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Evaluation of Vaccine-Preventable Diseases, HIV and HCV Antibody Levels in Residents

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ABSTRACT

Objectives: In our study, we aimed to evaluate the vaccine-preventable diseases and viral serology status of residents to prevent all the potential risks.

Methods: Referring to this study list dated 11/01/2014, 203 residents working in Selcuk University Faculty of Medicine were included in this study from the Department of Internal Medicine, Department of Surgical Medical Sciences and Department of Basic Medical Sciences. A questionnaire that consisted of 27 questions was administered using the face to face interview method. Anti-HAV IgG anti-HBs, HBsAg, anti-HCV and anti-HCV levels were measured by COBAS/E- 601 device with ELISA method. Measles IgG, rubella IgG, mumps IgG were measured by VIDAS device with ELFA method at Selcuk University Faculty of Medicine Department of Microbiology laboratory. SPSS for Windows 21.0 statistical software was used in the analysis of all the data.

Results: In this study, all of the residents' HBsAg (n=203, 100%), anti-HCV and anti-HIV levels were normal and 9 (4.4%) of the residents were no immune to mumps. Of the residents; 3 (1.5%) were no immune to rubella. Of the residents; 21 (10.3%) were no immune to measles. Of the residents; 52 (25.6%) were no immune to hepatitis A. Anti-HBs antibody levels were measured range to 0.0-9.9 mIU/mL as 13 (6.4%) of the residents and ≥10 mIU/mL as 190 (93.6%). Of the residents; 13 (6.4%) were no immune to varicella. Vaccine declaration of the residents and their serology results compared by Kapaa test and the findings showed that low or negligible compliance for hepatitis B (κ=0.153 p=0.022) and found low intermediate compliance for hepatitis A (κ=0.217 p<0.001). There was no compliance vaccine declaration of the residents and their serology results for measles, rubella, mumps and varicella (p>0.05).

Conclusion: As a result, increasing compliance with the residents for safeguard measures, assessment of serological status before beginning the work, and then, the vaccine for the seronegative disease and in-house training to increase vaccine awareness are necessary.

Keywords: Hepatitis, HIV, measles, mumps, rubella

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INTRODUCTION

Today, various studies have been conducted to improve and enhance the safety of both employees and patients. Many countries established various programs in medical institutions regarding this matter. Amongst these programs, immunization of healthcare professionals who are under the risk is regarded as one of the infection control methods to which particular importance is attached. However, occupational vaccination programs that are obligatory and recommended vary from country to country and even from center to center.[1]

In a study covering 30 countries consisting of 29 European countries and Russia, it is seen that all countries have vaccination programs when the vaccination policies in medical institutions are considered concerning recommended and obligatory immunization. However, these programs established for healthcare professionals to ensure protection from vaccine- preventable diseases differ from each other regarding the necessity, target healthcare professionals and administered vaccines. Based on the results, hepatitis B and seasonal influenza vaccines are recommended in 29 European Countries. Evaluation of the vaccination programs have revealed that immunization is available against the infections of chickenpox in 17 countries, measles-rubella in 15 countries, diphtheria-tetanus in 14 countries, mumps in 12 countries, hepatitis A in 11 countries, whooping cough in nine countries, meningococcal group C in nine countries and meningococcal serogroups A, C, W135 and Y in four countries. It is reported that it is obligatory to immunize the healthcare professionals against HAV, HBV, tetanus-diphtheria, mumps, measles, rubella, poliomyelitis and BCG[1] in some countries. On the other hand, it is recommended that healthcare professionals should be vaccinated against tetanus-diphtheria, measles, rubella, mumps, hepatitis A, hepatitis B, chickenpox and seasonal influenza in our country. However, these recommendations do not impose an obligation.[2,3]

A study examining the HCV seroprevalence revealed that 0.1-1% of the healthcare professionals turned out to be positive.[4] Although this rate is lower compared to the rate of hepatitis B given that vaccines cannot ensure prevention from HCV and approximately 70% of the HCV-infected people develop chronic hepatitis, some of whom develop HCC secondary to cirrhosis, amplifies the importance of the matter.

