Comparison of COVID-19 vaccine hesitancy between healthcare workers and community members: Implications for future vaccination strategies

Sağlık çalışanları ve toplum bireyleri arasında COVID-19 aşı tereddüdünün karşılaştırılması: Gelecekteki aşılama stratejilerine yönelik çıkarımlar

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Abstract

The COVID-19 pandemic has significantly reshaped global perceptions of vaccination. While vaccine hesitancy existed before the pandemic, the rapid development of vaccines and the emergence of new variants have further amplified concerns, making vaccine acceptance a pressing public health issue. This cross-sectional study was conducted between March and April 2021 in the Mamak district of Ankara, Türkiye, with 316 contact tracing personnel and 310 community members. The study aimed to evaluate COVID-19 vaccine hesitancy, attitudes toward rapidly developed vaccines, and differences between healthcare workers and the general public. Based on the data collected from the participants, it was determined that 49.1% of the contact tracing teams and 31.6% of the community members scored above the average score of all participants on the COVID-19 vaccine hesitancy questions. Among healthcare workers, the main reasons for hesitancy were concerns about long-term side effects and the duration of vaccine protection. In contrast, among community members, the primary concerns were insufficient knowledge about vaccines and doubts regarding the short-term effectiveness of the vaccine. Regression analysis showed that vaccination status, pandemic-related fear levels, prior influenza vaccination, and frequency of following pandemic-related news were significant predictors of vaccine attitudes. These findings suggest that vaccine hesitancy is not limited to COVID-19 specific concerns but is also associated with broader issues such as trust in the vaccine development process and confidence in public health authorities. Addressing these complex factors at both the healthcare and community levels is essential for future pandemic preparedness and for building resilient public health systems.

Keywords: COVID-19, vaccine hesitancy, healthcare workers

Özet

COVID-19 pandemisi, aşılamaya yönelik küresel algıları köklü biçimde değiştirmiştir. Pandemi öncesinde de var olan aşı tereddüdü, yeni aşıların hızla geliştirilmesi ve ortaya çıkan varyantlarla birlikte daha da artmış; bu durum, aşı kabulünü önemli bir halk sağlığı sorunu haline getirmiştir. Bu çalışmada, Mart-Nisan 2021 tarihleri arasında Ankara ili Mamak ilçesinde 316 filyasyon ekibi üyesi ve 310 mahalle sakini ile yürütülen kesitsel bir araştırma kapsamında, COVID-19 aşı tereddüdü ve hızla geliştirilen aşılara yönelik tutumlar değerlendirilmiş; sağlık çalışanları ile toplum bireyleri arasındaki farklılıklar incelenmiştir. Katılımcılardan toplanan veriler doğrultusunda, filyasyon ekiplerinin %49,1'inin, mahalle sakinlerinin ise %31,6'sının, çalışmaya katılan tüm bireylerin aşı tereddüdü sorularından aldıkları puanların ortalamasının üzerinde puan aldığı saptanmıştır. Sağlık çalışanlarında tereddüdün temel nedenleri, aşının uzun vadeli yan etkileri ve koruyuculuk süresine yönelik endişeler olarak öne çıkarken; toplum bireylerinde ise aşılar hakkında yeterli bilgiye sahip olmama ve aşının etkinliğinin kısa süreli olacağına dair kaygılar belirleyici olmuştur. Regresyon analizleri, COVID-19 aşılanma durumu, pandemiyle ilişkili korku düzeyi, grip aşısı geçmişi ve pandemi haberlerini takip etme sıklığının, aşıya yönelik tutumların anlamlı belirleyicileri olduğunu ortaya koymuştur. Bulgular, aşı tereddüdünün yalnızca COVID-19'a özgü kaygılarla sınırlı kalmadığını; aynı zamanda aşı geliştirme sürecine duyulan güven ve sağlık otoriteleriyle ilgili genel algılarla yakından ilişkili olduğunu göstermektedir. Gelecekteki pandemilere hazırlık ve halk sağlığı sistemlerinin dayanıklılığının artırılması açısından, bu çok yönlü faktörlerin özellikle sağlık çalışanları ve toplumdaki bireyler düzeyinde ele alınması büyük önem taşımaktadır.

