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ORIGINAL ARTICLE

Vaccines in adults with autoimmune inflammatory rheumatic disease: What are the knowledge and attitudes of physicians?

Suade Özlem Badak

Department of Internal Diseases, Division of Rheumatology, Adana City Research and Training Hospital, Adana, Türkiye

ABSTRACT

Objectives: The aim of this study was to evaluate the knowledge and practices about vaccination in adults with autoimmune inflammatory rheumatic diseases (AIRD) among primary care physicians (PCPs), internal medicine specialists (IMSs), and rheumatologists and to emphasize the importance of vaccination.

Patients and methods: Between March 2021 and April 2021, a total of 310 IMSs, PCPs, and rheumatologists (132 males, 178 females; mean age: 37.4±9.5 years; range, 24 to 64 years) were included. A web-based questionnaire was used in the study.

Results: Of the physicians, 87.7% were aware of that patients with AIRD were among adults with vaccination indications, but 53.9% reported that they knew about recommended vaccines, and 53.2% recommended vaccines to their patients. The most common reasons for not recommending vaccination were reservations about the drugs used (22.3%) and lack of information (17.7%). Those with longer practice as physicians and older physicians had less knowledge about the vaccine than the other participants. While 59.7% of the participants thought that the vaccination plans of the patients should be made by the rheumatologist, the rate of PCPs who did not prefer to apply the planned vaccines in the first step was 50.7%. A total of 50% of the participants did not recommend the administration of the COVID-19 vaccine in a primary healthcare institution to those receiving immunosuppressive therapy.

Conclusion: Considering that one of the major obstacles to adult vaccination is the physician's refusal to recommend it, our study highlights the missing points in the vaccination knowledge and approach of physicians. Providing advice on adult vaccination and immunization of risky groups to more physicians and periodic training to prevent loss of knowledge after graduation may contribute to an increase in the vaccination rate of adults with AIRD.

Keywords: Adult immunization, autoimmune inflammatory rheumatic disease, COVID-19, immunosuppressive, vaccine.

The most effective way to prevent infectious diseases in all age groups is to be vaccinated. Vaccine-preventable infections cause severe morbidity and mortality for adults with an autoimmune inflammatory rheumatic disease (AIRD), as in all adults.

Changes in the immune system, immunosuppressive and immunomodulatory drugs used cause susceptibility to infections.[1] Vaccination prevents or attenuates infections by inducing and/or enhancing protective immunity. Thus, it reduces hospital admissions due to infections and mortality rates in this patient group, where comorbidities are also common.

Vaccine studies to prevent severe acute respiratory syndrome-coronavirus 2 (SARS-CoV-2) infection progressed rapidly and started to be implemented in late 2020.[2] During this period, the importance of vaccines has been understood once again. There has also been an increased interest in other adult vaccines recommended for individuals at risk, such as pneumococcus,

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Correspondence: Suade Özlem Badak, MD. Adana Şehir Eğitim ve Araştırma Hastanesi, İç Hastalıkları Kliniği, Romatoloji Bölümü, 01060 Yüreğir, Adana, Türkiye.
Tel: +90 505 - 375 97 57 e-mail: suadeozlembadak@gmail.com

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including novel coronavirus 2019 disease (COVID-19) vaccination.[3]

Scientific societies such as the American College of Rheumatology (ACR)[1] and the European League Against Rheumatism (EULAR)[4] have offered recommendations aimed at guiding the optimal use of vaccines and improving compliance among patients with rheumatic disease, and recommendations on the COVID-19 vaccine have also been published. In the literature, data on COVID-19 vaccination began to take its place. Rotondo et al.,[5] in their study including 185 individuals, 137 of whom were diagnosed with autoimmune/chronic inflammatory rheumatological disease, reported that there was no significant difference in the occurrence of side effects between the patient groups after messenger ribonucleic acid (mRNA) and vector vaccines (p=0.341 and p=0.403, respectively). No vaccine-related moderate/severe adverse events were also reported in the results of the inactivated SARS-CoV-2 vaccine administered to AIRD patients.[6]

Despite all recommendations, it is known that vaccination rates do not reach the recommended levels in this target population.[7-9] However, physicians may have concerns about vaccinating adults with AIRD. It may be considered that if physicians are informed about vaccination recommendations for patients with AIRD, these reservations may be reduced, and thus vaccination rates may increase. Among the internal medicine specialists (IMSs), rheumatologists, and primary care physicians (PCPs) who follow this patient group, little is known about vaccination information, attitudes, and practices, including the COVID-19 vaccine.