HIV serology is generally found to be negative in studies; however, according to 2013 data of the Republic of Turkey Ministry of Health, there were 7050 people with HIV/AIDS, and this number shows an increase each year more than the previous year.[5] Supposing that there might be a lot of unrecorded patients, it is obvious that the healthcare professionals who are in contact with secretion and blood are under risk.

The risk is even greater, considering the huge wave of immigrants to Turkey since it is not known if they are already immunized or carrying any blood-borne diseases. The serological status of the residents working at the Departments of Basic Medical Sciences, Internal Medicine and Surgical Medical Sciences can be addressed separately. Thus, department-specific solutions can be developed. This study is devoted to the protection of healthcare professionals from such preventable risks and aims to interpret the immunity and serological situation with the sociodemographic questionnaire, detecting and eliminating the deficiencies by way of immunization and raising awareness. It is of great importance to ensure that healthcare professionals are immune to vaccine-preventable diseases and to determine whether they have any blood-borne diseases to both protect their own health and prevent nosocomial transmissions among the society. Thus, childhood diseases, such as measles, rubella, mumps and chickenpox the healthcare professionals had, their hepatitis history and their immune deficiency status, should be considered and recorded.[6]

METHOD

Place and Population of this Study

This is a descriptive cross-sectional study. This study was approved by the Ethics Committee of Selçuk University, Faculty of Medicine, with the decision no. 2014/295 on November 4, 2014, and carried out on the residents working at Selçuk University, Faculty of Medicine, between January 2, 2015, and May 16, 2015.

Based on the list of residents at the Faculty of Medicine, Selçuk University, on November 1, 2014, we planned to include 255 residents in this study. Residents from the following three divisions were invited for this study: Department of Internal Medicine, Department of Surgical Medical Sciences and Department of Basic Medical Sciences. Out of 255 residents, 52 (20.3%) of them were excluded from this study for various reasons. All in all, this study was conducted with the residents of 203 residents, which were detailed below.

A total of 144 (56.4%) residents were working in the Department of Internal Medicine, Faculty of Medicine, Selçuk University. Out of 144 residents, 11 (7.6%) residents refused to participate, 2 (1.3%) residents were in parental leave, 6 (3.9%) residents graduated, 2 (1.3%) residents were out of town or abroad for educational purposes and 1 (0.6%) residents transferred to another hospital were not able to participate in this study. Thus, there were a total of 133 (92.4%) residents as participants in this study. The participation rate for the Department of Internal Medicine was 92.4% (123/133) when some of the residents who left the university for various reasons, who were in parental leave, and who were out of town or abroad for educational purposes were excluded.

A total of 88 (61.1%) residents were working in the Department of Surgical Medicine Sciences, Faculty of Medicine, Selçuk University. Out of 88, we should note that 20 (22.7%) residents refused to participate in this study, 2 (2.2%) residents were in parental leave, 4 (4.4%) residents graduated,

1 (1.1%) residents was out of town or abroad for educational purposes and 1 (1.1%) residents transferred to another hospital were not able to participate in this study. There were a total of 80 (91.2%) residents. The participation rate for the Department of Surgical Medical Sciences was 75.0% (60/80) when residents who left the university for various reasons; who were in parental leave, and who were out of town or abroad for educational purposes were excluded from this study.

A total of 23 (9.0%) residents were working in the Department of Basic Medical Sciences, Faculty of Medicine, Selçuk University. 1 (4.3%) residents refused to participate, 1 (4.3%) residents graduated and 1 (4.3%) residents was out of town or abroad for educational purposes were not able to participate in this study. There were a total of 21 (91.3%) residents.The participation rate for the Department of Basic Medical Sciences was 95.2% (20/21) when residents who left the university for various reasons and who were out of town or abroad for educational purposes were excluded from this study.

Questionnaire Information

The questionnaire form consisted of 27 questions regarding participants' sociodemographic characteristics, the diseases they had, surgeries and medical procedures they underwent, their vaccination status and social habits and data was collected using the face to face meeting method.

