

## RESEARCH PAPER



## Recommending immunizations to adolescents in Turkey: a study of the knowledge, attitude, and practices of physicians

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### ABSTRACT

**Introduction:** The aim of this study was to determine the knowledge, attitudes, and practices of family physicians and pediatricians in regard to adolescent immunization.

**Methods:** The study was conducted from March to May 2017. A total of 665 physicians participated. Participants were asked 31 questions about their personal sociodemographic characteristics and their knowledge, attitudes, and practices around adolescent immunization.

**Results:** The study sample consisted of 348 family physicians (52.3% of the sample) and 317 pediatricians (47.7%). The results showed that 5.4% of family physicians and 10.4% of pediatricians thought that they had enough knowledge about adolescent immunization ( $p < .01$ ). Overall, 15.8% of family physicians and 12.7% of pediatricians provided adolescents with information about vaccines 'always/most of the time'. A variety of reasons for not providing information about adolescent vaccines was provided, including 'inability to allocate time' (50.2% of family physicians, 69.3% of pediatricians); 'forgetfulness' (34.8% of family physicians, 28.5% of pediatricians); 'lack of knowledge about vaccines' (34.1% of family physicians, 27.4% of pediatricians); and 'no need to immunize adolescents' (15.7% of family physicians, 6.5% of pediatricians) ( $p < .01$ ). HPV immunization was recommended only to girls by 30.5% of family physicians and 38.8% of pediatricians ( $p < .01$ ). The percentages of family physicians and pediatricians not recommending that adolescents be immunized with the Tdap vaccine were 53.4% and 42.6%, respectively ( $p = .016$ ). Meningococcal immunization was not recommended by 20.7% of family physicians and 11.4% of pediatricians ( $p < .01$ ), and influenza immunization was not recommended by 10.3% of family physicians and 8.2% of pediatricians ( $p < .01$ ).

**Conclusion:** Family physicians and pediatricians in Turkey have low rates of recommendation of immunization to adolescents. Reasons for not recommending immunization include an inability to allocate time, forgetfulness, and lack of knowledge about vaccines. We conclude that educational programs should be used to improve knowledge of adolescent immunization among family physicians and pediatricians.

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### Introduction

It is estimated that adolescents aged 10 to 19 years number 1.2 billion and constitute approximately one-sixth of the world's population.<sup>1</sup> Although expanded childhood immunization programs have led to a decline in adolescent mortality, the World Health Organization (WHO) reports that more than 3,000 young people die every day from preventable diseases.<sup>1,2</sup>

Immunization is a preventive health care measure that can improve adolescent health.<sup>3</sup> In the last decade, advances have been made in adolescent immunization. Among the vaccines that have been included in immunization guidelines are those for human papillomavirus vaccine (HPV), conjugated meningococcal (MCV4), influenza, and tetanus toxoid-reduced diphtheria toxoid-acellular pertussis (Tdap).<sup>3-7</sup> In many developed and developing countries, immunization programs are routinely delivered to healthy adolescents.<sup>8-10</sup>

In our country, Turkey, only adult type diphtheria-tetanus (dT) vaccine is included in the national immunization program and provided free of charge by the state.<sup>11</sup> The HPV, Tdap, MCV4, and influenza vaccines are licensed in Turkey and are recommended to adolescents by healthcare professionals in clinical practice.<sup>11</sup> However, the costs of these vaccines are paid by families or through private health insurance. The HPV vaccine costs US\$105 for a single dose and US\$210 for two doses. The MCV4 vaccine costs US\$52, the Tdap vaccine costs US\$18, and the influenza vaccine costs US\$5. A family would need to pay a total of US\$285 to fully immunize an 11–12 year old adolescent. In 2017, the national minimum wage in Turkey was US\$502.80 per month.

The aim of this study was to determine the knowledge, attitudes, and practices of family physicians and pediatricians as they pertain to adolescent vaccines.

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## Materials and methods

This descriptive, cross-sectional study was conducted from March to May 2017. The sample consisted of 665 physicians who voluntarily completed the study questionnaire. The study received approval from the Local Ethics Board (889/2017).

