needed for the mentioned problems (11, 24). It seems that a significant part of people considers antibiotics as a cure in URTIs. In addition, given that most people have mediocre performance, it seems that it is necessary to work on individuals' attitudes to reach optimal performance.

Based on the finding of present study, two-thirds of mothers reported that they did not use the remaining antibiotics from the previous

time in facing symptoms similar to an upper respiratory tract infection such as runny nose and cold in their child. In addition, 45.6% of cases believed that cold symptoms in children improved sooner with antibiotics. Therefore, it seems that using of remained antibiotics from previous visits is more likely due to the belief in the need for doctor's prescription than the knowledge about antibiotic effectiveness in colds.

In this study, knowledge, attitude, and practice towards antibiotic use in URTIs among participants were directly related to their level of education so that level of knowledge, attitude and practice increased significantly by increasing the level of education. Although the issue of high KAP in people with high level of education is a pleasant issue, in people with low level of education it is necessary to consider approaches to increase KAP about using antibiotics in URTIs. The results of some studies showed that the use of educational campaigns can play a very effective role in increasing KAP regarding the optimal use of antibiotics in people with low education (31). Due to the increasing use of antibiotics in Iranian society and the need to increase KAP regarding its optimal use, it is recommended that appropriate educational campaigns be organized in this field, especially for mothers with young children.

In this study the level of attitude and practice was lower in people who had been taking antibiotics arbitrarily in the last three months. Given that the proportion of arbitrary drug use, including antibiotics, has been reported to be high in Iran (32, 33), it seems that special attention should be paid to the issue of "education", which is the main action in increasing KAP and preventing the arbitrary use of antibiotics (32).

**Conclusion:** the majority of participants in present study had high knowledge, moderate attitude and performance, and poor KAP . Meanwhile,

most of mothers had not arbitrarily taken any antibiotics for their children's URTs during the last three months and about two-thirds of them had never given antibiotics to their child without doctor's prescription. However in most of cases that were visited by a physician during last three months, antibiotic was prescribed for the children's URTs. Therefore, it seems that although educational interventions to improve the level of knowledge, attitude and practice in the community especially among parents is necessary, performing more KAP studies on physicians regarding the administration of antibiotics in URTIs as well as provision of

valid and indigenous guidelines for the optimal administration of antibiotics may be helpful.

**Conflict of interest:** The authors declare that there is no conflict of interest.

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