Anahtar Kelimeler: COVID-19, aşı tereddüdü, sağlık çalışanları

Introduction

Vaccination remains a cornerstone of global health security, preventing an estimated 2–3 million deaths annually from vaccine-preventable infectious diseases. However, vaccine hesitancy has persisted as a major global public health issue, both before and during the COVID-19 pandemic (1). In 2019, the World Health Organization (WHO) identified vaccine hesitancy as one of the top ten threats to global health (2). defining it as the delay in acceptance or refusal of vaccination despite the availability of vaccination services. Vaccine hesitancy is complex, varying by time, place, and vaccine type, and is influenced by factors such as complacency, confidence, and convenience (3).

In response to the pandemic, WHO launched the Access to COVID-19 Tools (ACT) Accelerator and the COVID-19 Vaccines Global Access (COVAX) initiative to expedite vaccine development and equitable distribution (4).

Despite these efforts, the rapid development and deployment of COVID-19 vaccines raised public concerns about their safety and efficacy, further intensifying vaccine hesitancy (5). Healthcare workers, as highly trusted sources of vaccine information, play a crucial role in influencing public vaccination decisions. Positive recommendations from healthcare professionals have been shown to significantly reduce vaccine hesitancy within communities (6). Recognizing this, WHO emphasized the prioritization of healthcare workers' vaccination to sustain the COVID-19 response (7).

This study was designed to explore the reasons for hesitancy toward newly developed COVID-19 vaccines, as well as vaccination intentions, attitudes toward immunization, and associated factors among healthcare workers and the public. By understanding the drivers of vaccine hesitancy during pandemic conditions, this research aims to contribute to the development of evidence-based strategies to mitigate future hesitancy in the face of emerging public health threats.

Material and Method

Study Design and Setting

This descriptive cross-sectional study was conducted between March 1 and April 28, 2021, among two distinct populations: community members and healthcare workers involved in contact tracing services within the same region. The study was carried out in Mamak District, one of the central districts of Ankara, Türkiye.

Participants and Sampling

The first population included 356 healthcare workers (physicians, dentists, allied health professionals, and drivers) from the Mamak District Health Directorate. No sampling was applied; the entire population was targeted, and 316 individuals participated (response rate: 89%). To compare vaccine hesitancy between healthcare workers and the general public, a second sample was drawn from the General Zeki Doğan Neighborhood, selected for its representative sociodemographic profile (8). The adult population (≥18 years) of the neighborhood was 24,603 (8).

Using OpenEpi, with an estimated 30% vaccine hesitancy rate in Türkiye (9), a 5% margin of error, a design effect of 1, and a 20% non-response rate, the required sample size was calculated as 383.

In accordance with the Personal Data Protection Law in Türkiye, it is not possible to access personal information such as the names, ages, or genders of individuals residing in households. Therefore, the selection process was planned based on building numbers. The list of 692 buildings located in

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the neighborhood was obtained from the local mukhtar's office (neighborhood headman's office). Since a complete list of buildings within the study population was available, and in order to ensure the generalizability of the selected sample to the target population, the systematic sampling method, a type of probability sampling, was employed. The sampling interval was calculated by dividing the total number of buildings by the required sample size. Building numbers were ordered from highest to lowest, and residences were selected systematically based on this interval. It was aimed to reach at least the minimum required sample size by including one participant from each selected household. The individual to participate in the study within each household was determined using a random draw.