In the present study, we aimed to evaluate the knowledge, attitudes, and practices about vaccination in adults with AIRD among rheumatologists, IMSs, and primary care physicians and to emphasize the importance of vaccination awareness. Seeing the knowledge and approaches of physicians on this issue may pave the way for attempts to correct the missing and wrong points, which may ultimately contribute to increasing vaccination rates for patients with AIRD.

PATIENTS AND METHODS

This cross-sectional, web-based survey was conducted between March 2021 and April 2021. Our study group consisted of rheumatologists, IMSs, and PCPs who were able to follow adults with AIRD from all regions of Türkiye. The sample size was determined by an appropriate sampling technique based on IMS, PCP, and the number of rheumatologists in Türkiye.[10] Accordingly, a total of 310 participants (132 males, 178 females; mean age: 37.4±9.5 years; range, 24 to 64 years) were included.

The questionnaire was anonymous. The survey was based on the vaccination recommendations of the ACR,[1] the EULAR,[4] and the National Adult Immunization Guidelines.[7]

The survey was delivered to all participants via WhatsApp, and Facebook groups via professional online survey software (Google® Forms, Google LLC, Mountain View, CA, USA). The usability and technical functionality of the electronic questionnaire were tested three times in a group of 15 physicians (rheumatologist, IMSs, and PCPs).

Participation was voluntary, and no incentive was offered to complete it. Incomplete submission of the survey questionnaire was not possible due to the functionality of Google Forms to prevent partially answered or unfilled questions from being submitted. Only completed questionnaires were analyzed. Each participant could only fill out one questionnaire. Duplicate entries were blocked using Google Forms' single-response limit option.

Preliminary statements were informed about the study, and all participants were allowed to confirm their own informed consent to complete the questionnaire. Participating physicians completed the survey on a web page consisting of 16 questions, always appearing in the same order, with their identities confidential.

The first part measured demographic and occupational characteristics such as age, sex, the field of specialization, health institution, and duration of medical practice. In the second part, whether they examined the adult vaccination recommendations, whether they had information about vaccination recommendations in adults with AIRD, who was responsible

for vaccination planning, recommendations on the COVID-19 vaccine, whether they would apply the recommended vaccines in their own institutions, and whether they approve its application in a primary healthcare institution were asked. Whether they had information about recommended vaccines in adults with AIRD receiving immunosuppressive therapy, influenza, conjugated pneumococcus (PCV13), polysaccharide pneumococcus (PPSV23), Haemophilus influenzae type b (Hib), tetanus and adult diphtheria toxoid (Td)/tetanus-diphtheria-acellular pertussis (Tdap), hepatitis B virus (HBV), hepatitis A virus (HAV), and live vaccines herpes zoster (HZ), Measles-rubella-mumps (MMR), and varicella (VZV) vaccines were asked as multiple-choice options.

With the responses, the "vaccination knowledge score" was calculated for each participant. The COVID-19 vaccine was not included in the scoring. Vaccination knowledge score: Those who answered "Yes" to vaccines that can be administered under immunosuppressive treatment were given "1" points, and those who answered "No" were given "0" points. The total score was calculated for each participant by giving a score of "0" to those who answered "Yes" to vaccines not recommended under immunosuppressive treatment and "1" to those who answered "No" (maximum score 10). The knowledge score was classified as low and high (according to the median score). Immunosuppressive therapy was defined as tocilizumab, anakinra, rituximab, anti-tumor necrosis factor (TNF), other biological agents, and high-dose methotrexate, leflunomide, azathioprine, corticosteroid, and were specified in the questionnaire preliminary statements.[1,10,11]