Analysis of Blood Samples

Blood samples were collected from the participants in this study and then centrifuged. The plasma samples were transferred to Eppendorf tubes and kept at -20 ºC until the moment of this study. Anti-HAV IgG, anti-HBs, HBs Ag, anti-HIV, anti-HCV levels were measured by COBAS/E- 601 module using the ELISA method and measles IgG, German measles IgG, mumps IgG were measured using VZV VIDAS device with ELFA method at Selçuk University Faculty of Medicine Department of Microbiology laboratory. As to HBsAg, anti-HCV and anti-HAV IgG, specimens with values <1 S/CO were considered negative while ≥1 S/CO was considered positive. As to anti-HBs, specimens the concentration values of which were <10.00 mIU/ml were considered nonreactive, while the concentration values of which were ≥10.00 mIU/ml were considered reactive.

For mumps, mumps with the cut-off value above 0.50 were considered positive, mumps with the cut-off value below 0.35 were considered negative, and mumps with the cut-off value between 0.35-0.50 were considered doubtful.

For measles, measles with the cut-off value above 0.70 were considered positive, measles with the cut-off value below 0.50 were considered negative, and measles with the cut-off value between 0.50-0.70 were considered doubtful.

For rubella, those with the cut-off value above 0.15 were considered positive, those with the cut-off value below 0.10 were considered negative, and those with the cut-off value between 0.10-0.15 were considered doubtful.

For chickenpox, chickenpox with the cut-off value above 0.90 were considered positive, chickenpox with the cut-off value below 0.60 were considered negative, and chickenpox with the cut-off value between 0.60-0.90 were considered doubtful.

Statistical Analysis

For statistical analysis, SPSS (Statistical Package for Social Sciences) for Windows 21.0 was used in the evaluation of the findings obtained in this study. The results were evaluated at a confidence interval of 95% and the significance at a level of $p<0.05$. In the evaluation of data, number, percentage, average and standard deviation were used. Chi-square test was used among the groups providing the frequency distributions of the categorical data. In the Chi-square test, if the frequency was fewer than 5 in 20% and more of the cells, Fisher Exact Test was used when the minimum expected value was <5, Continuity Correction was used when it was between 5≤ and <25, and Pearson Chi-square test was used when it was ≥25. To compare the measurements for a certain variable of two distinct groups, the Student t-test was used for normally distributed groups and the Mann-Whitney U test was used for non-normally distributed groups. For comparing multiple groups, the Kruskal Wallis test was performed. Pearson correlation analyses were utilized in the determination of the relationship between the numerical variables. The correlation coefficient (r) with a value between 0.000-0.249 showed a weak relationship, between 0.250-0.499 showed a medium relationship, between 0.500-0.749 showed a strong relationship, and 0.750-1.000 showed a very strong relationship. Kappa test was adopted to control the agreement between the statements regarding vaccination status and antibody levels. Kappa values were interpreted as follows: 0.00-0.20 as slight agreement, 0.21-0.40 as fair, 0.41-0.60 as moderate, 0.61-0.80 as substantial and 0.81-1.00 as perfect agreement.[7]

RESULTS

Residents working at the Faculty of Medicine, Selçuk University were included in this study. The socio-demographical and other characteristics of the 203 residents who participated in this study are shown in Table 1.

In this study, 190 (93.6%) of the participants had no chronic disease, whereas 13 (6.4%) of them had (hypo-thyroid, pso-

Table 1. Socio-demographical and other characteristics of the residents

	Mean±SD
Age	29.41±3.5
	n, (%)
Gender	
Male	115 (56.7)
Female	88 43.3)
Marital Status	
Married	126 (62.1)
Single	76 (37.4)
Widow	1 (0.5)
Professional Year	
<5	132 (65.0)
>5	71 (35.0)
BMI	
Normal (18.5-24.9 kg/m^2)	102 (50.3)
Overweight (25-29.9 kg/m^2)	91 (44.8)
Obese (≥30 kg/m^2)	10 (4.9)
Department of residents	
Doctors of Surgical	60 (29.6)
Doctors of Internal	123 (60.6)
Doctors of Basic Medicine	20 (9.8)
Hepatitis B Inflammation in Relatives	
No	185 (91.1)
Yes	18 (8.9)
Cigarette	
Nonsmoker	168 (82.8)
Smoker	25 (12.3)
Old smoker	10 (4.9)

BMI: Body Mass Index; SD: Standard Deviation.

