

Original Research

Validation of the parental knowledge and attitude towards antibiotic usage and resistance among children in Tetovo, the Republic of Macedonia

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ABSTRACT*

Objective: This study sought to explore the knowledge and attitudes of parents on the use of antibiotics among children that could serve as baseline data and provide further insight in planning and developing strategies for local health education purposes.

Methods: A cross-sectional survey involving 500 parents who attended community pharmacies in Tetovo, Republic of Macedonia, was conducted using a self-administered questionnaire from October 2013 to January 2014. The questionnaire included demographics, knowledge and attitude statements of parents towards antibiotics. The data collected were analyzed using SPSS program, version 19.0. Descriptive statistics was used to summarize the data. In all statistical analyses, a p-value of <0.05 was considered statistically significant.

Results: Nearly 40% of the parents demonstrated a moderate level of knowledge. The highest correct response in the knowledge part was the awareness of parents in using antibiotics to treat a bacterial infection (61.2%). However, most of the parents did not know that antibiotics cannot cure viral infections (59.6%). About 48.2% of the parents were aware of the antibiotic resistance as a result of the overuse. Concerning attitudes, 60.8% reported keeping any leftover antibiotics, 77.0% agreed that taking antibiotics when having cold symptoms could help their children recover faster, while, 74.6% wrongly agreed with the statement of appropriate use of antibiotics for prophylaxis' measure.

Conclusions: This study has documented the main areas that merit attention when parental knowledge on antibiotic use for their children is the concern, reflecting in some inappropriate attitudes as well. The findings highlight the need to devise effective interventions to decrease misconceptions regarding antibiotic use and to increase parents' awareness for the risks of inappropriate use of antibiotics in children specifically and in the community at large.

Keywords: Anti-Bacterial Agents; Drug Resistance, Bacterial; Health Knowledge, Attitudes, Practice; Parents; Macedonia (Republic)

INTRODUCTION

Antibiotics are the most frequently prescribed and misused drugs and there are reported concerns about the continuous indiscriminate and excessive use of antibiotics leading to the emergence and spread of antibiotic-resistant organisms.^{1,2} The use of antimicrobial agents, especially antibiotics, has become a routine practice for the treatment of pediatric illnesses.^{3,4} A substantial portion of prescribed antibiotics is considered nonessential, and such prescribing may be due to reasons related to: patients, parents or guardians, or the physicians.⁵⁻⁷ Studies from American, Asian and European countries indicate that between 22% and 70% of parents have misconceptions about the appropriate applications and efficacy of antibiotics^{8,9} and often use them without a prescription.¹⁰⁻¹² It is estimated that more than 50% of antibiotics worldwide are purchased privately without a prescription, from pharmacies or street vendors in the informal sector.¹³ Haug *et al.* revealed that while most antibiotics about 66.66% is given to children according to prescriptions, the rest of antibiotics are given without prescriptions.¹⁴ Self-medication has also been noted in the United States of America and Europe, particularly for colds and upper respiratory tract symptoms, which are self-limiting and mostly caused by viruses.^{15,16} Therefore, several studies have discussed the causes associated with antibiotic overuse. These include attitudes, beliefs, knowledge of antibiotic use¹⁷⁻¹⁹, behaviors^{20,21}, patients' perceptions regarding patient-doctor interaction, patient satisfaction, and patients' experience with antibiotics.¹⁹⁻²² The rationale for educating the public is that knowledge about antibiotic treatment and awareness of antibiotic resistance are thought to influence patient and parent demand for antibiotic prescribing.²³ Bajcetic and Jovanovic observed lack of knowledge and skill in administering antibiotics among children. The authors indicated that parents lack essential knowledge to deal with antibiotics they give to their children.²⁴ Because of wide cross-national differences in antibiotic use²⁵, tailoring of educational interventions requires determination of the needs of the audience in each country. Thus, this study sought to explore the knowledge and attitudes of parents on the use of antibiotics among children that could serve as baseline data and provide further insight in planning and developing strategies for local health education purposes.

