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Comparative Evaluation of Knowledge, Attitudes and Hesitancies Related to Four Different Types of Vaccines: Smallpox, Influenza, Tetanus Versus Covid-19 Vaccines

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ABSTRACT

Purpose: The Covid-19 pandemic has brought the anti-vaccination problem back to the agenda. In this study, knowledge, attitudes and hesitancies related to four different types of well-publicized vaccines (smallpox, influenza, tetanus vs Covid-19) were comparatively evaluated to provide a unique understanding of vaccine hesitancy in general and distinctively for Covid-19.

Methods: A cross-sectional study was conducted face-to-face among the university students. A 26-item questionnaire was designed to collect the data. The survey covered demographics and vaccine-related sections for each of four vaccines. Vaccine knowledge, attitudes/perceptions related to vaccine hesitancy were questioned in 4 sub-sections to receive participants answers for each vaccine. Obtained data were analyzed by biostatistical methods.

Results: Covid-19 PCR positivity rate was 38.2% among the participants during study. General knowledge level score mean was 31.63/48 (65.89%) among the participants. General correct attitude score towards all vaccines mean was 70.78/104 (68.06%) among the participants. Participants have responded significantly different answers to Covid-19 vaccines in 14 of 22 questions/statements. New types of vaccines, logistics of these vaccines and severe side effects of vaccines were the parameters perceived significantly different for Covid-19 vaccines among others.

Conclusion: Our comparative analyzes have revealed that there are different points particularly for Covid-19 among others in the vaccine opposition seen in the Covid-19 pandemic.

Keywords: COVID-19, Vaccines, Vaccine hesitancy.

ÖZET

Amaç: Covid-19 salgını, aşı karşıtlığını yeniden gündeme getirmiştir. Bu çalışmada, genel anlamda ve özel olarak Covid-19 için aşı tereddütünün anlaşılmasını sağlamak amacıyla farklı bir bakış açısıyla iyi bilinen dört farklı aşı türüyle (çiçek hastalığı, grip, tetanoz ve Covid-19) ilgili bilgi, tutum ve tereddütler karşılaştırmalı olarak değerlendirildi.

Yöntemler: Üniversite öğrencileri arasında yüz yüze, kesitsel bir çalışma yapılmıştır. Verileri toplamak için 26 soruluk bir anket tasarlanmıştır. Anket, dört aşının her biri için demografi ve aşıyla ilgili bölümleri kapsamaktadır. Aşı bilgisi, aşı tereddüdüne ilişkin tutumlar/algılar, katılımcıların her bir aşı için yanıtlarını almak üzere 4 alt bölümde sorgulandı. Elde edilen veriler biyoistatistik yöntemlerle analiz edildi.

Bulgular: Çalışma süresince katılımcılar arasında Covid-19 PCR pozitiflik oranı %38,2 idi. Katılımcıların genel bilgi düzeyi puan ortalaması 31,63/48 (%65,89) idi. Katılımcıların tüm aşılara yönelik genel doğru tutum puanı ortalaması 70,78/104 (%68,06) idi. Katılımcılar, 22 sorudan/ifadeden 14'ünde Covid-19 aşılarına önemli ölçüde farklı yanıtlar verdiler. Yeni aşı türleri, bu aşıların lojistiği ve aşıların ciddi yan etkileri, diğerleri arasında Covid-19 aşıları için önemli ölçüde farklı algılanan parametrelerdi.

Sonuç: Karşılaştırmalı analizlerimiz, Covid-19 pandemisinde görülen aşı karşıtlığında Covid-19`a karşı diğerlerinden farklı noktaların olduğunu ortaya koydu.

Anahtar Kelimeler: COVID-19, Aşı, Aşı karşıtlığı.

COVID-19 pandemic caused by a new type of coronavirus namely severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is continuing which there is still no specific therapy for the infection making it easily transmittable by individuals with or without symptoms(1). This made the management of pandemic challenging. With the uneasiness caused by the pandemic, all people closely followed the daily cases, the control of the situation and the vaccination studies which creates an expectancy for the ending of pandemic.