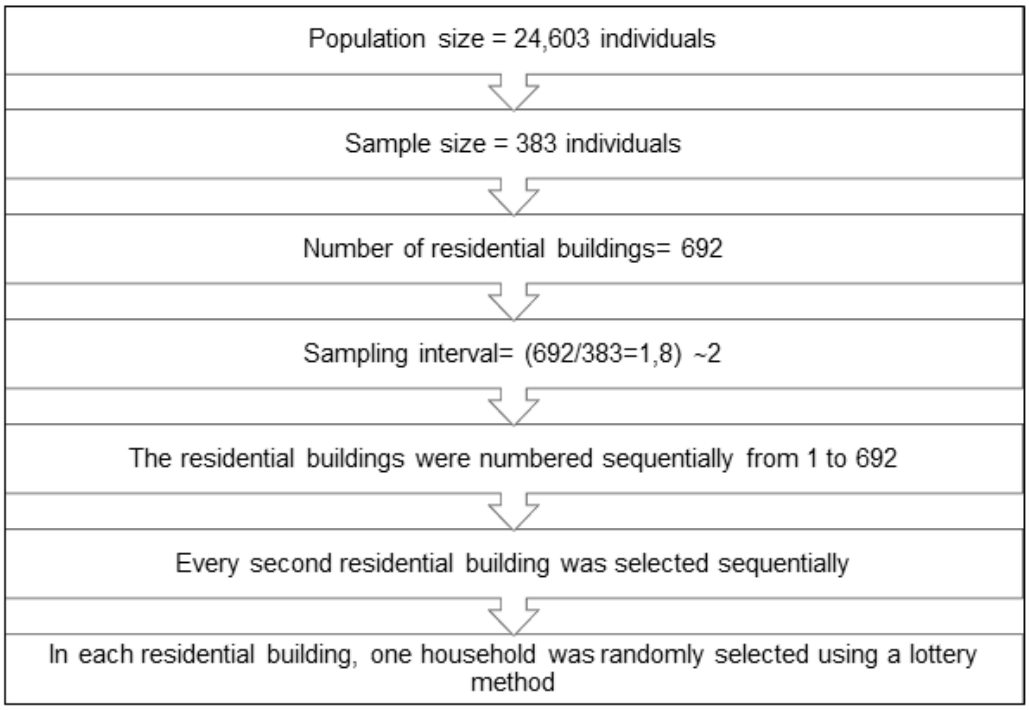

Figure 1: Steps of systematic sampling in the neighborhood

It was planned to reach the minimum required sample size by including one participant from each household. The individual to be interviewed in each household was selected by a simple random method among those who met the inclusion criteria. If eligible individuals were not present at home during the visit, a second visit was made to the same household at a different time. If no eligible individual could be reached during the second visit either, the household was excluded from the study. In cases where no one was found residing at the selected household address, the next household in the sequence was included in the study.

Of the 383 individuals targeted for inclusion in the neighborhood, 310 were successfully reached, resulting in a participation rate of 81%. A total of 24 individuals were not at home during the initial household visit and could not be reached during the second visit either. Additionally, 49 individuals declined to participate in the study.

Inclusion and Exclusion Criteria

Participants were included if they were aged 18 or older, provided informed consent, and were permanent residents. Exclusion criteria included incomplete interviews, inability to answer due to cognitive impairments, and temporary residency at the surveyed address.

Data Collection Tools and Procedures

Data were collected using a structured questionnaire developed by the researchers, consisting of 67 items and two validated scales. The Fear of COVID-19 Scale (7 items, Cronbach's α=0.82) measures COVID-19-related fear, with higher scores indicating greater fear (10).The Attitudes Toward COVID-19 Vaccine Scale (9 items, Cronbach's α=0.80) assesses vaccination

attitudes, where higher scores in both subscales reflect more positive attitudes (11). Following a pilot study with 20 participants, adjustments were made based on feedback.

The questionnaire included items on sociodemographic characteristics, occupational status, chronic diseases, medication use, smoking status, COVID-19 history, sources of COVID-19 information, attitudes toward vaccination, protective behaviors, and influenza vaccination history. COVID-19 vaccine hesitancy was assessed through 25 statements rated on a 5-point Likert scale (1=Strongly disagree to 5=Strongly agree), with total scores ranging from 25 to 125, where higher scores indicated greater hesitancy.

Additionally, the Fear of COVID-19 Scale (7 items) (10) and the Attitudes Toward COVID-19 Vaccine Scale (9 items) (11) were included.

Data collection for both groups was conducted simultaneously through face-to-face interviews to ensure data quality.

Ethical Considerations

Ethical approval was obtained from the Non-Interventional Clinical Research Ethics Committee of Hacettepe University Faculty of Medicine (approval number: 16969557-93; date: January 19, 2021). Participants provided written informed consent and confirmed their approval to participate in the study. An educational infographic about vaccination was distributed at the end of the survey. Permission was obtained from the developers of the standardized scales used.

Statistical Analysis

Data were analyzed using IBM SPSS Statistics version 23.0. A significance level of $p<0.05$ was considered statistically significant.

Descriptive statistics were presented as frequencies, percentages, means, standard deviations, medians and ranges. Categorical variables were compared using Chi-square or Fisher's exact tests. Normality of continuous variables was assessed using the Kolmogorov-Smirnov and Shapiro-Wilk tests. For non-normally distributed variables, the Mann-Whitney U test and Kruskal-Wallis test were used. When Kruskal-Wallis indicated significant differences, pairwise comparisons were performed with Mann-Whitney U tests and Bonferroni correction was applied.