Statistical analysis

Statistical analysis was performed using the IBM SPSS version 26.0 software (IBM Corp., Armonk, NY, USA). Descriptive data were used to summarize participants' characteristics and patterns of answers to knowledge and opinion items. A vaccine knowledge score (range=0-10) was calculated as the sum of correct answers given by the participant regarding the 10 knowledge questions. The knowledge score, age, and duration of medical practice were analyzed using the Kolmogorov-Smirnov statistics and showed a non-normal distribution of variables. The participants were divided into low and high knowledge categories according to the median score. Categorical data were expressed in number and frequency and were compared using the chi-square test. Non-normally distributed data were expressed in median and interquartile range (IQR). Non-normally distributed data were compared between two groups using the Mann-Whitney U test and between more than

Table 1. Characteristics of the participants

	n	%	Mean±SD	Median	Min-Max
Age (year)			37.4±9.5	35	24-64
Sex					
Male	132	42.6			
Female	178	57.4			
Primer health institutions	148	47.7			
Secondary health institution	31	10.0			
Research and university hospitals	126	40.6			
Private*	5	1.6			
Primary care physicians	187	60.3			
Internal medicine specialist	97	31.3			
Rheumatologist	26	8.4			
Medical experience			13.4±9.6	11	1-41

SD: Standard deviation; * Private secondary health institution.

two groups using the Kruskal-Wallis test. A *p* value of <0.05 was considered statistically significant.

RESULTS

A total of 310 physicians answered the questionnaire. Of these, 187 (60.3%) were PCPs, 97 (31.3%) were IMSs, and 26 (8.4%) were rheumatologists (Table 1).

The answers given by the physicians to the general questions about the vaccine are presented in Table 2. Those who reviewed the National Adult Immunization Guideline (NAIG) were more likely to recommend vaccines to their patients (p<0.001). The proportion of recommending vaccination to their patients was higher in those who were familiar with the recommended vaccines in those with AIRD diagnosis (p<0.005).

Internists and those who did not know the vaccines recommended for adults with AIRD were less likely to question their vaccination history (p<0.005 for each). To the question "Are those with AIRD among adults with vaccination indications," more internists (IMSs) than PCPs answered "Yes" (p<0.05). The rate of PCPs was significantly higher among those who did not provide information about the COVID-19 vaccine and did not recommend the COVID-19 vaccine (p<0.05). The proportion of IMSs recommending the COVID-19 vaccine to those receiving immunosuppressive therapy was higher than PCPs (p<0.05).

A total of 155 (50%) participants did not recommend administering the COVID-19 vaccine in a primary healthcare facility. Of these participants, 92 (59.4%) were PCPs, 57 (36.8%) IMSs, and six (3.9%) rheumatologists. The reason for the physicians who did not recommend vaccination to their patients mainly was their lack of knowledge and the fact that the patients had reservations depending on the drugs they used (Table 3). While more than half of the participants (59.7%) thought that a rheumatologist should make the vaccination plans for adults with AIRD, the rate of PCPs who did not prefer to apply the vaccines planned at the first stage was 50.7% (75) (p<0.001) (Table 3).

The most recommended vaccines were influenza in 261 (84.2%), PCV13 in 261 (84.2%), and PPSV23 in 261 (84.2%). Among those recommending influenza (p<0.005), HBV (p<0.005), Td/Tdap (p<dec.05), HAV (p<0.005), Hib (p<0.005) vaccines, the proportion of rheumatologists was significantly higher. For those on immunosuppressive therapy, the