Vaccination aims to prevent diseases with high morbidity and mortality, especially infectious diseases, and reduce the rate of harm in general(2). But if it is required to provide full immunization to the community, the first point that needs to be strengthen is the vaccine trust. During the fight against COVID-19, some pharmaceutical companies have announced that vaccine studies were completed earlier than expectations and some vaccines have had severe side effects in some populations. Speculative explanations have been developed from many different channels about the safety of these vaccines, and with these explanations, prejudice and confusion were created in the public against vaccines(3). After this type of announcements and news, the World Health Organization (WHO) has warned that we are at war with another type of epidemic called 'infodemics', which spread fake news, false information, and false scientific claims to the public all around the world(4).

Vaccine hesitancy is evaluated under three main items as: fear of vaccines, not taking the disease seriously and not needing a vaccine, and difficulty with accessing the vaccine. Based on these three items, people should be informed about the disease and the vaccine, and their hesitations should be thoroughly examined and evaluated to ensure high-rate immunization(5). Despite vaccine hesitancy there were very successful applications of vaccination campaigns which led to full eradication of such diseases such as smallpox. On the other hand, there are historical diseases which vaccination could not succeeded as expected due to various reasons. Some of the unsuccessfulness of these vaccines may be related to improper structure of vaccines and some troubles associated with campaigns. Notably, knowledge of people regarding the fact that different vaccines may have been developed for different purposes (i.e., vaccines aiming for complete immunization vs. prevention from severe disease) is questionable. So, each vaccines success is mainly related to many technical factors including the ones related to disease but also to vaccines unique nature.

In this study, it was aimed to comparatively evaluate young populations` knowledge, attitudes and hesitancies related to 4 different types of well-publicized vaccines (smallpox, influenza, tetanus vs Covid-19) to provide a complete understanding of vaccine hesitancy in general and distinctively for Covid-19 pandemic.

Material and Methods

Ethical Statement

Before reaching to participants ethical approval was received from the ethical board of Eastern Mediterranean University, Board of Scientific Research and Publication Ethics with decision number; ETK00-2022-0089. Participation in the study was voluntary and each participant signed an informed consent form before participating. Only students who are over the age of 18, studies at EMU, who voluntarily agreed to participate in the study and signed the informed consent form have participated in the study.

Study Design, Data Collection Methods and Tools

This study was designed as a cross-sectional study. Convenience sampling method is used. The sample pool was comprised of volunteer English speaking university students above age 18. Sample size was calculated with the OpenEpi program based on the number of foreign students at the university. Aiming for a 95% confidence interval, the sample was aimed to consist of 377 students.

Study was conducted face-to-face in a university in Northern Cyprus from April 2022 to May 2022. A 26-item questionnaire was designed to collect the data. The topic guide for this questionnaire was based on a review of the literature and general issues faced during the pandemic. Content validity was assessed by an expert panel consisting of two microbiologists and one specialized pediatrician. Also, a test-retest pilot study was conducted using a convenience sample of 20 students from the university. Questionnaires were delivered together with a cover letter, outlining the study objectives, and highlighting the importance of participation. The survey covered demographic characteristics and included vaccine-related sections. Vaccine related sections were about general

knowledge about vaccines and general attitudes about vaccines and each item in these sections were divided into 4 sub-sections to receive participants answers for tetanus, influenza, smallpox and covid-19 vaccines. In the demographic section age, gender, education level, previous PCR results and vaccination status were questioned. For scoring of knowledge and attitude, expected answers were graded as 2 points, unexpected answers as 0 point, and undecided ones as 1 point. These scores were then summed for both knowledge and attitudes questions and scores were obtained.

Statistical Analysis

IBM SPSS 26.0 (SPSS Inc., Chicago, IL, USA) package was used to analyze the data. Descriptive analysis was calculated, and the mean of numeric variables and frequency analysis of categorical variables were measured. Normality test was calculated to determine whether sample data has been drawn from a normally distributed population. Chi-square Tests and paired sample T tests were used to calculate associations and/or differences. The confidence level set to 95%. p <0.05 considered to be statistically significant. To validate the questionnaire, Cronbach's Alpha test was performed (Scores= 0.823 for knowledge section and 0.871 for attitudes section).