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METHODS

Study design

A cross-sectional survey was conducted from October 2013 to January 2014 among 500 parents who attended community pharmacies in Tetovo, an urban city in the north-western part of the Republic of Macedonia. The community pharmacies were randomly selected, in order to obtain an unbiased sample of the parents regarding age, gender and level of education. In total six community pharmacies were randomly selected with an alpha 5% and a power of 80%. The sample size of 500 parents was calculated to give a 95% confidence level and 5% margin of error assuming that 50% of parents answered each question correctly. The parents were recruited consecutively. All parents presenting a prescription for the treatment of their child with antibiotics were eligible for the study. The inclusion criteria were: (1) Parents aged 18 years and over; (2) Parents of children younger than 14 years; (3) not working as health care provider (4) aware of the term 'Antibiotics'. In order to increase compliance, pharmacists in the randomly selected community pharmacies were personally informed by the researcher about the study and its importance. They were asked to distribute the questionnaires to the parents, collect and give them back to the researcher. Verbal consent was obtained from all parents enrolled in the study before administering the questionnaire. No personal identifiers were included in the form.

Questionnaire development and grading

This self-administered questionnaire was developed by reviewing relevant literature and questionnaires used previously for the same manner.²⁶⁻³¹ In the first part of the questionnaire, information about the parents' sex, age, education level, number of children aged one week and 14 years and experience of antibiotic use was noted. The second part consisted of nine knowledge statements covering aspects including the role of antibiotics, identification of antibiotics, dangers of using antibiotics (allergy reaction) and antibiotic efficacy. Parents were asked to respond with either "Yes," "No" or "Not Sure." The third part contained ten attitude statements including patient-doctor relationship. Parents were asked to answer the statements according to a 5-point Likert scale ranging from "Strongly Disagree" to "Strongly Agree." To simplify the analysis, we classified those who answered "Strongly Disagree" and "Disagree" like having disagreed and those who answered "Strongly Agree" and "Agree" as having agreed. The option "Disagree" for statements 1-6 and "Agree" for statements seven to 10 in the attitude domain indicated a positive attitude.

The questionnaire was designed in three language versions: English, Albanian and Macedonian. A pilot study was conducted with 30 subjects randomly selected. From the pilot study, respondents easily answered the questionnaire provided.

Characteristics	Total frequency (N)	Percent	
Age	18-30	133	26.6
	31-40	156	31.2
	41-50	140	28.0
	51-60	56	11.2
	61-70	15	3.0
Sex	Male	277	55.4
	Female	223	44.6
Educational Status	Primary or lower	4	0.8
	Secondary	179	35.8
	University	317	63.4
Recent antibiotic use	Within the last months	433	86.6
	More than 12 months ago	67	13.4

Statistical analysis

In the second part assessing the antibiotic knowledge of the parents, 1 mark was awarded for each correct answer, while each wrong or unsure response was marked 0, with a maximum obtainable correct score of 9. An arbitrary scoring was used to assess the level of knowledge based on the answers given. Three levels of categorizing the total knowledge were used indicating poor (0-3) mark 1, moderate (4-6) mark two and good (7-9) mark 3. In the third part positive attitude were given 1 mark, while negative attitude or "Not Sure" were scored with 0. Unsure responses were included to discourage guessing and scored as incorrect. The data collected were analyzed using Statistical Package for Social Sciences program (SPSS), version 19.0. Descriptive statistics was used to summarize the data about demographic characteristics, knowledge and attitudes toward antibiotic usage. Chi-square and Fisher exact tests were used to test for significant association between demographic characteristics such as sex of parents, age, education, number of children in the household and reported recent antibiotic use with knowledge and attitude. In all statistical analyses, a p-value of <0.05 was considered statistically significant.

RESULTS

Parent's demographic characteristics

A total of 500 parents from various ethnicities were enrolled in this study. No parent refused to take part in this questionnaire study. More fathers (55.4%) responded than mothers. Parent's personal characteristics are summarized in Table 1. Almost an equal distribution of parents for age groups between 18-50 years old was revealed. The median of age was 45.5 years (range:18-70). The majority of parents have completed university (63.4%). From the results obtained, 86.6% of parents reported using antibiotics within the last months.

Parent's knowledge of antibiotics

About the level of knowledge, 29.4% of parents were at the poor level of overall scores of knowledge, 53.0% had a moderate level of knowledge, and 17.6% had good knowledge.

Table 2. Association of demographic characteristics with level of knowledge.