The questionnaire used in this study was based on information in current medical articles and was prepared by two pediatricians and two family physicians. The questionnaire included multiple choice, close ended, and semi-close ended questions. Participants were asked a total of 31 questions about their sociodemographic data and their knowledge, attitudes, and practices in regard to vaccines recommended to adolescents. The questionnaire was tested on a small group before being administered to participants. The test group consisted of 10 pediatricians and 10 family physicians. Any difficulties that the participants had in answering the questions were investigated. The mean completion time for the questionnaire was 10–15 minutes. At a national pediatric congress in Turkey, a stand was established and eligible visitors were invited to participate in the study. Physicians who agreed to participate were asked to complete the questionnaire. There have been no changes to adolescent immunizations in Turkey since the date of data collection.

## Study group

The study group consisted of pediatricians and family physicians that were employed in their field at the time of the study. We compared the responses of pediatricians and family physicians.

## Statistics

SPSS 21.0 for Windows was used for statistical analysis. Descriptive statistics included counts and percentages for

categorical variables. Responses from pediatricians and family physicians were compared using the chi-square test. Statistical significance was set at  $p < .05$ .

## Results

In total, 810 physicians were invited to participate in the study. Of these, 118 refused to participate and 27 were excluded for failing to complete the questionnaire. The final study sample included 665 physicians, of whom 348 (52.3%) were family physicians and 317 (47.7%) were pediatricians. The mean age of the participants was  $34.3 \pm 7.1$  years, and 436 (65.6%) were female. The percentage of family physicians that thought that they had enough knowledge about adolescent vaccines was 5.4%. For pediatricians, it was 10.4%. The proportion of respondents who did not think they had enough knowledge about adolescent vaccines was 37.9% among family physicians and 29% among pediatricians ( $p = .007$ ). The knowledge, attitudes, and practices of family physicians and pediatricians in regard to adolescent immunization are presented in Table 1.

The results showed that 29.6% of family physicians and 36.6% of pediatricians provided information about adolescent vaccines 'if the adolescent or the adolescent's family asked for information'. Among family physicians, 42.2% provided information to adolescents 'sometimes/rarely', and 12.3% never gave information. Among pediatricians, 36.9% of pediatricians provided information to adolescents 'sometimes/rarely' and 13.9% never gave information (see Table 1). The reasons given for declining to provide information about adolescent vaccines are detailed in Table 1.

When asked which vaccine/vaccines should be added to the national immunization program, there was a statistically significant difference between family physicians and pediatricians

**Table 1.** Family physicians' and pediatricians' knowledge, attitudes, and practices around adolescent immunization.

	Family physicians % (n = 348)	Pediatricians % (n = 317)	P-value
Question 1: Do you think you have enough knowledge about the recommended vaccines for adolescents?			
I have enough knowledge	5.4 (19)	10.4 (33)	<b>.007</b>
I have some knowledge, but I need more	56.6 (197)	60.5 (192)	
I don't think I have enough knowledge	37.9 (132)	29.0 (92)	
Question 2: When an adolescent comes in for an examination, do you provide information about the recommended vaccines?			
Always/most of the time	15.8 (55)	12.7 (40)	.09
If adolescent/family asks for information	29.6 (103)	36.6 (116)	
Sometimes/rarely	42.2 (147)	36.9 (117)	
Never	12.3 (43)	13.9 (44)	
Question 3 was only asked to the participants who did not select "Always/most of the time" for Question 2	n = 293	n = 277	
Question 3: Reasons for not providing information about the vaccines to adolescents?			
I cannot allocate the time because of having a large number of patients	50.2 (147)	69.3 (192)	<b>&lt;.001</b>
I forget	34.8 (102)	28.5 (79)	
I do not have enough knowledge about the vaccines	34.1 (100)	27.4 (76)	
Childhood immunization is sufficient – there is no need to immunize adolescents	15.7 (46)	6.5 (18)	
Question 4: Which vaccine/vaccines should be added to the national immunization program for adolescents?			
HPV	75.6 (263)	82.3 (261)	<b>&lt;.001</b>
Influenza	23.6 (82)	18.3 (58)	
Tdap	31.9 (111)	42.3 (134)	
Meningococcal	32.5 (113)	45.4 (144)	
No need to add vaccines	16.7 (58)	6.9 (22)	
Question 5: What are the most significant obstacles to adolescent immunization?			
The family decides whether or not to vaccinate	48.3 (168)	41.6 (132)	<b>.01</b>
Changing vaccination schedules	14.7 (51)	10.7 (34)	
Weakening of family relations in adolescence	16.4 (57)	18.3 (58)	
Adolescents cannot receive adequate preventive health care	59.8 (208)	72.6 (230)	
Lack of knowledge of adolescent immunization	72.1 (251)	67.5 (214)	

( $p < .001$ ). However, both groups stated that the HPV vaccine should be added to the national immunization program (see Table 1).