Results

In the current study, it was aimed to reach 377 people and 325 people completed the questionnaire corresponding to a response rate of 86.2%. Mean age of the participants was 21.34±2.03. There were 162 (%50) male, 150 (%46) female and 12(%4) non-binary participants and most of them were undergraduate students (%88). Covid-19 PCR positivity rate was 38.2% among the participants during study. Overall responses of participants related to demographic characteristics, vaccinations status, general knowledge and attitudes toward vaccines are shown in Table 1.

General knowledge level score mean was 31.63/48 (65.89%) among the participants. There were no significant differences among different vaccines in terms of knowledge. Females are observed to have higher knowledge and hesitancy score means than males and non-binary students for all vaccines. Knowledge scores varied among education levels. However, PhD students have the lowest knowledge score for Covid-19 vaccine, yet they are still the ones that have the most positive attitude towards Covid-19 (p<0.05).

General correct attitude score towards all vaccines mean was 70.78/104 (68.06%) among the participants. Knowledge scores, attitude scores and vaccination status of participants were moderately associated (p<0.05).

When the questions related to vaccine hesitancy were evaluated for Covid-19, percentage of participants who placed their selves in the hesitant group was highest in questions related to side effects of the vaccines (62.8%) followed by types of vaccines (47.1%), ways of gaining immunity (herd immunity vs vaccination) (42.7%) and logistics of vaccines (30.5%).

For Covid-19 vaccines, it was found that people trust the information given by doctors related to vaccination (73.6%) rather than government officials (38.1%) or usual media (17.9%) and social media (17.9%).

Responses given by participants for Covid-19 vaccines were compared with means of responses given for other types of vaccines (Tetanus, Smallpox, Influenza) by using paired sample T tests. According to this comparison participants have responded significantly different answers to Covid-19 vaccines in 14 of 22 questions/statements. In the section related to knowledge of participants (Table 2; B-H), only statement which was not significantly different for Covid-19 was "Healthy people don't need vaccination". In the section where sources of information are questioned (Table 2; I-L), it was observed that participants responses were significantly different when they are asked if they trust the information given by their doctors and government officials. Participants attitudes did not significantly differ for statements related to trust to social media and usual media. In the section covering questions/statements related to vaccine hesitancy, it was observed that participants responded significantly different to following statements; (i) i don't trust the handling and logistics of the vaccines offered in my country (regarding cold chain procedures) which hesitates me to get vaccinated, (ii) i recommend my relatives to get vaccinated for, (iii) vaccines have severe side effects that make me hesitate getting vaccinated and (iv) severity of the side effects I experienced after my previous dose/doses makes me hesitate to get my future doses. Details of these comparisons are given in Table 2.

Table 1: Descriptive statistics including demographical information of participants.