Binary logistic regression analysis was conducted using variables that were significant ($p<0.05$) or nearly significant ($p<0.20$) in univariate analyses, or were found relevant in previous literature. The dependent variable was defined as 'having a COVID-19 vaccine hesitancy score above the mean', by categorizing participants into two groups based on whether their individual scores were above or below the overall average score. Multicollinearity was assessed using variance inflation factor (VIF <10) and tolerance (>0.2). A minimum of 50 observations per categorical variable level was ensured for model stability.

Results

A total of 316 individuals working in contact tracing teams at the Mamak District Health Directorate and 310 residents of the General Zeki Doğan Neighborhood in Mamak District, Ankara, participated in the study between March and April 2021.

Regarding seasonal influenza vaccination, 5.1% (n=16) of the contact tracing teams and 2.3% (n=7) of the community members reported receiving the vaccine every year. Additionally, 12.3% (n=39) of the healthcare workers and 8.7% (n=27) of the community members stated that they had received or intended to receive the flu vaccine for the first time that year (Table 1).

Table 1: Comparison of sociodemographic characteristics and selected health variables of participants

Characteristic	Contact Tracing Teams		Community Members		p
	n	%	n	%	
Sex					
Female	205	64.9	159	51.3	**0.001**[1]
Male	111	35.1	151	48.7	

Age (years) Mean±SD Median Min–Max	35.1±8.8 32.0 21.0-65.0		49.6±17.0 48.5 20.0-87.0		**<0.001**[2]
Marital status					
Single	112	35.4	61	19.7	**<0.001**[1]
Married	204	64.6	249	80.3	
Educational status					
Secondary school or lower	4	1.2	94	20.3	-
High school graduate	26	8.2	139	44.8	
University degree or higher	286	90.6	77	24.9	
Having children					
Yes	178	56.3	244	78.7	**<0.001**[1]
No	138	43.7	66	21.3	
Presence of chronic disease					
Yes	60	19.0	87	28.1	**0.007**[1]
No	256	81.0	223	71.9	
Smoking status					
Never smoked	185	58.5	146	47.1	**0.014**[1]
Former smoker	35	11.1	49	15.8	
Current smoker	96	30.4	115	37.1	
Influenza vaccination status					
Vaccinated every year	16	5.1	7	2.3	**<0.001**[1]
Vaccinated occasionally	89	28.2	53	17.1	
Planning first vaccination	39	12.3	27	8.7	
Hesitant but inclined to accept	39	12.3	139	44.8	
Hesitant or refusing	133	42.1	81	26.1	
Belief about the origin of SARS-CoV-2					
Natural origin	102	32.3	180	58.1	**<0.001**
Human-made origin	150	47.5	39	12.6	
Undecided/No opinion	64	20.2	91	29.3	
Frequency of following news related to COVID-19					
Always	176	55.7	238	76.8	-
Occasionally / Rarely	138	43.7	67	21.6	
Never	2	0.6	5	1.6	

Note: *Percentages are presented as column percentages.*
[1] Pearson's chi-square test was applied. [2] Due to skewed distribution, the Mann-Whitney U test was applied.

Willingness to volunteer for a COVID-19 vaccine trial was reported by 11.1% of contact tracing teams and 24.8% of community residents (p<0.001). Strong vaccine recommendation to close contacts was higher among community residents (83.9%) compared to contact tracing teams (58.6%) (p<0.001). The mean score on the COVID-19 vaccine hesitancy questions among participants from the contact tracing team was 61.7±15.5, with a median of 61.0, while the mean score among community members was 52.4±15.2, with a median of 50.0 (Table 2). A total of 49.1% of the contact tracing team members and 33% of the community members scored above their respective group means.