Table 2 shows the knowledge, attitudes, and practices of family physicians and pediatricians in regard to immunizing adolescents against HPV, Tdap, MCV4, and influenza. We asked physicians which vaccines and doses they would recommend to 11-, 12-, and 16-year old sample cases. Family physicians were most likely to recommend the MCV4 vaccine at the appropriate dose (67.5%) and least likely to recommend the HPV vaccine at the appropriate dose (31%). Pediatricians were most likely to recommend the influenza vaccine at the appropriate dose (63.1%) and least likely to recommend the HPV vaccine at the appropriate dose (39.7%). The reasons that family physicians and pediatricians did not recommend HPV, Tdap, MCV4, and influenza vaccination to adolescents are presented in Table 3.

The effects of participants' sociodemographic characteristics on their knowledge, attitudes, and practices around adolescent vaccination are shown in Table 4. Physicians with >20 years of experience were more likely to report that they had enough knowledge about adolescent immunization ( $p < .001$ ) and more likely to provide adolescents with information about vaccines ( $p = .003$ ).

Approximately one-quarter (25.8%) of physicians at state hospitals did not think they had enough knowledge about adolescent immunization, versus 39.2% of physicians in educational and research hospitals ( $p = .001$ ). The proportion of respondents who provided adolescents with information about vaccines 'always/most of the time' was 9.1% among physicians in state hospitals and 19.2% among participants in university hospitals ( $p < .001$ ). The most common reason

for not providing information about immunization to adolescents, reported by 70% of physicians working in state hospitals, was an inability to allocate time ( $p = .002$ ). The percentage of respondents giving the correct answer to a sample case question about HPV immunization in adolescents was highest among participants in state hospitals ( $p = .018$ ). The percentage of respondents giving correct answers to the sample case question on MCV4 immunization in adolescents was higher among physicians in family health centers (75.9%) and in state hospitals (72.5%) ( $p = .001$ ).

## Discussion

The results of the present study demonstrate that family physicians and pediatricians in Turkey need to improve their knowledge of adolescent vaccines. Relatively low proportions of family physicians and pediatricians thought that they had enough knowledge of adolescent immunization. This is the first study examining the knowledge, attitudes, and practices of physicians in regard to adolescent immunization in Turkey. The study data were collected in 2017. Since data collection there was no change in the national immunization program for adolescent in Turkey

Immunization is a crucial component of preventive health care for adolescents, and each physician visit should be seen as an opportunity to complete vaccinations.<sup>3,7</sup> Physician advice has been shown to be a critical factor in adolescent immunization.<sup>12</sup> It has been reported that lack of a physician's recommendation is the most common reason for an adolescent to remain unvaccinated.<sup>13</sup> Parents and adolescents consider physicians the most trusted and important source of information about vaccines.<sup>14-16</sup> The present study found

**Table 2.** Family physicians' and pediatricians' recommendations and responses to sample cases in regard to HPV, Tdap, meningococcal, and influenza immunization of adolescents.