Age	**Mean**	**Median**	**Range**			
	21.34	21.00	11			
Gender	**Male (N, %)**	**Female (N, %)**	**Non-binary (N, %)**			
	162, 49.84	150, 46.15	13, 4			
Education level	**Preparatory (N, %)**	**Undergraduate (N, %)**	**Masters (N, %)**	**PhD (N, %)**		
	29, 8.92	285, 87.69	8, 2.46	3, 0.92		
Tested COVID-19 positive (PCR) previously	**Yes (N, %)**	**No (N, %)**				
	125, 38.46	200, 61.53				
Vaccination status		**Fully vaccinated (N, %)**	**Not vaccinated (N, %)**	**Unaware (N, %)**	**Missing dose/ doses (N, %)**	
	T*	234, 72	22, 6.76	53, 16.30	16, 4.92	
	I*	160, 49.23	51, 15.69	86, 26.46	28, 8.61	
	S*	226, 69.53	19, 5.84	74, 22.76	6, 1.84	
	C*	300, 92.3	7, 2.15	1, 0.3	17, 5.23	
Recently developed vaccines carry more risks than older vaccines.		**Strongly disagree (N, %)**	**Disagree (N, %)**	**Undecided (N, %)**	**Agree (N, %)**	**Strongly Agree (N, %)**
	T	57, 17.54	83, 25.54	108, 33.23	38, 11.69	39, 12
	I	52, 16	84, 25.85	112, 34.46	40, 12.31	37, 11.38
	S	51, 15.69	84, 25.85	118, 36.31	37, 11.38	35, 10.77
	C	50, 15.38	67, 20.62	88, 27.08	62, 19.08	58, 17.85
Healthy people don't need vaccination.	**T**	190, 58.46	78, 24	26, 8	23, 7.08	8, 2.46
	I	167, 51.38	72, 22.15	53, 16.31	24, 7.38	9, 2.77
	S	179, 55.08	79, 24.31	41, 12.62	18, 5.54	8, 2.46
	C	198, 60.92	73, 22.46	22, 6.77	19, 5.85	13, 4
Harmful effects (mid-term/long-term) of vaccines outweigh the benefits.	**T**	96, 29.54	89, 27.38	90, 27.69	32, 9.85	18, 5.54
	I	85, 26.15	90, 27.69	106, 32.62	31, 9.54	13, 4
	S	91, 28	86, 26.46	104, 32	29, 8.92	15, 4.62
	C	80, 24.62	81, 24.92	98, 30.15	45, 13.85	21, 6.46
A good vaccine is one that has been studied/researched for at least 5-10 years.	**T**	34, 10.46	20, 6.15	63, 19.38	117, 36	91, 28
	I	32, 9.85	26, 8	68, 20.92	113, 34.77	86, 26.46
	S	32, 9.85	22, 6.77	71, 21.85	111, 34.15	89, 27.38
	C	38, 11.69	33, 10.15	63, 19.38	105, 32.31	86, 26.46
People who had the infection do not need to get vaccinated.	**T**	108, 33.23	111, 34.15	71, 21.85	25, 7.69	10, 3.08
	I	91, 28	99, 30.46	76, 23.38	47, 14.46	12, 3.69
	S	86, 26.46	100, 30.77	77, 23.69	46, 14.15	16, 4.92
	C	99, 30.46	113, 34.77	54, 16.62	44, 13.54	15, 4.62
I have a good level of knowledge about vaccines.	**T**	30, 9.23	74, 22.77	94, 28.92	90, 27.69	37, 11.38
	I	31, 9.54	68, 20.92	96, 29.54	100, 30.77	30, 9.23
	S	31, 9.54	70, 21.54	99, 30.46	92, 28.31	33, 10.15
	C	24, 7.38	47, 14.46	67, 20.62	125, 38.46	62, 19.08
I trust the information and suggestions given by my doctor related to vaccination.	**T**	11, 3.38	17, 5.23	34, 10.46	153, 47.08	110, 33.85
	I	11, 3.38	20, 6.15	43, 13.23	151, 46.46	100, 30.77
	S	11, 3.38	20, 6.15	39, 12	143, 44	112, 34.46
	C	21, 6.46	27, 8.31	38, 11.69	139, 42.77	100, 30.77
I trust the information and suggestions available on social media (Facebook, Instagram etc.).	**T**	128, 39.38	119, 36.62	57, 17.54	18, 5.54	3, 0.92
	I	127, 39.08	116, 35.69	62, 19.08	18, 5.54	2, 0.62
	S	124, 38.15	118, 36.31	63, 19.38	19, 5.85	1, 0.31
	C	135, 41.54	111, 34.15	58, 17.85	18, 5.54	3, 0.92