Table 2. Evaluation of medical histories and habits of the residents

	n	%
Chronic Disease		
Yes	13	6.4
No	190	93.6
Blood Transfusion		
Yes	1	0.5
No	202	99.5
Operation		
Opere	67	33.0
Nonopere	136	67.0
Dentist Examination		
<5	110	54.2
≥5	93	45.8
Dentist Preference		
Private institutions	115	56.6
State or university institutions	88	43.4
Dormitory		
No	57	71.9
Yes	146	28.1
Manicure/pedicure		
No	184	90.6
Yes	19	9.4
Barber Haircut (Male)		
No	94	81.7
Yes	21	18.3

riasis, chronic sinusitis, thalassemia trait, disc herniation, hypertension, Familial Mediterranean Fever, Behçet's disease and ankylosing spondylitis). Table 2 outlines the evaluation results concerning the medical histories and habits of the residents.

Table 3 displays the statements of participants regarding their vaccination status.

There was no significant difference in viral serology results between male and female groups (Table 4).

Participants were compared for various traits, such as seronegativity and seropositivity. Immunity against measles of the residents who had undergone at least one surgery in their lives was significantly higher than the residents who had not at all (p=0.004). Anti-HBs positivity was significantly different between departments. This significance was rooted in the difference between surgical medicine and basic medicine departments and immunity against hepatitis B was significantly higher in the Department of Surgical Medical Sciences (p=0.002). All of the married participants were significantly more immune to chickenpox than the unmarried participants (p=0.002). No significant difference was identified between other traits (p>0.05) (Table 5).

In the questionnaire filled out by the participants, 108 physicians stated that neglect is the reason why they lack certain vaccines. Of these physicians; 59 (54.6%) were in internal medicine, 35 (32.4%) were in surgical medicine and 14 (13%) were in basic medical sciences. There was no statistically significant difference among these three groups (p>0.05). In group evaluation of these physicians for seronegativity revealed that 32 (29.6%) were not immune to hepatitis A, 10 (9.3%) against hepatitis B, 6 (5.6%) against mumps, 3 (2.8%) against rubella, 13 (12.1%) against

Table 3. Statements of the residents regarding their vaccination status

	Female		Male	
	n	%	n	%
Tetanus				
None	2	2.2	3	2.6
1 dose	5	5.7	7	6.1
2 dose	8	9.1	2	1.8
3 dose	26	29.5	65	56.5
4 dose	3	3.4	0	0
5 dose	17	19.4	0	0
Does not remember the vaccination status	27	30.7	38	33.0
Hepatitis B				
None	1	1.2	3	2.6
1 dose	0	0	1	0.9
2 dose	4	4.5	6	5.2
3 dose	72	81.8	97	84.3
Does not remember the vaccination status	11	12.5	8	7.0
Hepatitis A				
None	15	17.0	24	20.9
1 dose	5	5.7	0	0
2 dose	17	19.3	22	19.1
Natural Immune	12	13.7	10	8.7
Does not remember the vaccination status	39	44.3	59	51.3
MMR				
None	1	1.1	1	0.9
1 dose	5	5.7	5	4.4
2 dose	40	45.4	52	45.2
Natural Immune	7	8.0	6	5.2
Does not remember the vaccination status	35	39.8	51	44.3
Varicella				
None	8	9.1	11	9.6
1 dose	1	1.1	0	0
2 dose	11	12.5	21	18.3
Natural Immune	21	23.9	15	13.0
Does not remember the vaccination status	47	53.4	68	59.1

measles, and 10 (9.3%) against chickenpox.