Table 2. Physicians' answers to general questions about vaccination

	PCP		IMS		Rheumatologist		Total		
	n	%	n	%	n	%	n	%	*p*
Have you reviewed the National Adult Immunization Guideline before?	141	75.4	59	60.8	20	76.9	220	71	0.029
Do you know about vaccination recommendations in adult patients with AIRD? (yes)	98	52.4	43	44.3	26	100	167	53.9	0.001
Are those with AIRD among adults with vaccination indications? (yes)	154	82.4	92	94.8	26	100	272	87.7	0.001
Have you questioned the vaccination history of your patients? (yes)	149	79.7	62	63.9	21	80.8	232	74.8	0.011
Do you recommend vaccination to your patients? (yes)	97	51.9	42	43.3	26	100	165	53.2	0.001
Would you recommend the COVID-19 vaccine for those diagnosed with AIRD? (yes)	162	86.6	93	95.9	26	100	181	90.6	0.009
Would you recommend the COVID-19 vaccine for those receiving immunosuppressive therapy (yes)	95	50.8	40	41.2	20	76.9	155	50	0.005

PCP: Primary care physicians; IMS: Internal medicine specialist; AIRD: Autoimmune inflammatory rheumatic disease.

Table 3. Vaccination plans and reasons for not recommending vaccination

	PCP		Rheumatologist		IMS		Total	
	n	%	n	%	n	%	n	%
Who should make vaccination plans for those with AIRD?								
PCP	21	11.2	4	15.4	5	5.2	30	9.7
IMS	24	12.8	0	0	5	5.2	29	9.4
Infectious diseases specialist	14	7.5	0	0	15	15.5	29	9.4
Pulmonologist	0	0	0	0	0	0	0	0
Pharmacist	0	0	0	0	0	0	0	0
Rheumatologist	109	58.3	17	65.4	59	60.8	185	59.7
All of them	19	10.2	5	19.2	13	13.4	37	11.9
What is your reason for not recommending vaccination?								
'It can activate the disease'	14	7.5	0	0	8	8.2	22	7.1
'I have concerns about the drugs used'	33	17.6	0	0	36	37.1	69	22.3
'I do not believe it is effective'	1	0.5	0	0	0	0	1	0.3
'I don't know about vaccination'	42	20.5	0	0	13	13.4	55	17.7
'I have doubts about the vaccines applied in our country'	1	0.5	0	0	0	0	1	0.3

PCP: Primary care physicians; IMS: Internal medicine specialist.

Table 4. Vaccination recommendations for those receiving immunosuppressive therapy

		PCPs		IMS		Rheumatologist		Total		
Vaccine		n	%	n	%	n	%	n	%	*p*
COVID-19	Yes	108	57.8	74	77.3	26	100	209	67.4	<0.001
Influenza	Yes	161	86.1	74	76.3	26	100	261	84.2	0.007
PCV13	Yes	155	82.9	81	83.5	25	96.2	261	84.2	0.216
PPSV23	Yes	155	82.9	81	83.5	25	96.2	261	84.2	0.216
Hib	Yes	54	28.9	31	32.0	17	65.4	102	32.9	<0.001
Td/Tdap	Yes	81	43.3	37	38.1	17	65.4	135	43.5	0.045
HAV	Yes	67	35.8	40	41.2	18	69.2	125	40.3	0.005
HBV	Yes	90	48.1	62	63.9	24	92.3	176	56.8	<0.001
VZV	No	177	94.7	93	95.9	20	76.9	290	93.5	0.001
MMR	No	176	94.7	91	93.8	21	80.8	288	92.9	0.42
HZ	No	167	89.3	89	91.8	14	80.8	270	87.1	<0.001

p-Values value less than 0.05 was considered significant; PCP: Primary care physicians; IMS: Internal medicine specialis; COVID-19: Coronavirus 2019 disease; PCV13: Conjugated pneumococcus; PPSV23: Polysaccharide pneumococcus; Hib: Haemophilus influenzae type b; Td/Tdap: Tetanus and adult diphtheria toxoid/Tetanus-diphtheria-acellular pertussis; HAV: Hepatitis A; HBV: Hepatitis B; VZV: Varicella; MR: Measles-rubella-mumps; HZ: Herpes zoster; Pearson's chi-square test.