Question		Family physicians % (n = 348)	Pediatrician % (n = 317)	P-value
How do you recommend HPV immunization to adolescents?	I recommend it to adolescent girls	30.5 (106)	38.8 (123)	<.001
	I recommend it to adolescent girls and boys	24.1 (84)	34.7 (110)	
	I recommend it to girls with HPV-related disease/cancer in their families	10.9 (38)	7.8 (25)	
	I recommend it to boys and girls with HPV-related disease/cancer in their families	7.5 (26)	5.0 (16)	
How do you recommend Tdap vaccine to adolescents?	I do not recommend the HPV vaccine to adolescents	27.0 (94)	13.5 (43)	.016
	The booster dose of the dT vaccine	34.5 (120)	41.3 (131)	
	dT independent of vaccine dose	12.0 (42)	16.1 (51)	
How do you recommend conjugated meningococcal (MenACWY) vaccine to adolescents?	I do not recommend pertussis vaccine to adolescents	53.4 (186)	42.6 (135)	<.001
	I recommend it to all adolescents	8.9 (31)	18 (57)	
	I recommend it only to adolescents with medical risk factors	70.4 (245)	70.7 (224)	
How do you recommend influenza vaccine to adolescents?	I do not recommend conjugated meningococcal vaccine to adolescents	20.7 (72)	11.4 (36)	.005
	I recommend it to all adolescents	24.1 (84)	14.8 (47)	
	I recommend it to adolescents with a high risk of influenza disease	65.5 (228)	77 (244)	
Sample case 1: The rate of recommending HPV immunization at the right dose and correct vaccine for a 16-year-old male	I do not recommend influenza vaccine	10.3 (36)	8.2 (26)	.088
Sample case 2: The rate of recommending Tdap vaccine at the right dose for a 12-year-old individual	n = 180	n = 184		
	31.1 (56)	39.7 (73)		.456
Sample case 3: The rate of recommending conjugated meningococcal (MenACWY) vaccine at the right dose for a 12-year-old individual	n = 191	n = 197		
	42.9 (82)	46.7 (92)		.178
Sample case 4: The rate of recommending influenza vaccine at the right dose for an 11-year-old individual	n = 191	n = 200		
	67.5 (129)	61 (122)		.820
	n = 213	n = 203		
	62 (132)	63.1 (128)		

**Table 3.** Reasons that family physicians and pediatricians do not recommend HPV, Tdap, meningococcal, and influenza immunization to adolescents.

	Family physicians % (n)	Pediatricians % (n)	P
Reasons I do not recommend HPV vaccine to adolescents:	n = 94	n = 43	.459
I do not have enough knowledge about the vaccine	57.4 (54)	60.5 (26)	
High cost	26.6 (25)	21 (9)	
Not required in Turkey	11.7 (11)	14 (6)	
Side effects	9.6 (9)	4.6 (2)	
I don't think it's safe	7.4 (7)	2.3 (1)	
I don't think it's effective	5.3 (5)	2.3 (1)	
Reasons I do not recommend Tdap vaccine to adolescents:	n = 186	n = 135	.45
I do not have enough knowledge about the vaccine	35.5 (66)	36.3 (49)	
Childhood immunization is sufficient – there is no need to immunize adolescents	31.2 (58)	34.8 (47)	
Pertussis is not seen in adolescents	28.5 (53)	28.1 (38)	
I don't think it's effective	3.7 (7)	3(4)	
I do not trust the vaccine	1.6 (3)	0 (0)	
Reasons I do not recommend conjugated meningococcal (MenACWY) vaccine to adolescents:	n = 72	n = 36	.006
I do not have enough knowledge about the vaccine	70.9 (51)	41.7 (15)	
It is not necessary for adolescents	29.2 (21)	47.2 (17)	
High cost	7 (5)	8.3 (3)	
I don't think it's safe	0 (0)	2.8 (1)	
Reasons I do not recommend influenza vaccine to adolescents:	n = 36	n = 26	.213
Influenza vaccine is not required	50 (18)	30.8 (8)	
The vaccine is not effective	16.7 (6)	34.6 (9)	
The vaccine should be repeated annually	13.9 (5)	30.8 (8)	
I do not have enough knowledge about vaccine	16.7 (6)	11.5 (3)	
There are too many side effects. I do not trust the vaccine.	2.8 (1)	3.8 (1)	

that family physicians and pediatricians recommend immunization to adolescents at very low rates. The two most common reasons that physicians gave for not recommending immunization to adolescents were 'inability to allocate time due to having a large number of patients' and 'forgetting'. Other reasons included a lack of knowledge about the recommended vaccines and a belief that immunization was not necessary for adolescents. These results suggest that it is necessary to increase physician knowledge to achieve higher rates of adolescent immunization. Web-based programs such as the Pillars™ Practice Transformation Program have been shown to be effective in expanding and maintaining vaccine coverage in adolescents.<sup>17</sup> The use of such programs in Turkey may improve the rate of adolescent immunization.