The seronegativity evaluation of the physicians who stated in the questionnaire that they do not lack any vaccines revealed vealed that 3 (7.1%) were not immune to hepatitis A, 8 (19%) against hepatitis B, 3 (7.2%) against mumps, 3 (7.1%) against measles, and 1 (2.4%) against chickenpox.

There was a weak negative significant correlation between age and seropositivity for hepatitis B (r=-0.154 p=0.033). Kappa test was adopted in the comparison of the participants' statements regarding their vaccination status and their antibody status and it revealed that there was a slight agreement in the hepatitis B vaccination status (κ=0.153 p=0.022) and a fair agreement in the hepatitis A vaccination status (κ=0.217 p<0.001). No statistically significant agreement was identified between the statements regarding their vaccination status against measles, rubella, mumps and chickenpox and their antibody status (p>0.05) (Table 6).

DISCUSSION

It is of great importance to ensure that healthcare profes-

sionals are immune to vaccine- preventable diseases and to determine whether they have any blood-borne diseases to both protect their own health and prevent nosocomial transmissions among the society.

This study was carried out to identify the serological sta-tus of the residents regarding vaccine-preventable diseases, hepatitis C and HIV. This study also aims to investigate whether there were a serological difference and a difference concerning sensitivity for vaccination among the departments of surgical medicine, basic medicine and internal medicine and to come up with solutions either general or specific to each of the departments of surgical, basic and internal medicine.

In their study, Köse et al. and Öksüz et al. identified the HBsAg seropositivity among healthcare professionals to be 2.4% and 1.7%, respectively.[8,9] Çakaloğlu et al. compiled the studies conducted on the healthcare professionals in Turkey and attempted to identify the HBsAg seroprevalence amongst 14.000 healthcare professionals between 1980-2000. The results revealed that the HBsAg seroprevalence was 5.8% in between 1980-1990, whereas this rate receded to 3.6% between 1990-2000 with a statistically significant decrease.[10] Studies carried out in the last decade reported that the HBsAg positivity amongst healthcare professionals was between 0.7-4.4%.[11] This decrease may be associated with the increase in the infection control measures and successful vaccination policies.

In this study, the anti-HBs antibody level of 6.4% of the participants was found to be below 10 mIU/mL. When the reasons were examined, the findings showed that 2% of the participants were not vaccinated against hepatitis B, while 0.5% received one dose and 4.9% received two doses of the hepatitis B vaccine. 9.4% did not remember whether or not they were vaccinated.

The participants were grouped, considering the presence of any hepatitis B carriers in their family. When the reasons for not having been vaccinated were examined, the comparison between neglect and other reasons did not show a significant difference. 131 (64.5%) physicians accounted for not having been vaccinated; arguing that it was neglect, 9.9% of them had hepatitis B carriers amongst their first- or second-degree relatives. Although there was not a significant relationship between neglect and family history and the medical profession does not tolerate any neglect, it was surprising to see our colleagues, who are especially under risk because of their relatives, attributed their failure to undergo vaccination to neglect.

Susceptibility to mumps varies between 0.7-10% in the studies carried out on healthcare professionals in Turkey.

Table 4. Viral serology status of serology status of residents

	HBsg*		AntiHBs		Anti-HIV*		Anti-HCV*		Measles*		Mumps*		Rubella*		Varicella*		Anti-HAV*	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Male																		
Positive	0	0	108	94.0	0	0	0	0	103	90.0	110	95.7	114	99.2	109	95.0	89	77.4
Negative	115	100.0	7	6.0	115	100.0	115	100.0	12	10.0	5	4.3	1	0.8	6	5.0	26	22.6
Female																		
Positive	0	0	82	93.2	0	0	0	0	79	90.0	84	95.5	86	98.0	81	93.0	62	70.5
Negative	88	100.0	6	6.8	88	100.0	88	100.0	9	10.0	4	4.5	2	2.0	7	7.0	26	29.5
Total																		
Positive	0	0	190	93.6	0	0	0	0	182	89.7	194	95.6	200	98.6	190	93.6	151	74.4
Negative	203	100.0	13	6.4	203	100.0	203	100.0	21	10.3	9	4.4	3	1.4	13	7.4	52	25.6