I trust the information and suggestions available on usual media (TV, newspaper etc.).	**T**	74, 22.77	93, 28.62	97, 29.85	53, 16.31	8, 2.46
	I	72, 22.15	95, 29.23	95, 29.23	57, 17.54	6, 1.85
	S	68, 20.92	94, 28.92	99, 30.46	58, 17.85	6, 1.85
	C	79, 24.31	93, 28.62	95, 29.23	51, 15.69	7, 2.15
I don't trust the handling and logistics of the vaccines offered in my country (regarding cold chain procedures) which hesitates me to get vaccinated.	**T**	40, 12.31	76, 23.38	122, 37.54	55, 16.92	32, 9.85
	I	39, 12	72, 22.15	128, 39.38	56, 17.23	30, 9.23
	S	36, 11.08	76, 23.38	130, 40	53, 16.31	30, 9.23
	C	34, 10.46	70, 21.54	122, 37.54	60, 18.46	39, 12
I feel positive about getting vaccinated for infectious diseases.	**T**	14, 4.31	14, 4.31	45, 13.85	139, 42.77	113, 34.77
	I	11, 3.38	19, 5.85	65, 20	130, 40	100, 30.77
	S	9, 2.77	15, 4.62	55, 16.92	132, 40.62	114, 35.08
	C	17, 5.23	21, 6.46	52, 16	125, 38.46	110, 33.85
I would prefer to get treatment if available rather than getting vaccinated.	**T**	75, 23.08	84, 25.85	84, 25.85	45, 13.85	37, 11.38
	I	62, 19.08	88, 27.08	91, 28	50, 15.38	34, 10.46
	S	64, 19.69	89, 27.38	90, 27.69	43, 13.23	39, 12
	C	71, 21.85	75, 23.08	86, 26.46	48, 14.77	45, 13.85
I trust the information and suggestions about vaccination given by government officials.	**T**	41, 12.62	49, 15.08	80, 24.62	109, 33.54	46, 14.15
	I	41, 12.62	50, 15.38	91, 28	104, 32	39, 12
	S	40, 12.31	45, 13.85	96, 29.54	102, 31.38	42, 12.92
	C	56, 17.23	59, 18.15	86, 26.46	83, 25.54	41, 12.62
I think that herd immunity strategy is more effective than vaccination.	**T**	59, 18.15	79, 24.31	116, 35.69	42, 12.92	29, 8.92
	I	40, 12.31	72, 22.15	127, 39.08	51, 15.69	35, 10.77
	S	47, 14.46	74, 22.77	129, 39.69	47, 14.46	28, 8.62
	C	53, 16.31	78, 24	106, 32.62	57, 17.54	31, 9.54
I recommend my relatives to get vaccinated for:	**T**	16, 4.92	9, 2.77	48, 14.77	110, 33.85	142, 43.69
	I	20, 6.15	23, 7.08	64, 19.69	97, 29.85	121, 37.23
	S	16, 4.92	10, 3.08	59, 18.15	106, 32.62	134, 41.23
	C	17, 5.23	11, 3.38	41, 12.62	101, 31.08	155, 47.69
Vaccines have severe side effects that make me hesitate to get vaccinated.	**T**	69, 21.23	93, 28.62	85, 26.15	65, 20	13, 4
	I	59, 18.15	93, 28.62	94, 28.92	67, 20.62	12, 3.69
	S	62, 19.08	100, 30.77	87, 26.77	64, 19.69	12, 3.69
	C	53, 16.31	92, 28.31	72, 22.15	90, 27.69	18, 5.54
Severity of the side effects I experienced after my previous dose/ doses makes me hesitate to get my future doses.	**T**	88, 27.08	95, 29.23	77, 23.69	48, 14.77	17, 5.23
	I	78, 24	93, 28.62	92, 28.31	47, 14.46	15, 4.62
	S	78, 24	93, 28.62	89, 27.38	47, 14.46	18, 5.54
	C	80, 24.62	82, 25.23	61, 18.77	74, 22.77	28, 8.62
I prefer the vaccine having the least side effects.	**T**	18, 5.54	29, 8.92	73, 22.46	102, 31.38	103, 31.69
	I	19, 5.85	29, 8.92	76, 23.38	105, 32.31	96, 29.54
	S	18, 5.54	28, 8.62	75, 23.08	105, 32.31	99, 30.46
	C	18, 5.54	36, 11.08	63, 19.38	106, 32.62	102, 31.38
My thoughts on vaccination may change if I get more information.	**T**	11, 3.38	26, 8	61, 18.77	132, 40.62	95, 29.23
	I	9, 2.77	24, 7.38	67, 20.62	135, 41.54	90, 27.69
	S	10, 3.08	23, 7.08	70, 21.54	130, 40	92, 28.31
	C	9, 2.77	25, 7.69	59, 18.15	123, 37.85	109, 33.54
Type of vaccine (mRNA, conventional etc.) is an important determinant for me to decide for vaccination.	**T**	26, 8	36, 11.08	112, 34.46	104, 32	47, 14.46
	I	25, 7.69	40, 12.31	111, 34.15	106, 32.62	43, 13.23
	S	25, 7.69	39, 12	108, 33.23	109, 33.54	44, 13.54
	C	25, 7.69	35, 10.77	92, 28.31	110, 33.85	63, 19.38