Immunization is recommended for adolescents in many countries, but the desired vaccination rates are often not reached.<sup>3,8</sup> Limited parental knowledge, lack of a physician's recommendation, concerns about vaccine safety, inadequate preventive health care for adolescents, changing vaccination schemes, and cost have all been identified as obstacles to achieving desired levels of adolescent immunization.<sup>3,7,12</sup> In the present study, the most important obstacle to family physicians offering adolescent immunization was 'lack of knowledge about adolescent immunization'. For pediatricians, it was 'inadequate preventive health care for adolescents'. In our country, professional associations organize congresses and meetings for postgraduate training of health workers. However, participation is not mandatory, depends on the wishes of physicians. Furthermore, there is no education program for adolescent vaccination.

HPV can cause anogenital warts, oropharyngeal cancers, and anogenital cancers in both men and women.<sup>18</sup> Many HPV-induced infections and precancerous changes can be prevented if an individual is vaccinated before encountering HPV.<sup>19</sup> For the last ten years, the WHO has recommended that HPV vaccines be included in national immunization

programs in countries where cervical cancer is common and vaccinating against HPV is cost-effective.<sup>20</sup> In the United States, HPV vaccination at 11 to 12 years of age has been recommended for girls since 2007 and for both boys and girls since 2011. However, the rate of vaccination in both sexes remains low for HPV compared to other vaccines.<sup>8</sup> A recent study investigating the cause of this difference found that clinicians tended not to recommend this vaccine strongly or consistently.<sup>19</sup> The study also found that HPV vaccine was recommended to boys and young adolescents less often than to girls and older adolescents.<sup>19</sup> Another study found that pediatricians were aware of the problems caused by HPV infection and of the value of immunization, but generally recommended immunization to girls only. A mere 10% knew that HPV vaccine should be given to boys. The most common reason for physicians not recommending the HPV vaccine was the high cost.<sup>21</sup> A recent study investigating the attitudes of Turkish pediatricians to vaccines found that approximately half of participating pediatricians recommended the HPV vaccine to their patients.<sup>22</sup> The three most common reasons for not recommending the HPV vaccine were the cost of the vaccine, the feeling that HPV infection was not a priority issue in Turkey, and the belief that the HPV vaccine was not necessary in Turkey.<sup>22</sup> In a study of parents with children between the ages of 10 and 13, it was found that parents had limited knowledge of HPV infection and immunization.<sup>23</sup> The present study, consistent with previous studies, found that family physicians and pediatricians recommend the HPV vaccine to girls more frequently than to boys. Among both family physicians and pediatricians, the most common reason for not recommending the HPV vaccine was a lack of knowledge. The next most common reason was the high cost. The majority of participants identified HPV as the vaccine that they would want to see added to the national immunization program. Therefore, we believe that rates of HPV immunization in adolescents would

**Table 4.** The effects of participants' demographic characteristics on attitudes and practices around adolescent immunization.