Table 5. Comparison of the nonimmune residents with respect to various traits

	Mumps				Rubella				Measles			
	Nonimmune		Immune		Nonimmune		Immune		Nonimmune		Immune	
	n	%	n	%	n	%	n	%	n	%	n	%
Doctors of surgical	6	4.8	117	95.2	1	0.8	122	99.2	12	9.7	111	90.3
Doctors of internal medicine	1	1.6	59	98.4	2	3.0	58	97.0	10	10.0	50	90.0
Doctors of basic medicine	2	10.0	18	90.0	0	0	20	100.0	3	15.0	17	85.0
	x^2=2.604		p=0.272		x^2=2.092		p=0.351		x^2=0.521		p=0.771	
Single	5	6.4	72	93.6	3	3.8	74	96.2	6	7.7	71	92.3
Married	4	3.1	122	96.9	0	0	126	100.0	15	11.9	111	88.1
	x^2=1.243		p=0.304		x^2=4.983		p=0.053		x^2=0.872		p=0.351	
Assistant	9	4.5	188	95.5	3	1.5	194	98.5	20	10.1	177	89.9
Follow assistant	0	0	6	100.0	0	0	6	100.0	1	16.6	5	83.4
	x^2=0.287		p=0.592		x^2=0.093		p=0.761		x^2=0.266		p=0.606	
Nonsmoker	9	5.0	169	95.0	3	1.5	175	98.5	17	9.5	161	90.5
Smoker	0	0	25	100.0	0	0	25	100.0	4	16.0	21	84.0
	x^2=1.323		p=0.605		x^2=0.428		p=0.513		x^2=0.983		p=0.302	
Without Chronic Disease	8	4.2	182	95.8	3	1.5	187	98.5	20	10.5	170	89.5
With Chronic Disease	1	7.0	12	93.0	0	0	13	100.0	1	7.0	12	93.0
	x^2=0.348		p=0.555		x^2=0.208		p=0.648		x^2=0.105		p=0.704	
Nonoperated	6	4.4	130	95.6	3	2.2	133	97.8	20	14.7	116	85.3
Operated	3	4.4	64	95.6	0	0	67	100.0	1	1.4	66	98.6
	x^2=0.001		p=0.983		x^2=1.500		p=0.552		x^2=8.450		p=0.004	
Who think to need not to be vaccinated	0	0	14	100.0	0	0	14	100.0	5	21.7	9	78.3
Who think to need to be vaccinated	9	5.0	180	95.0	3	1.7	186	98.3	16	8.9	173	91.1
	x^2=1.203		p=0.602		x^2=0.389		p=1.000		x^2=3.631		p=0.70	
Dentist Examination	7	6.4	103	93.6	3	2.7	107	97.3	13	11.8	97	88.2
Dentist Examination	2	2.2	91	97.8	0	0	93	100.0	8	8.6	85	91.4
	x^2=2.111		p=0.184		x^2=2.574		p=0.252		x^2=0.562		p=0.453	
Dentist Preference Private Institutions	6	5.2	109	94.8	1	0.8	114	99.2	11	9.5	104	90.5
Dentist Preference State or university institutions	3	3.4	85	96.6	2	2.2	86	97.8	10	11.3	78	88.7
	x^2=0.788		p=0.502		x^2=0.435		p=0.607		x^2=0.000		p=0.987	

Table 5. CONT.