**T:Tetanus vaccines, I: Influenza vaccine, S: Smallpox vaccines, C: Covid-19 vaccines*

Table 2: Comparisons of answers given to questions/statements for Covid-19 vaccines versus other vaccines.	
Parameters of comparison between Covid-19 vaccines vs other vaccines	**p values***
A) Vaccination status	**.000**
B) Getting vaccinated is important for the health of people around me	**.003**
C) Recently developed vaccines carry more risks than older vaccines.	**.000**
D) Healthy people don't need vaccination	.173
E) Harmful effects (mid-term/long-term) of vaccines outweigh the benefits.	**.000**
F) A good vaccine is one that has been studied/researched for at least 5-10 years.	**.002**
G) People who had the infection do not need to get vaccinated.	**.000**
H) I have a good level of knowledge about vaccines.	**.000**
I) I trust the information and suggestions given by my doctor related to vaccination.	**.000**
J) I trust the information and suggestions available on social media (Facebook, Instagram etc.).	.879
K) I trust the information and suggestions available on usual media (TV, newspaper etc.).	.109
L) I trust the information and suggestions about vaccination given by government officials.	**.000**
M) I don't trust the handling and logistics of the vaccines offered in my country (regarding cold chain procedures) which hesitates me to get vaccinated.	**.016**
N) I feel positive about getting vaccinated for infectious diseases.	.055
O) I would prefer to get treatment if available rather than getting vaccinated.	.059
P) I think that herd immunity strategy is more effective than vaccination.	.876
Q) I recommend my relatives to get vaccinated for:	**.007**
R) Vaccines have severe side effects that make me hesitate getting vaccinated.	**.000**
S) Severity of the side effects I experienced after my previous dose/doses makes me hesitate to get my future doses.	**.000**
T) I prefer the vaccine having the least side effects.	.778
U) My thoughts on vaccination may change if I get more information.	.228
V) Type of vaccine (mRNA, conventional etc.) is an important determinant for me to decide for vaccination.	**.000**
** Paired sample T test was used to analyze the differences across various parameters. Numerical means of responses to each questions/statements were used for Tetanus, Influenza, Smallpox vaccines to be compared against Covid-19 vaccines. A p value below 0.05 was considered as a significant difference between the parameters.*	

Table 3	
Statements regarding vaccine hesitancy in the survey	**Percent of Covid-19 vaccine hesitant participants***
I don't trust the handling and logistics of the vaccines offered in my country (regarding cold chain procedures) which hesitates me to get vaccinated.	30.5
I feel positive about getting vaccinated for infectious diseases.	7.4
I would prefer to get treatment if available rather than getting vaccinated.	25.2
I trust the information and suggestions about vaccination given by government officials.	26.2
I think that herd immunity strategy is more effective than vaccination.	42.7
I recommend my relatives to get vaccinated for:	8
Vaccines have severe side effects that make me hesitate to get vaccinated.	23.4
Severity of the side effects I experienced after my previous dose/doses makes me hesitate to get my future doses.	20
I prefer the vaccine having the least side effects.	62.8
My thoughts on vaccination may change if I get more information.	10.2
Type of vaccine (mRNA, conventional etc.) is an important determinant for me to decide for vaccination.	47.1

Discussion

One of the most effective public-health measures, vaccines, ensure the protection of many people from infectious diseases that can cause morbidity and mortality(6). Despite overwhelming evidence of the effectiveness and safety of vaccines, there are people who are reluctant to get vaccinated or who refuse vaccines altogether(7). Vaccine hesitancy is felt significantly during the Covid-19 pandemic. However, it is known that vaccine hesitancy exists since the introduction of first vaccines. In this study, we aimed to evaluate Covid-19 vaccine hesitancy and knowledge of younger population in a perspective that we can compare with other well-known vaccines to see if there are any differences/similarities.