Table 5. Vaccination knowledge score

	Low		High		
	n	%	n	%	*p*
Woman	96	53.9	82	46.1	>0.05
Primary care physicians	114	61	73	39	
Internal medicine specialist	56	57.7	41	42.3	<0.001
Rheumatologist	6	23.1	20	76.9	
Primer health institutions	99	66.9	49	33.1	
Secondary health institution, research and university hospitals	77	47.5	85	52.5	<0.001
Have you reviewed the 'National Adult Immunization Guideline' before? (yes)	117	53.2	103	46.8	<0.05
Have you questioned the vaccination history of your patients? (yes)	135	57.9	97	42.1	<0.05
Do you recommend vaccination to your patients? (yes)	78	47.3	87	52.7	<0.001
Do you know about vaccination recommendations in adult patients with AIRD? (yes)	81	48.5	86	51.5	<0.001

AIRD: Autoimmune inflammatory rheumatic disease.

vaccine recommendations of the participants are presented in Table 4.

Vaccination knowledge score (Table 5)

The median score for answer was 4 and, according to this cut-off value, 134 (43.2%) respondents had higher and 176 (56.8%) lower vaccination knowledge scores. Those who reviewed the NAIG and those who were familiar about recommended vaccines for adults with AIRD had a higher level of knowledge ($p<0.05$ for each). In addition, vaccination recommendation and knowledge level were significantly related ($p<0.001$). The level of knowledge was also related to the age of the physicians and the duration of medical practice. Age and duration of medical practice were higher in those with a lower level of knowledge ($p<0.05$). No relationship was found with sex ($p>0.05$).

DISCUSSION

To the best of our knowledge, this is the first study in the literature to examine the knowledge and practice of vaccination, including the COVID-19 vaccine, in adults with AIRD in Türkiye.

According to the answers, the majority of our participants examined the national adult vaccination recommendations and were aware of that patients with AIRD were among adults with vaccination indications. Fewer participants were familiar with the vaccines recommended for adults with AIRD and recommended vaccines to these patients. Half of our participants did not recommend the use of the COVID-19 vaccine in the primary care setting.

Many of the infections that are common in adults with AIRD and progress with complications are among the diseases that can be prevented by vaccination. However, as in the world, adult vaccination rates are not at the desired levels in our country, including the risk group.[12,13] One of the most common reasons for adults not to be vaccinated is reported as the doctor's refusal.[14] When they examined the reasons why 268 patients with rheumatoid arthritis (RA) and 189 spondyloarthritis (SpA) patients in France were vaccinated or not, the main reason for unvaccinated patients was the lack of a recommendation from their treating physicians.[15] A total of 53.2% of our participants recommended vaccination to their patients. The rate of recommending vaccines to their patients was significantly higher by physicians who previously reviewed the national vaccination guidelines, considered that they knew about the recommended vaccines for adults with AIRD, and knew that patients with AIRD were among adults with vaccination indications ($p<0.001$, for each). There was a

significant relationship between the vaccination information score and the vaccination recommendation status of the physicians, and the vaccination recommendation rate of those with a high vaccination information score was higher ($p<0.001$). The reasons why they did not recommend vaccination were mostly their reservations about the drugs used and their lack of knowledge. The striking point is that more than half of PCPs did not prefer to vaccinate adults with AIRD in their own institutions, that is, in primary care.

It has been previously reported that physicians have reservations about recommending vaccines to individuals with chronic diseases who require a special immunization approach due to their diseases and medications, and it has been shown that the lack of knowledge of physicians about vaccination in adults with AIRD affects vaccination rates.[13,16] Factors such as disease activity, comorbid diseases, type of vaccine, immunosuppressive therapy in patients with AIRD require a special approach regarding the vaccines to be administered and the timing of the vaccines. Physicians who do not know about these issues may hesitate to recommend vaccines to their patients. Physicians' knowledge of which vaccine can be administered to adults with AIRD and when can reduce their reservations and increase vaccination rates.

Similar to the literature, we found that recommending vaccination was associated with the physicians' knowledge and awareness. The Adult Immunization Guidelines in our country have been updated since 2009, when it was first published, and present its recommendations including adults with AIRD. The Turkish League Against Rheumatism (TLAR) also published the vaccination recommendations for adult patients with rheumatic diseases in 2016 and announced its recommendations to physicians and patients on various platforms. Knowledge of these recommendations, not only by rheumatologists, but also by PCPs and general internists, may enable the vaccination of people with AIRD who cannot reach a rheumatologist.