	Mumps				Rubella				Measles			
	Nonimmune		Immune		Nonimmune		Immune		Nonimmune		Immune	
	n	%	n	%	n	%	n	%	n	%	n	%
Dormitory												
No	3	5.4	54	94.6	0	0	57	100.0	3	5.3	54	94.7
Yes	6	4.1	140	95.9	3	2.1	143	97.9	18	12.3	128	87.7
	x^2=0.129		p=0.713		x^2=1.189		p=0.561		x^2=2.207		p=0.137	
Manicure/pedicure												
No	9	4.9	175	95.1	2	1.1	182	98.9	21	11.4	163	88.6
Yes	0	0	19	100.0	1	5.3	18	94.7	0	0	19	100.0
	x^2=0.972		p=1.00		x^2=2.063		p=0.256		x^2=2.419		p=0.229	
Barber Haircut												
No	9	4.9	85	95.1	3	1.6	91	98.4	20	11.0	74	89.0
Yes	0	0	21	100.0	0	0	21	100.0	1	4.8	20	95.2
	x^2=1.087		p=0.602		x^2=0.351		p=1.000		x^2=0.787		p=0.704	

[12–14] In their study carried out on 309 healthcare professionals between 2011-2012, Cılız et al. identified a susceptibility rate of 0.7%.[12] Alp et al. found out the susceptibility rate to be 10% in their study conducted on 1255 healthcare professionals in 2011.[13] Kutlu et al. carried out a study on 351 female medical school students in 2011 and identified a susceptibility rate of 6.5%. The results of this study are agreeable with the country average.[14] 4.4% of the participants are susceptible to mumps. 4.8% of the internal medicine physicians, 1.6% of the surgical medicine physicians and 10% of the basic medicine physicians who participated in this study were not immune to mumps. There was no statistically significant difference among the three groups. However, when we focused on the percentages, the need for mumps immunization was higher in the department of basic medical sciences.

Susceptibility to measles of healthcare professionals in Turkey has been identified to be between 1.7-5%.[13,14] Alp et al. found out the susceptibility rate to be 5% in their study conducted in 2011.[13] Kutlu et al. identified a susceptibility rate of 2.8% in 2011.[14] The results of this study are agree-able with the country average. 1.5% of the participants were not immune to rubella.

Susceptibility to rubella varies between 0.3-8.4% in the studies carried out on healthcare professionals in Turkey. Alp et al. found out the susceptibility rate to be 3% in their study conducted in 2011.[13] Kutlu et al. identified a susceptibility rate of 8.4% in 2011.[14] 10.3% of the participants of this study were susceptible to measles. The studies conducted throughout the country identified a high percentage of susceptibility to measles.

Öncü et al. carried out a study in 2004 to identify the immunity of healthcare professionals in Turkey against hepatitis A and found out that anti-HIV positivity of nurses was 92.2%, while it was 57.5% for nursing students.[15] In 2013, Korkmaz et al. conducted a study on 586 healthcare professionals, 152 of them were examined for anti-HAV and positivity was found in 71.7%.[16] In this study, 74.4% of the participants were immune to hepatitis A. This study was found to be consistent with the other studies carried out in Turkey.[15,16] Since hepatitis A vaccine was included in the vaccination schedule of Turkey just in 2012, immunization of adults should be laid weight on in order to improve the current situation. It is of great importance for healthcare professionals, the group at the highest risk, to become completely immunized immediately both for their own health and protection of people from nosocomial infections.

Aypak et al. carried out a study to investigate the immunity of healthcare professionals in Turkey against chickenpox

Table 6. Agreement between statements regarding vaccination statuses and serological statuses of the residents

Hepatitis B	Immune		Nonimmune		Hepatitis A Immune		Nonimmune		Varicella Immune		Nonimmune	
	n	%	n	%	n	%	n	%	n	%	n	%
I've been vaccinated	171	95.0	9	5.0	62	94.0	4	6.0	67	97.0	2	3.0
I was not vaccinated	19	83.0	4	17.0	89	65.0	48	35.0	123	92.0	11	8.0
	κ=0.153		p=0.022		κ=0.217		p<0.001		κ=0.037		p=0.143	
Mumps	**Immune**		**Nonimmune**		**Measles Immune**		**Nonimmune**		**Rubella Immune**		**Nonimmune**	
	n	%	n	%	n	%	n	%	n	%	n	%
I've been vaccinated	109	95.0	6	5.0	106	92.0	9	8.0	114	99.1	1	0.9
I was not vaccinated	85	97.0	3	3.0	76	86.0	12	14.0	86	98	2	2.0
	κ=-0.020		p=0.535		κ=0.064		p=0.178		κ=0.016		p=0.412	