Characteristics	Frequency N (%)	Level of knowledge n (%)			p Value
		Poor	Moderate	Good	
Age					2.155E-4*
18-30	133 (26.6)	33(6.6)	74(14.8%)	26(5.2%)	
31-40	156 (31.2)	32(6.4)	96(19.2%)	28(5.6%)	
41-50	140 (28.0)	44(8.8)	72(14.4%)	24(4.8%)	
51-60	56 (11.2)	28(5.6)	20(4.0%)	8(1.6%)	
61-70	15 (3.0)	10(2.0)	3(0.6%)	2 (0.4)	
Sex					0.507
Male	277 (55.4)	85 (17.0)	150(30.0%)	42(8.4%)	
Female	223 (44.6)	62 (12.4)	115(23.0%)	46(9.2%)	
Educational Status					1.151E-44*
Primary or lower	4 (0.8)	4 (0.8)	0 (0.0)	0 (0.0)	
Secondary	179 (35.8)	120 (24.0)	53(10.6%)	6(1.2%)	
University	317 (63.4)	23 (4.6)	212(42.4%)	82(16.4%)	
Recent antibiotic use					0.877
Within the last months	433 (86.6)	129 (29.8)	171 (39.5)	133 (30.7)	
More than 12 months ago	67 (13.4)	18 (26.9)	27 (40.3)	22 (32.8)	

(chi-square test/ Fisher Exact test); *statistically significant difference

The difference in knowledge level was statistically significant between age groups and levels of education (Table 2). Poor level of knowledge was found in the generation between the ages of 41-50 years (8.8% versus others <6.6%), and in a secondary educational level (24.0% versus others <4.6%).

From the evaluation of the knowledge about the role of antibiotics (Table 3), it was found that the highest correct response in the knowledge part was the awareness of parents in using antibiotics to treat a bacterial infection (61.2%). However, most of the parents did not know that antibiotics cannot cure viral infections (59.6%), followed by 44% of the parents who wrongly thought that taking antibiotics

when their children are having a cold could help them recover faster. As for the identification of antibiotics, 65.2% of the parents could make a difference between antibiotics and pain relievers such as paracetamol and 82.4% could correctly identify penicillin as an antibiotic. On the other hand, 69.6% of the parents seemed to be aware that antibiotics may cause allergic reactions to their children. As for the section of antibiotic effectiveness, a high percentage of parents (60.1%) were more knowledgeable about the importance of completing the full treatment course of antibiotics. On the other hand, only 7.4% disagreed with the statement that reducing the prescribed dose of antibiotics could be healthier for their children. About 57.6% believed that the effectiveness of antibiotics is related to the cost and novelty.

Table 3. Association of demographic characteristics with knowledge statements.

Statement	Correct answer	Incorrect answer	Unsure	p value (chi-square test/ Fisher Exact test)			
				Age	Gender	Education	Recent antibiotic use
Role of Antibiotics							
Antibiotics can treat bacterial infections	306 (61.2%)	17 (3.4%)	177 (35.4%)	0.498	0.731	5.369E-7*	0.816
Antibiotics can cure viral infections	121 (24.2%)	298 (59.6%)	81 (16.2%)	0.260	0.326	4.752E-14*	0.559
Antibiotics must be taken once a child has a cold	198 (39.6%)	220 (44.0%)	82 (16.4%)	0.463	0.971	1.332E-14*	0.938
Identification of Antibiotics							
Antibiotics are the same as medications used to relieve pain and fever such as paracetamol	326 (65.2%)	64 (12.8%)	110 (22.0%)	0.874	0.332	1.906E-11*	0.838
Penicillin is an antibiotic	412 (82.4%)	0 (0%)	88 (17.6%)	0.007 *	0.480	1.394E-15*	0.730
Dangers of Antibiotics							
Children can be allergic to antibiotics	348 (69.6%)	61 (12.2%)	91 (18.2%)	0.034*	0.155	2.237E-4*	0.469
Effectiveness of Antibiotics							
The effectiveness of treatment is reduced if a full course of antibiotic is not completed	300 (60.1%)	118 (23.6%)	82 (16.4%)	0.115	0.174	6.661E-14*	0.565
Taking fewer antibiotics than prescribed is healthier than taking the full course prescribed	310 (62.0%)	37 (7.4%)	153 (30.6%)	0.072	0.611	3.950E-8*	0.257
Is the efficacy better if the antibiotics are newer and more costly	145 (29.0%)	288 (57.6%)	67 (13.4%)	0.379	0.186	0.004*	0.206

*statistically significant difference

Table 4. Association of demographic characteristics with attitude statements.