Table 2: Participants status of receiving at least one dose of COVID-19 vaccine and distribution of selected vaccine-related characteristics

Variables	Contact Tracing Teams		Community Members		p[1]
	n	%	n	%	
Status of receiving at least one dose of COVID-19 vaccine					
Vaccinated	258	81.6	63	20.3	**<0.001**
Wants to get vaccinated	6	1.9	202	65.2	
Hesitant but inclined to accept	1	0.3	21	6.8	
Hesitant	24	7.6	15	4.8	
Hesitant but disinclined to accept	23	7.3	6	1.9	
Refuses vaccination	4	1.3	3	1.0	
Willingness to participate in COVID-19 vaccine clinical trials					
Yes	35	11.1	77	24.8	**<0.001**
No	192	60.7	179	57.7	
Hesitant	89	28.2	54	17.5	
Advice given to relatives regarding COVID-19 vaccination					
Strongly recommend and encourage vaccination	180	58.6	260	83.9	**<0.001**
Do not wish to give any advice on this matter	77	25.1	27	8.7	
Recommend delaying vaccination	32	10.4	6	1.9	
Recommend not getting vaccinated	4	1.3	3	1.0	
No opinion	14	4.6	14	4.5	
Sources influencing participants opinions about COVID-19 vaccines[3]					
Ministry of Health	171	54.1	285	91.9	**<0.001**
Family physician	35	11.1	121	39.0	**<0.001**
TV/newspaper news	41	13.0	265	85.5	**<0.001**
Talk shows on TV	23	7.3	221	71.3	**<0.001**
Statements by academics	184	58.2	216	69.7	**0.003**
Social media and friends	41	13.0	149	48.1	**<0.001**
World Health Organization	118	37.3	49	15.8	**<0.001**
Celebrities/public figures	9	2.8	31	10.0	**<0.001**
Scientific articles	210	66.5	34	11.0	**<0.001**
Other	6	0.9	2	0.6	
Distribution of COVID-19 vaccine hesitancy scores Mean±SD Median Min–Max	61.7±15.5 61.0 25-125		52.4±15.2 50.0 25-125		**<0.001**

[1]Pearson's chi-square test was applied.

[2]Due to skewed distribution, the Mann-Whitney U test was applied.

[3]This was a multiple response question

Among healthcare workers, 91% of physicians and 77% of other healthcare staff were classified as Vaccinated or Willing (p<0.001). The most common reasons for unwillingness included lack of trust in the vaccine, fear of side effects, and doubts about efficacy. Additionally, 22% of community members and 22% of other healthcare staff believed the SARS-CoV-2 virus was human-made (p<0.001). Vaccine hesitancy was highest among other healthcare workers, with a hesitancy rate of 64% (Figure 2).