According to our study results, there was a relationship between age and the duration of medical practice. The age and the duration of medical practice were higher in those with low level of knowledge ($p<0.05$ for each). It can be considered that this may be due to the fact that younger physicians can more easily access up-to-date information (e.g., congresses, seminars, access to web-based information) about vaccination recommendations in patients receiving immunosuppressive therapy, and their information is more up-to-date, as it has not been a long time since the medical school education. Based on our study results, we consider that the knowledge of physicians with training on the immunization of risky groups, the delivery of recommendations to more physicians, and some activities to be carried out periodically to prevent loss of information after graduation may increase the vaccination rate.

In the 2019 EULAR vaccination recommendations, it is recommended that the vaccination status of patients with AIRD be evaluated annually by the rheumatology team. In a study of rheumatologists in Ireland, 50% of 80 rheumatologists did not ask about their patients' vaccination history.[13] Also, 57% accepted vaccination responsibility as the domain of PCPs.

In France, when 49 general practitioners and 23 specialists were asked about the pneumococcal and influenza vaccine approaches in patients receiving biological therapy for joint, bowel, and skin inflammatory diseases, they found that most physicians prescribed flu vaccine to patients under biological therapy, whereas 83% of specialists and 59% of general practitioners prescribed the pneumococcal vaccine ($p=0.049$).[17] The majority of 61% of physicians who reported that they had insufficient knowledge about vaccination in those receiving immunosuppressant treatment were general practitioners. Many general practitioners felt that vaccine prescriptions should only be expertly supervised. In their study with RA and SpA patients, Hua et al.[18] found that 53% of RA patients and 54.5% of SpA patients had the pneumococcal vaccine. For patients with pneumococcal vaccine, the proportion of patients vaccinated at the recommendation of the PCPs was 21.8% for RA patients and 13.6% for SpA patients.

In the present study, while the rate of physicians who questioned the vaccination history was 74.8%, 80.8% of the rheumatologists did. The questioning of the vaccination

history was also related to the knowledge of the physicians. While more than half of the participants thought that vaccination plans should be made by rheumatologists, only 9.7% of them reported that the plans should be made by family physicians. Considering that the physicians' major reservations about vaccination are the lack of knowledge about vaccination and their concerns about the drugs used, eliminating the reservations of physicians on these issues may allow more patients to be recommended vaccination. In the Workshop Report of the National Vaccination Workshop, it was stipulated that adult vaccination was the responsibility of all physicians working in internal and surgical branches, not on a branch basis.[14]

In our country, influenza, PCV13, PPSV23, HBV, VZV, tetanus vaccines within the scope of adult vaccination programs are given free of charge to those with chronic diseases. HAV, HZ, MMR, Hemophilus influenza vaccines are given free of charge according to risk status. In the literature, there are studies indicating that the immune response is decreased in most immunosuppressive drugs but that protective antibody levels are achieved in most of the patients.[17-21] On the other hand, the infection itself and the discontinuation of immunosuppressive therapy during the infection periods may also lead to exacerbation of the autoimmune disease.[11]

A systematic review showed that pneumococcus and influenza were two vaccines that are strongly recommended for immunocompromised patients.[22] Chen et al.,[23] in their study to determine the clinical effects of influenza vaccine on RA patients, reducing the risk of hospitalization due to septicemia, bacteremia, or viremia (hazard ratio [HR]=0.65, 95% confidence interval [CI]: 0.45-0.94) and mortality risk (HR) of being vaccinated against influenza vaccine=0.62, 95% CI: 0.39-0.97). In our results, the majority of our physicians recommended influenza and pneumococcal vaccines. Chickenpox, MMR, and HZ vaccines are contraindicated in patients receiving immunosuppressive/immunomodulatory therapy. However, since the risk of shingles in these patients is higher than in the normal population, it has been specified that it can be applied to patients receiving low-dose immunosuppressive therapy after taking expert opinion.[24]

It is recommended that vaccination history in all adults with AIRD is thoroughly questioned at the first visit. Thus, all necessary vaccinations, including live vaccines, can be administered before starting immunosuppressive therapy. Considering that questioning the vaccination history of patients and recommending vaccination is related to information, developing a system that delivers current recommendations to more physicians and gives warnings for risk groups, and including all health institutions in this system may contribute to the implementation of all recommended vaccinations on time.