Statement	Disagree	Neither agree nor disagree	Agree	p value (chi-square test/ Fisher Exact test)			
				Age	Gender	Education	Recent antibiotic use
Leftover antibiotics are good to keep at home in case I might be needed it for my child later on.	177 (35.4%)	19 (3.8%)	304 (60.8%)	0.015*	0.117	1.396E-22*	0.772
It is good to be able to get antibiotics for my child from siblings, relatives or friends without having to see a doctor.	214 (42.8%)	48 (9.6%)	238 (47.6%)	0.013*	0.583	3.786E-22*	0.737
It would be good to be able to buy antibiotics over-the-counter at the pharmacy.	240 (48.0%)	81 (16.2%)	179 (35.8%)	0.173	0.006*	3.333E-21*	0.230
It is appropriate to use antibiotics when my child has a sore throat because otherwise he/she might catch something more serious.	71 (14.2%)	56 (11.2%)	373 (74.6%)	0.005*	0.009*	1.251E-29*	0.205
Antibiotics speed up recovery from a cold	95 (19.0%)	20 (4.0%)	385 (77.0%)	2.664E-6*	3.428E-4*	4.383E-24*	0.248
I usually stop giving antibiotics to my child when he/she starts feeling better	303 (60.6%)	42 (8.4%)	155 (31.0%)	2.791E-5*	9.368E-9*	9.729E-17*	0.201
I will stop giving my child an antibiotic if he/she has skin reaction or gets side-effects	0 (0.0%)	59 (11.8%)	441 (88.2%)	0.001*	0.050*	1.843E-9*	0.237
I usually will look at the expiry date of antibiotics before giving it to my child	4 (0.8%)	219 (43.8%)	277 (55.4%)	3.749E-11*	0.044*	3.481E-17*	0.055
Doctors often take time to consider carefully whether my child needs to be prescribed antibiotics or not	106 (21.2%)	101 (20.2%)	293 (58.6%)	0.037*	0.003*	4.119E-4*	0.171
Doctors often take time to inform parents how antibiotics should be used for their children	95 (19.0%)	106 (21.2%)	299 (59.8%)	0.007*	0.016*	9.186E-5*	0.613

*statistically significant difference

Education was a significant predictor for all the statements assessed in the knowledge part, while age appeared to be significant mainly for the dangers of antibiotics.

Parent's attitudes towards antibiotic use

The attitude score ranged from zero to 10 points. The percentages of inappropriate responses for ten attitude statements are summarized in Table 4. In our study, 60.8% of parents reported keeping leftover antibiotic if their child may be needed it later. Almost an equal distribution of parents reported their agreement/disagreement for sharing antibiotics for their children with siblings, relatives or friends. Meanwhile, 77.0% of the parents agreed that taking antibiotics when the child is having a cold could help them recover faster, while, 74.6% of the parents wrongly agreed with the statement of proper use of antibiotics for prophylaxis' measure. Although, 48% of the parents seemed to be aware that antibiotics cannot be purchased as over-the-counter, it was noted that almost 36% prefer the possibility to do so. About 31.0% stopped giving antibiotics to their children when symptoms improved. A small percentage of parents demonstrated little caution when consuming antibiotics. In particular, a high percentage of

parents (88.2%) agreed to stop giving a child an antibiotic if skin reaction or any side-effects appears, while, 0.8% did not check expiry dates.

Information and trust were evaluated in two statements on the topic 'patient–doctor relationship'. Most of the parents (58.6%) reported trusting the consideration of doctors whether to prescribe an antibiotic for their children. In addition, 59.8% of them declared doctor often take time to tell them about the usage of antibiotics for their children.