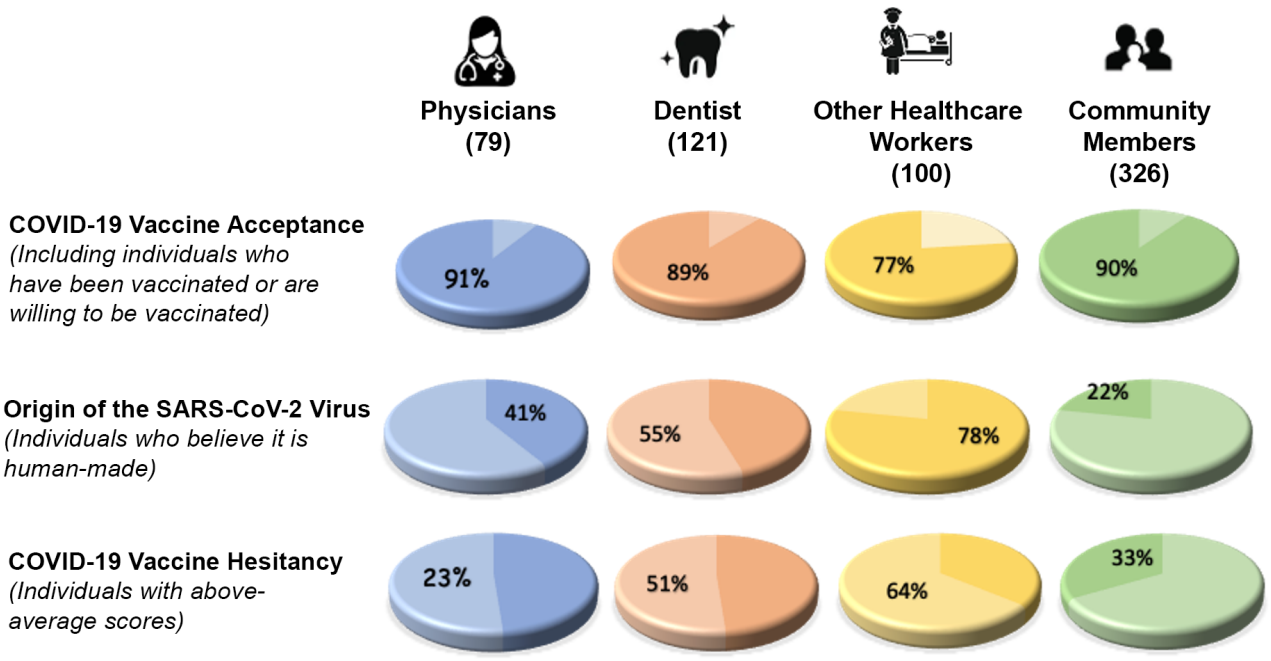

Figure 2: Selected variables related to participants' approaches to COVID-19 vaccination

The scores obtained from the COVID-19 Fear, Vaccine Hesitancy, and Vaccine Attitude subscales are summarized in Figure 3. When the scores on the positive and negative attitude subscales were examined, a statistically significant difference was found between the groups (p<0.001). According to the Bonferroni correction, the difference in positive attitude scores was statistically significant between other healthcare workers and physicians, as well as between community members and other healthcare workers (3.5±0.8), dentists (3.7±0.7), and physicians (4.0±0.7). The highest COVID-19 fear scores were observed among community members (19.8±5.1), while the lowest were found among physicians (17.1±5.2 [median: 18.0]), and this difference was statistically significant (p< 0.001). Regarding vaccine hesitancy scores, other healthcare workers had the highest mean score (67.9±14.4). According to the Bonferroni correction, a statistically significant difference was found between other healthcare workers and dentists, physicians, and non-healthcare workers (p<0.001) (Figure 3).

Among the 25 items developed through a literature review to measure COVID-19 vaccine hesitancy, the top three reasons identified by participants differed between groups. For the contact tracing workers, the leading reasons were: fear of side effects, the belief that vaccine studies are insufficient, and the perception that vaccine effectiveness would be short-lived. Among community members, the most frequently cited reasons were: the belief that vaccine effectiveness would be short-lived, lack of sufficient information about vaccines, and distrust in the country where the vaccine was produced (Table 3).