With the approval of the use of COVID-19 vaccines, the recommendations of national and international rheumatological societies were published in a short time and shared on various platforms. Based on the risks of COVID-19, the ACR guidelines for the use of COVID-19 vaccines in adults with AIRD suggested that this patient group be prioritized for vaccination over the non-priority general population of similar age and sex. It noted that there was no evidence to support a concern regarding the use or timing of immunomodulatory therapies with respect to the vaccine and that there were no known additional contraindications for COVID-19 vaccination beyond known allergies to vaccine components. Additionally, it offered timing recommendations for optimal vaccine response in those receiving immunomodulatory therapy.[25,26]

Although the importance of the vaccine to protect against this disease, for which there is no proven treatment yet, there was also a group of individuals who did not want to be vaccinated by developing prejudice against the vaccine due to information pollution. To overcome this situation, physicians' having knowledge about COVID-19 vaccination in patients with AIRD and, thus, informing their patients and relieving their concerns may contribute to the vaccination of more people. In the current study, the majority of our participants reported that they gave information about the COVID-19 vaccine to their AIRD patients and recommended the COVID-19 vaccine, including those receiving immunosuppressive therapy. However, strikingly, 50% of the physicians did not consider it appropriate to administer the COVID-19 vaccine in a primary healthcare institution in patients

with AIRD receiving immunosuppressive therapy. Considering the importance of rapid vaccination and vaccinating a large number of people for vaccines to be effective on the pandemic, referring adults with AIRD who apply to primary healthcare institutions to be vaccinated would be a waste of time and workforce, and would also increase the hesitancy of patients about vaccination.

Nonetheless, this study has certain limitations that should be acknowledged. First, the bias of non-response should be taken into account, as the research is voluntary. Our sample may not represent the PCP, general internist and rheumatologist population in our country. Another limitation is that we used questionnaires prepared by ourselves. In our study, we questioned the vaccines of common infections in patients with AIRD according to the prevalence in our country, but we did not question other important vaccines such as meningococcal. To comprehend the practical reflection of our results, it would be appropriate to compare the vaccination rates of the patients. Despite all our limitations, it is one of the first studies in our country and one of the few studies in the literature, to the best of our knowledge, that measures the vaccination recommendations and approaches of physicians, including COVID-19 vaccination, in patients with AIRD. Suggestions on COVID-19 vaccination and other vaccinations would be updated over time. Our results can be used as a basis for further studies to evaluate changes in physicians. However, this study showed that the fact that physicians did not recommend vaccination and did not question the vaccination history was related to the lack of knowledge about vaccination. It has been shown that concerns about the drugs used also contribute to this, that knowledge is less in older participants, and that the proportion of physicians who do not recommend administering other vaccines, including the COVID-19 vaccine, in primary care is high.

We believe that this study adds important data to the literature that PCPs, which are the primary task of community immunization, and general internal medicine physicians who can track adults with AIRD, should have their reservations about vaccination eliminated and their information updated.

In conclusion, considering that one of the major obstacles to adult vaccination is the physician's refusal to recommend it, our study highlights the missing points in vaccination knowledge and approach in physicians. Providing advice on adult vaccination and immunization of risky groups for more physicians and periodic training to prevent loss of knowledge after graduation may contribute to increasing the vaccination rate of adults with AIRD.

Ethics Committee Approval: The study protocol was approved by the Çukurova University Faculty of Medicine Ethics Committee (Date: March 05, 2021, No: 109). The study was conducted in accordance with the principles of the Declaration of Helsinki.

Patient Consent for Publication: This study required no informed consent.

Data Sharing Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

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