DISCUSSION

The aim of this questionnaire was to assess parental knowledge and attitudes on antibiotic use for their children. Thirteen percent of parents said that they did not use antibiotics in the past year for their children, which is higher than the percentage (3.3%) noted in the study done in Riyadh, Saudi Arabia.³² The findings have shown confusion among parents about the effectiveness of antibiotics for bacterial or viral infections. Among 500 parents involved in the study, almost 60% believe that antibiotic is a proper treatment for viral infections, which is comparable with the proportion of parents (68.6%) in Riyadh, Saudi Arabia.³² On the other hand, the percentage of parents who knew that

antibiotics are effective for bacterial infection (61.2%) was much higher than the percentage found in Al-Ain City, United Arab Emirates.³³ In the present study, 44% of the parents were found to believe that antibiotics must be taken for common cold, which is lower than the percentage (68%) found in Hulu Langat district, Malaysia.¹⁸ Frequent prescribing of antibiotics for viral respiratory infections, which mainly are self-limiting, has influenced parental misconceptions and confusion regarding the indications of antibiotics use. Hence, indications for use of antibiotics are to be suggested among main issues in parental education activities.

In an effort to clarify if the parents were able to identify antibiotics, it was found that most of the parents replied correctly. Overall, most of the parents (69.6%) were aware with the risk of antibiotic use such as an allergic reaction. Similarly, in a questionnaire conducted in Amman, Jordan³⁴, it is showed that most of the sample (65%) were aware that their children may develop an allergic reaction to antibiotic and that may cause death. Most of the respondents (60.1%) had correctly agreed that the effectiveness of treatment could be reduced without completion of the full course of antibiotics that is 1.9% less as compared with 62.0% who know the need to take the full course prescribed. A comparable proportion of parents who agreed that overuse and inappropriate use of antibiotics reduce efficacy was noted in the study done in Riyadh, Saudi Arabia.³⁵ Most of the parents (57.6%) incorrectly consider that newer and more costly antibiotics give better effectiveness, as a reason more towards inappropriate use of antibiotics.

Parents in our study had substantial misunderstandings that may contribute greatly to inappropriate antibiotic use. A relevant concern is that most of the parents (60.8%) in the present study agreed to keep a left-over antibiotic at home, which might be another indicator of antibiotic misuse. This proportion is much lower in Patras, Greece, where very few respondents (7.3%) declared they keep left-over antibiotics for future use.¹⁹ In particular, more parents from our study were expecting antibiotics to speed up the recovery of their children from the common cold (77%). The need for a quick recovery in order to return to child care could further contribute to the parental misuse of antibiotics in communities that depend on institutional rather than family child care.³⁶ In a study done in Amman, Jordan³⁴ more than half of respondents (52.5%) that are 5% more as compared to 47.6% of the parents from our study reported using antibiotics between siblings.

Differences in implementing drug regulations that affect the availability of antibiotics in different countries can play an important role in misconceptions about antibiotics.³⁷ Increased availability of over the counter antibiotics at the pharmacy despite the fact that this is against the law, is an important component contributing to self-medicating children with antibiotics. In our study, 48.0% of parents preferred the possibility of purchasing antibiotics over the counter. This gray

area of pharmacy practice deserves further investigations to know the relative importance of over-the-counter sales. In our study, 31.0% of parents admitted that their child did not finish the entire course of antibiotics given. A lower proportion (26%) of parents with the same incorrect knowledge was noted in the study done in Malaysia.¹⁸

There should be made efforts of improving this practice that increases the risk of relapse and the development of resistant pathogens. In contrast, to those misconceptions, a high proportion (88.2%) of parents in this study reported stopping treatment earlier if skin reaction or side-effects appear, which in a way it can be an indicator that parents had enough knowledge about the risks of using antibiotics. Also, the trust and the confidence in doctors are evident. More than half of parents (58.6%) demonstrated trust in the doctor, for the decision of antibiotic prescribing or not and 59.8% of them were satisfied with the information given by the doctor about the usage of antibiotics. This good patient-doctor relationship should be emphasized in increasing mutual communications because findings show the important role of doctors in the appropriate use of antibiotics among children.