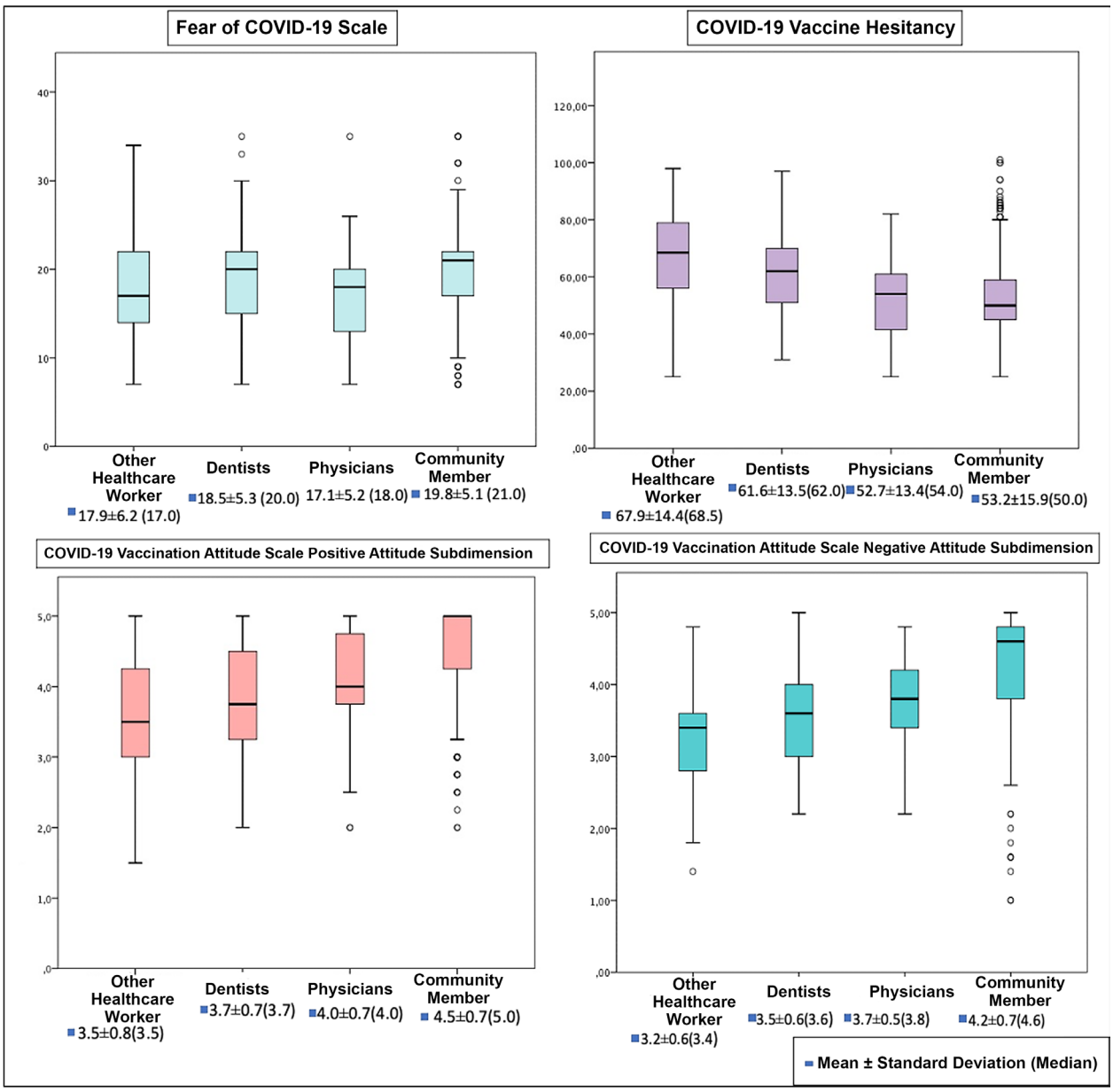

Figure 3: Distribution of participants' scores on COVID-19 Fear, Vaccine Hesitancy and Vaccine Attitude Subscales

Table 3: Most common reasons for COVID-19 vaccine hesitancy

Variables	Contact Tracing Teams			Community Members			p[1]
	Agree[2]	Neutral	Disagree[3]	Agree[2]	Neutral	Disagree[3]	
	n(%)	n(%)	n(%)	n(%)	n(%)	n(%)	
I am afraid of the side effects of the vaccine.	178(56.3)	68(21.5)	70(22.2)	40(12.9)	30(9.7)	240(77.4)	**<0.001**
I am concerned that the effectiveness of the vaccine will be short-lived.	168(53.2)	74(23.4)	74(23.4)	88(28.4)	84(27.1)	138(44.5)	**<0.001**
The vaccine studies are insufficient.	159(50.3)	81(25.6)	76(24.1)	31(10.0)	66(21.3)	213(68.7)	**<0.001**

I am concerned that an adequate amount of vaccine will not be produced.	125(39.6)	57(18.0)	134(42.4)	63(20.3)	105(33.9)	142(45.8)	**<0.001**
I do not have sufficient knowledge about vaccines.	121(38.3)	77(24.4)	118(37.3)	72(23.2)	42(13.5)	196(63.3)	**<0.001**
I do not trust the country where the vaccine was produced.	116(36.7)	105(33,2)	95(30.1)	41(13.2)	41(13.3)	228(73.5)	**<0.001**

[1]Pearson's chi-square test was applied.

[2]Participants who responded "Strongly Agree" and "Agree" were combined into a single group.

[3]Participants who responded "Strongly Disagree" and "Disagree" were combined into a single group.

A binary logistic regression model was constructed using the enter method with independent variables that were statistically significant ($p < 0.05$) in univariate analyses, not significant but with p-values < 0.20, or identified as important in the literature. The dependent variable was defined as "having a COVID-19 vaccine hesitancy score above the mean," categorizing participants into two groups based on whether their scores were above or below the mean.

Among the contact tracing team, vaccine hesitancy was associated with being Unvaccinated/Unwilling (OR=4.83), increasing age (OR=1.05), and higher Fear of COVID-19 scores (OR=1.12). Higher scores on the Negative Attitudes Toward COVID-19 Vaccination Scale (Higher scores reflect more positive attitudes) were associated with a 97% reduction in vaccine hesitancy (OR=0.03) (Table 4).