In our study, general knowledge level score mean was 31.63/48 (65.89%) among the participants and there were no significant differences among different vaccines in terms of knowledge. In a study, knowledge scores were lower in contrast to our study possibly because of differences in study design and study populations(8). In studies where the students were the study population usually higher knowledge score were reported(9). In our study, four well known vaccines were included such as Influenza, Smallpox, Tetanus and Covid-19. When it comes to knowledge, it can be said that people have a good knowledge of all these vaccines as they are well-recognized throughout the public communities because of various reasons. For instance, influenza vaccines are discussed publicly each season, tetanus is well known most probably related to personal experiences, smallpox is a renowned vaccine because of its success in the eradication of disease. Finally, Covid-19 vaccine is well publicized due to pandemic setting. So, there were no significant difference in terms of knowledge which may be explained because of these similarities.

In our study, participants seem to trust the information given by their doctors mostly rather than government officials or usual media and social media regarding all types of vaccines being asked in our survey. This result may mean that family physicians play a key role in driving vaccine acceptance because of the trust of people as suggested previously. Therefore, involving family physicians more in the establishment of vaccine recommendations might be a driving force to increase vaccine acceptance(10).

In terms of Covid-19 vaccine hesitancy, side effects of the vaccines were the mostly hesitated parameter in our setting. This was followed by other parameters such as types of vaccines (mRNA, conventional, etc.), believing to herd immunity strategy and handling logistics etc.. All these parameters alongside with others are widely discussed previously(11–13). Alongside with others, our results indicate that understanding the barriers and facilitators ahead of vaccine acceptance will be a key step to attain maximum vaccine coverage. Notably, in our setting such parameters like type of vaccine, handling logistics are parameters which can be thought to be more unique for Covid-19 vaccines. This might be aroused due to popular media coverage of such issues during the pandemic in the modern times.

In our study, one of the aims was to analyze the differences of responses given by participants to questions regarding Covid-19 vaccines in contrast to other three types of vaccines questioned (tetanus, influenza, smallpox). For this purpose, reported vaccination status was investigated and found to be significantly higher for Covid-19. This was mainly due to the unique pandemic setting and also people may report their vaccination status wrongly due to the fact that they may forget/not aware their vaccination status. On the other hand, in knowledge related questions participants responses were all significantly higher in the correct side for Covid-19 vaccines. So, in our setting participants seem to be more knowledgeable for Covid-19 vaccines in contrast to other questioned vaccines. Given the fact that, the general knowledge scores were also high in our setting, it may be concluded that vaccine hesitancy is probably not all about the knowledge of people. When the information sources are questioned, participants trusting their doctors and government officials were significantly higher for Covid-19 when compared with other three vaccines covered in the study. It was previously shown that, informal COVID-19 information sources, such as social media, Internet, and friends/family, induces vaccine hesitancy and using formal sources of information, such as government guidance and medical providers is reported to be better for increasing vaccine acceptance(14).

Comparing responses given to different vaccines has also provided insights to improve the understanding of reasons for vaccine hesitancy in the Covid-19 pandemic. It seems like 4 parameters related to vaccines affected people's views to be significantly different from other vaccines in the Covid-19 pandemic. For Covid-19 vaccines, handling and logistics of the vaccines and side effects of vaccines were the two significantly different parameters related to hesitancy. Proper storage of mRNA vaccines used in the Covid-19 pandemic was questioned publicly by media as it was a new vaccine safety guideline for the community which was not aware of previously(15). Actually, many types of vaccines including conventional ones may require special storage conditions. To the best of our knowledge, handling and logistics was not

questioned before as a factor for vaccine hesitancy and our results may suggest that handling and logistics may be considered as another barrier against vaccine acceptance. The next significantly differed response for Covid-19 vaccines were the ones related to side effects of vaccines which is studied extensively. Current literature suggests the side effects experienced after the vaccines recommended during the pandemic have affected the vaccine acceptance dramatically(16, 17). Our results agree with this outcome and underlies the necessity for such studies focusing on improvement of vaccine side effects.

There were a few limitations to note for this study. The cross-sectional design restricts the ability to draw causal conclusions. The sample, may not be representative of the broader population, potentially limiting the generalizability of the findings. Additionally, self-reported data may be subject to biases. The questionnaire's design, while validated by an expert panel and a pilot study, might still have inherent limitations. The questionnaire may not capture the full complexity of vaccine hesitancy, and the differentiation between vaccines could be influenced by participants' varying exposure to information about each vaccine type. The study's focus on only four types of vaccines excludes other relevant vaccines, which might offer additional insights into vaccine hesitancy. Finally, the timing of the study might have influenced the findings, as public opinions and knowledge about COVID-19 and its vaccines were rapidly evolving during this period.