κ= Kappa value.

and identified the susceptibility rate to be 1.8%.[17] Alp et al. found out that the susceptibility rate was 2%.[13] In our study, 6.4% of the participants were susceptible to chickenpox, which is high when compared to the results of other studies carried out in Turkey.[13,17] Since immunization was included in the childhood routine vaccination schedule of Turkey just in 2013, immunization of adults becomes more of an issue.

The participants were grouped according to their departments, namely surgical medicine, basic medicine and internal medicine. When the reasons for not having been vaccinated were compared, there was a significant difference among the groups. The comparison between neglect and other reasons within each group revealed that neglect was the main reason for 58.5%, 68.3%, and 90% of the participants in the departments of internal medicine, surgical medicine and basic medicine, respectively. In their study, Cılız et al. grouped the participants as surgical, internal, pediatric and laboratory. The incidence of stab wounds was the lowest amongst laboratory personnel who were identified to have the lowest rate of immunization as well.[12] This suggests that residents in basic sciences do not pay sufficient attention to being vaccinated due to the low risk of being wounded and not coming into direct contact with the patients.

In this study, 5% of the participants who claimed that they had their hepatitis B shots were found to be negative for anti-HBs antibody. 6%, 3%, 5%, 8% and 0.9% of them who said they were vaccinated against hepatitis A, chickenpox, mumps, measles and rubella, respectively were found to be negative for antibodies. What first comes to mind is that these people did not develop post-vaccination immunization. Seroconversion rates for hepatitis B after three doses were identified to be 100% for children and 95% for adults.[18] Sufficient immune response for protection against the infection is developed for 95-100% four weeks after the first dose of the hepatitis A vaccine.[19] Two doses of measles vaccine, two doses of mumps vaccine, two doses of rubella vaccine; one dose of chickenpox vaccine for kids and two doses for adults provide immunization at the rate of 99%, 79-95%, 95-99%, 95% and 80%, respectively.[20] In other words, completion of vaccinations does not provide 100% immunization; therefore, one may need to be revaccinated if seronegativity is the case. Some of the physicians who thought they had been vaccinated might have been misremembering because some of the vaccines were administered in childhood. Therefore, an online national vaccination tracking system may make a difference in tracking not only the childhood vaccines but also the adult vaccination, which has recently come into prominence. In this regard, family physicians, the cornerstones of preventive medicine, need to

be organized and adult immunization needs to be speeded up. It is clear that starting from the healthcare professionals, immunization of each individual of the society is for the benefit of the country's health.

The participants were grouped based on whether they go to a dentist regularly. When the reasons for not having been vaccinated were investigated, the comparison between neglect and other reasons did not show a significant difference. However, participants who see a dentist on a regular basis were found to be less negligent than the participants who did not when it comes to being vaccinated, which might be because people who care for their individual health do that for a variety of healthcare fields.

The participants were grouped as immune if they were immune to all of the diseases focused on herein and as susceptible if they needed vaccination against at least one of these diseases. When the reasons for not having been vaccinated were investigated, the comparison between neglect and other reasons displayed a significant difference. In this study, 46.6% of the negligent participants, and 27.8% of the participants who provided other reasons to lacking some vaccines showed seronegativity. As expected, the participants who were negligent of immunization were found to be more in need of vaccination.

When they were still students and before they encounter the patients, the importance of being vaccinated in the face of vaccine-preventable diseases should be stressed and explained to all of the healthcare providers. Awareness in this regard should be raised among them, and necessary tests should be performed to identify and complete any missing vaccines before they start their professional life. As long as healthcare professionals and physicians remain healthy, patients' and society's health will no doubt improve. Training events on vaccination and blood-borne diseases provided to all healthcare professionals should be repeated regularly and updated with new information rather than just being rare occasions.

Disclosures

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