	Years of practice				Education and				Institutions <sup>+</sup>			
	0–5 years % (n = 267)	6–10 years % (n = 184)	11–15 years % (n = 89)	16–20 years % (n = 74)	>20 years % (n = 51)	Research Hospital % (n = 250)	Family Health Center % (n = 201)	University Hospital % (n = 104)	State Hospital % (n = 66)	p-value	p-value	
Question 1: Do you think you have enough knowledge about the recommended vaccines for adolescents?												
I have enough knowledge	5.2 (14)	4.9 (9)	7.9 (7)	12.2 (9)	23.5 (12)	7.6 (19)	6.0 (12)	8.7 (9)	3.0 (2)		<b>.001</b>	
I have some knowledge, but I need to learn more	54.3 (145)	65.2 (120)	62.9 (56)	60.8 (45)	51.0 (26)	53.2 (133)	60.2 (121)	64.4 (67)	71.2 (47)			
I don't think I have enough knowledge	40.4 (108)	29.9 (55)	29.2 (26)	27 (20)	25.5 (13)	39.2 (98)	33.8 (68)	26.9 (28)	25.8 (17)			
Question 2: When an adolescent comes for examination, do you provide information about the recommended vaccines?												
Always/most of the time	10.5 (28)	14.7 (27)	12.4 (11)	18.9 (14)	29.4 (15)	11.2 (28)	14.4 (29)	19.2 (20)	9.1 (6)		<b>&lt;.001</b>	
If adolescent/family asks for information	33.7 (90)	35.9 (66)	32.6 (29)	32.4 (24)	19.6 (10)	33.6 (84)	31.3 (63)	32.7 (34)	42.4 (28)			
Sometimes/rarely	37.1 (99)	40.2 (74)	42.7 (38)	39.2 (29)	47.1 (24)	37.6 (94)	43.3 (87)	37.5 (39)	36.4 (24)			
Never	18.7 (50)	9.2 (17)	12.4 (11)	9.5 (7)	3.9 (2)	17.6 (44)	10.9 (22)	10.6 (11)	12.1 (8)			
Question 3a: What are your reasons for not providing information about the vaccines to adolescents?	n = 239	n = 157	n = 78	n = 60	n = 36	n = 222	n = 172	n = 84	n = 60			
I cannot allocate the time because of having a large number of patients	54.4 (130)	63.0 (99)	57.7 (45)	65.0 (39)	72.2 (26)	64.0 (142)	56.4 (97)	50.0 (42)	70.0 (42)		<b>.002</b>	
I forget	35.6 (85)	33.1 (52)	23.0 (18)	28.3 (17)	25.0 (9)	31.1 (69)	33.1 (57)	28.6 (24)	33.3 (20)			
I do not have enough knowledge about the vaccines	36.0 (86)	31.2 (49)	28.2 (22)	21.7 (13)	16.7 (6)	37.8 (84)	25.6 (44)	34.4 (29)	21.7 (13)			
Childhood immunization is sufficient – there is no need to immunize adolescents	7.9 (19)	12.1 (19)	16.7 (13)	15.0 (9)	11.1 (4)	5.0 (11)	19.8 (34)	10.7 (9)	8.3 (5)			
Sample case 1: Rate of recommending HPV immunization at the right dose and correct vaccine for a 16-year-old male	n = 161	n = 102	n = 42	n = 34	n = 25	n = 146	n = 94	n = 61	n = 32		<b>.018</b>	
Sample case 2: Rate of recommending Tdap vaccine at the right dose for a 12-year-old individual	32.9 (53)	36.3 (37)	35.7 (15)	38.2 (13)	44.0 (11)	31.5 (46)	27.7 (26)	37.7 (23)	50.0 (16)			
Sample case 3: Rate of recommending conjugated meningococcal (MenACWY) vaccine at the right dose for a 12-year-old individual	41.7 (65)	40.2 (43)	53.1 (26)	41.9 (18)	66.7 (22)	39.7 (58)	44.4 (48)	42.9 (27)	56.8 (21)		<b>.199</b>	
Sample case 4: Rate of recommending influenza vaccine at the right dose for an 11-year-old individual	n = 153	n = 110	n = 53	n = 43	n = 32	n = 145	n = 108	n = 63	n = 40		<b>.001</b>	
	45.8 (70)	75.5 (83)	66.0 (35)	90.7 (39)	75.0 (24)	52.4 (76)	75.9 (82)	58.7 (37)	72.5 (29)			
Sample case 4: Rate of recommending influenza vaccine at the right dose for an 11-year-old individual	n = 163	n = 114	n = 57	n = 49	n = 33	n = 152	n = 122	n = 66	n = 42		<b>.411</b>	
	57.7 (94)	60.5 (69)	70.2 (40)	67.3 (33)	72.7 (24)	63.8 (97)	63.9 (78)	65.2 (43)	47.6 (20)			

<sup>a</sup>Question 3 was only presented to participants who did not answer 'Always/most of the time' to Question 2.  
<sup>†</sup>The category 'Other institutions' (private hospitals and community health centers) is not shown in this table because of the small number of respondents (n = 44).

increase if knowledge gaps were addressed and the problem of cost was resolved.