To the best of our knowledge, this study is a first to evaluate different parameters about vaccination knowledge and hesitations etc. by comparing different types of vaccines. Our results indicate that, there are significantly different points in the vaccine opposition to Covid-19 vaccines in contrast to other studied vaccines. In general, modern world living conditions, factors related to the uncertainties of the Covid-19 disease/vaccines, misinformation may be thought as the reason for this situation. Specifically, unusual new types of vaccines, logistics of these vaccines and severe side effects of these vaccines were the parameters perceived significantly different for Covid-19 vaccines among others in this study. Therefore, understanding vaccine opposition and developing specific strategies to increase vaccine acceptance remain as important challenges.

Declarations

Conflict of Interest

The authors declare no conflict of interest.

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References

1. Kim YC, Dema B, Reyes-Sandoval A. 2020. COVID-19 vaccines: breaking record times to first-in-human trials. NPJ Vaccines 5:1–3.
2. Locht C. 2020. Vaccines against COVID-19. Anaesth Crit Care Pain Med. Elsevier.
3. Broniatowski DA, Quinn SC, Dredze M, Jamison AM. 2020. Vaccine communication as weaponized identity politics. Am J Public Health 110:617.
4. Organization WH. 2021. Infodemic management: an overview of infodemic management during COVID-19, January 2020–May 2021.
5. BAŞARAN A, Barış ÇİL. 2022. Vaccine Opposal in People Over 60 Years of Age in Mardin/Turkey–A Territory with Low Rate of Vaccination. Journal of Contemporary Medicine 12:81–85.
6. Orenstein WA, Ahmed R. 2017. Simply put: Vaccination saves lives. Proceedings of the National Academy of Sciences 114:4031–4033.
7. Ryan J, Malinga T. 2021. Interventions for vaccine hesitancy. Curr Opin Immunol 71:89–91.
8. Mohamed NA, Solehan HM, Mohd Rani MD, Ithnin M, Che Isahak CI. 2021. Knowledge, acceptance and perception on COVID-19 vaccine among Malaysians: A web-based survey. PLoS One 16:e0256110-.
9. Jiang N, Wei B, Lin H, Wang Y, Chai S, Liu W. 2021. Nursing students' attitudes, knowledge and willingness of to receive the coronavirus disease vaccine: A cross-sectional study. Nurse Educ Pract 55:103148.
10. Shen S (Cindy), Dubey V. 2019. Addressing vaccine hesitancy. Canadian Family Physician 65:175.
11. Joshi A, Kaur M, Kaur R, Grover A, Nash D, El-Mohandes A. 2021. Predictors of COVID-19 Vaccine Acceptance, Intention, and Hesitancy: A Scoping Review. Front Public Health 9.
12. Hudson A, Montelpare WJ. 2021. Predictors of Vaccine Hesitancy: Implications for COVID-19 Public Health Messaging. Int J Environ Res Public Health 18.
13. Yasmin F, Najeeb H, Moeed A, Naeem U, Asghar MS, Chughtai NU, Yousaf Z, Seboka BT, Ullah I, Lin C-Y, Pakpour AH. 2021. COVID-19 Vaccine Hesitancy in the United States: A Systematic Review. Front Public Health 9.
14. Kim J, Kim Y, Li Y. 2022. Source of information on COVID-19 vaccine and vaccine hesitancy among U.S. Medicare beneficiaries. J Am Geriatr Soc 70:677–680.
15. Anand P, Stahel VP. 2021. The safety of Covid-19 mRNA vaccines: a review. Patient Saf Surg 15:20.
16. Donnelly SC. 2022. COVID-19 vaccine hesitancy after side effects to the first vaccine: what are our options? QJM: An International Journal of Medicine. Oxford University Press.
17. Paris C, Bénézit F, Geslin M, Polard E, Baldeyrou M, Turmel V, Tadié É, Garlantezec R, Tattevin P. 2021. COVID-19 vaccine hesitancy among healthcare workers. Infect Dis Now 51:484–487.