Limitations

Parent's data were collected through a self-administered questionnaire. This methodology was preferred more than the face-to-face or telephone interviews for the chance of avoiding interviewer influence in the parents' response and as well for the likelihood interviewees to respond in accordance with what is believed to be the expected answer. Additionally, we avoided the impractical training of many interviewers and as well, we aimed to exclude the impact of the variability among the interviewers. On the other hand, self-administered questionnaire increases the precision of responses obtained since each parent received the same formulated set of statements. However, some limitations in this study are to be mentioned. The main limitation of this study is that the data provided is of local interest and that participants were parents of children who had had a prescription for antibiotics, so they are not comparable with a population-based sample. Also, there were an unexpectedly high proportion of participants with higher educational qualification compared to other groups which might have had an impact on the study findings. Excluding all the parents who had never heard about antibiotics might result in missing information regarding this category of parents. Similarly to all self-administered public surveys, the results revealed in this questionnaire study were dependent on the honesty and understanding of the parents.

Despite its limitations this study has identified significant parental knowledge and attitude deficiencies and misconceptions, resulting in an irrational use of antibiotics in Tetovo, the Republic of Macedonia.

CONCLUSIONS

In conclusion, this study has documented the main areas that merit attention when parental knowledge on antibiotic use for their children is the concern, reflecting in some inappropriate attitudes as well. The findings highlight the need to devise effective interventions to decrease misconceptions regarding antibiotic use and to increase parents' awareness for the risks of inappropriate use of antibiotics in children specifically and in the community at large. These strategies should include well-planned, organized and structured educational programs that focus on the basic concepts of antibiotics, appropriate use and the consequences of misuse and as well the importance for discontinuation of using leftover antibiotics. In addition, there should be included information about the complications associated with antibiotic resistance and the importance of maintaining the current trust in the doctors' decision for prescribing or not antibiotics. Reinforcement of the existing national regulation is essential to restrict antibiotics as prescription-only medicines.

Change, however, does not come easily; multifaceted approaches are needed to tackle the problem of improving rational use of antibiotics.

CONFLICT OF INTEREST

None declared.

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VALIDACIÓN DEL CONOCIMIENTO Y ACTITUDES PARENTERALES SOBRE USO DE ANTIBIÓTICOS Y RESISTENCIAS EN NIÑOS DE TETOVO, REPUBLICA DE MACEDONIA

RESUMEN

Objetivo: Este estudio intentó explorar el conocimiento y actitudes de padres sobre el uso de antibióticos en niños para servir como punto de partida y proporcionar futuro conocimiento para planear y desarrollar estrategias de educación local de salud.

Métodos:

Se realizó un estudio transversal que incluyó a 500 pacientes que visitaron farmacias comunitarias en Tetovo, República de Macedonia mediante el uso de un cuestionario auto-administrado entre octubre 2013 y enero 2014. El cuestionario incluía datos demográficos y afirmaciones sobre conocimiento y actitud de los padres hacia los antibióticos. Los datos recogidos se analizaron usando el programa SPSS versión 19.0. Se usó estadística descriptiva para resumir los datos. En todos los análisis estadísticos se consideró estadísticamente significativo un valor de $p < 0,05$.

Resultados: Casi el 40% de los padres demostraron tener un nivel moderado de conocimiento. La respuesta correcta más frecuente en la parte de conocimiento era la consciencia de los padres de que los antibióticos se usan para tratar una infección bacteriana (61,2%). Sin embargo, la mayoría de los padres no sabían que los antibióticos no curan infecciones víricas (59,6%). Alrededor del 48,2% de los padres sabían que las resistencias a los antibióticos resultan de su sobreutilización. En relación a las actitudes, el 60,8% comunicó guardar los restos de los antibióticos, el 77,0% aceptó que tomar antibióticos cuando sus hijos tienen síntomas de resfriado puede ayudarles a recuperarse más rápidamente, mientras que el 74,6% estaba de acuerdo con la medida equivocada de usar antibióticos como medida profiláctica.

Conclusiones: Este estudio documentó las áreas principales que merecen atención en relación al conocimiento parenteral sobre uso de antibióticos para sus hijos, reflejando también algunas actitudes inadecuadas. Los hallazgos apuntan a la necesidad de diseñar intervenciones efectivas para disminuir los conceptos equivocados sobre el uso de antibióticos y aumentar el conocimiento de los padres sobre los riesgos del uso inapropiado de antibióticos en niños específicamente y en la comunidad en general.

Palabras clave: Antibacterianos; Resistencia Bacteriana a medicamentos; Conocimientos, Actitudes y Práctica en Salud; Padres; Macedonia (República)

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