In recent years, many countries have seen an increase in pertussis cases in adolescents and adults.<sup>24,25</sup> The most notable increases have occurred in areas where a high percentage of infants are immunized against pertussis.<sup>24</sup> This phenomenon may be explained by the decrease in protective antibodies (whether vaccine-induced or natural) that occurs over time.<sup>25</sup> Adolescents are frequently responsible for transporting infectious agents to infants.<sup>3</sup> For this reason, many countries administer the Tdap vaccine to children aged 11 to 12 years.<sup>24</sup> Studies have shown that the Tdap vaccine is effective and safe for adolescents.<sup>24</sup> A review of 27 studies found that the vaccine was also cost-effective in this population.<sup>26</sup> The present study found that nearly half of family physicians and pediatricians did not routinely recommend the Tdap vaccine for adolescents. The three most common reasons for not recommending the vaccine were a lack of knowledge, the conviction that childhood immunization against pertussis was sufficient, and the belief that pertussis was not seen in adolescents. However, it has been reported that the pertussis-specific anti-pertussis toxin (anti-PT) seropositivity rate is only 12–46% among children aged 10 to 15 years.<sup>27</sup> In another study of patients between 2 and 80 years old, anti-PT IgG antibodies were found to be lowest at 11 years old and highest at 15 years old.<sup>28</sup> The authors suggested that the high levels of anti-PT IgG antibodies detected in 15-year-olds were due to pertussis infection.<sup>28</sup> In another study, Bordetella pertussis positivity was found in 19.8% of children who had a cough for more than two weeks between the ages of 7 and 18.<sup>29</sup> The results of the present study indicate that physicians do not have sufficient knowledge of Tdap immunization for adolescents.

Adolescents have significant involvement in the spread of meningococcal disease.<sup>3,30,31</sup> In a study of 10- to 25-year olds in Turkey, 17-year olds had the highest carriage rate of *Neisseria meningitidis*.<sup>31</sup> Eleven percent of this group were carriers, versus 6.3% of the overall sample.<sup>31</sup> In the present study, the percentage of family physicians and pediatricians recommending meningococcal immunization to healthy adolescents was very low. However, physicians did recommend this vaccine for adolescents at risk of meningococcal disease. The most common reason that family physicians did not recommend meningococcal immunization was a lack of knowledge. Pediatricians thought that it was unnecessary to immunize adolescents.

It has been reported that individuals under 18 years of age have a high rate of influenza-related deaths.<sup>32,33</sup> However, immunization has reduced the frequency of influenza-related deaths.<sup>34</sup> School children and adolescents become reservoirs for the spread of influenza infection in the community.<sup>35</sup> Annual flu vaccination was previously recommended only to the at-risk population. Within the last decade, this recommendation has been amended to include all individuals over six months old.<sup>35,36</sup> In the present study, both family physicians and pediatricians were less likely to recommend influenza immunization to healthy adolescents than to high-risk adolescents. For family physicians, the most common reason for not recommending immunization was not considering it necessary; for pediatricians, it was the belief that the vaccine was ineffective.

A limitation of the present study is its reliance on physician self-report to determine knowledge, attitudes, and practices around vaccination. The strengths of the study include the anonymity offered to participants and the inclusion of family physicians and pediatricians who are actively providing preventive health care to adolescents. We believe that this study will be useful for understanding barriers to adolescent immunization in developing countries and identifying solutions.

## Conclusion

The present study found that a low percentage of family physicians and pediatricians in Turkey were recommending vaccination to adolescents. The most common reasons for not recommending immunization included an inability to allocate the time because of having a large number of patients, forgetfulness, and lack of knowledge about vaccines. Among both family physicians and pediatricians, a significant proportion of study participants thought that childhood immunization was sufficient and that there was no need to immunize adolescents. The rate of physicians recommending the HPV vaccine was low, and most recommended it only for girls. Half of all participants did not recommend the Tdap vaccine, and meningococcal and influenza vaccines were recommended primarily to adolescents at risk for these infections. In conclusion, the knowledge level of the physicians providing preventive health care to adolescents should be improved to increase the adolescent immunization rate. There is no mandatory training program for adolescent immunization in our country. We believe that the training programs should be implemented in order to increase the adolescent immunization.

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No potential conflicts of interest were disclosed.

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