Table 4: Logistic regression analysis of selected variables associated with scoring above the mean on COVID-19 vaccine hesitancy questions among member of contact tracing team

Variables Included in the Model	β	Standard Error	Wald Statistic	df	OR (95% CI)	p
Sex						
Male (Reference)						
Female	0.377	0.388	0.944	1	1.45 (0.68-3.11)	0.331
Age	0.052	0.021	6.247	1	**1.05** (1.01-1.09)	**0.012**
Household income	0.047	0.314	0.023	1	1.04 (0.56-1.93)	0.881
Healthcare occupation group						
Physicians and Dentists Other Healthcare Workers (Reference)	-0.469	0.395	1.409	1	0.62 (0.28-1.35)	0.235
COVID-19 vaccination status						
Vaccinated/Willing (Reference)						
Unwilling/Undecided	1.575	0.624	6.376	1	**4.83** (1.42-16.39)	**0.012**
Fear of COVID-19 Scale scores	0.114	0.036	9.978	1	**1.12** (1.04-1.20)	**0.002**
Compliance scores for COVID-19 preventive measures in daily life	0.006	0.139	0.002	1	1.01 (0.76-1.32)	0.967
Negative Attitude Subscale scores of the COVID-19 Vaccine Attitudes Scale	-3.602	0.444	65.797	1	**0.03** (0.01-0.06)	**<0.001**
Influenza vaccination status						
Vaccinated/Willing (Reference)						
Unvaccinated/Unwilling	0.295	0.369	0.640	1	1.34 (0.65-2.77)	0.424

**Correct prediction rate: 84.1%. Hosmer-Lemeshow test p-value = 0.489.*

***Note:** The mean score of the contact tracing team participants on the COVID-19 vaccine hesitancy questions was 61.7. Participants who scored below this value were considered the reference group for the analysis.*

Among community residents, vaccine hesitancy was associated with being female (OR=2.37), not having children (OR=3.79), having a chronic disease (OR=8.27), and not having received or not willing to receive the influenza vaccine (OR=5.61). Following COVID-19 news (OR=0.64), positive attitudes toward COVID-19 vaccination (OR=0.05), and compliance with protective measures (OR=0.62) were factors that decreased vaccine hesitancy (Table 5).

Table 5: Logistic regression analysis of selected variables associated with scoring above the mean on COVID-19 vaccine hesitancy questions among participants from the community

Variables Included in the Model	β	Standard Error	Wald Statistic	df	OR (95% CI)	p
Sex						
Male (Reference)						
Female	0.866	0.428	4.094	1	**2.37** (1.02-5.49)	**0.043**
Having children						
Yes (Reference)						
No	1.332	0.568	5.497	1	**3.79** (1.24-11.5)	**0.019**
Household Income	0.196	0.337	0.340	1	1.21 (0.62-2.35)	0.560
Presence of chronic disease						
Yes	2.113	0.518	16.643	1	**8.27** (2.99-22.8)	**<0.001**
No (Reference)						
Smoking status						
Smoker	0.424	0.488	0.756	1	1.52 (0.58-3.98)	0.385
Non-smoker (Reference)						
Frequency of following COVID-19 news scores	-1.578	0.466	11.441	1	**0.20** (0.83-0.51)	**0.001**
Compliance scores for COVID-19 preventive measures	-0.465	0.207	5.059	1	**0.62** (0.41-0.94)	**0.024**
Positive Attitude Subscale scores of the COVID-19 Vaccine Attitudes Scale	-3.279	0.522	39.433	1	**0.03** (0.01-0.10)	**<0.001**
Influenza vaccination status						
Vaccinated/Willing (Reference)						
Unvaccinated/Unwilling	1.726	0.670	6.634	1	**5.61** (1.51-20.87)	**0.010**

**Correct prediction rate: 86.0%. Hosmer-Lemeshow test p-value = 0.109.*

Note: *The mean score of the community participants on the COVID-19 vaccine hesitancy questions was 52.4. Participants who scored below this value were considered the reference group for the analysis.*

Discussion

This study aimed to investigate the determinants and underlying reasons for COVID-19 vaccine hesitancy, which emerged as a major barrier to vaccination efforts during the pandemic. For comparative analysis, the study included individuals actively engaged in contact tracing teams who were frequently exposed to COVID-19 cases, as well as residents from a neighborhood within the district where these teams operated. A wide range of sociodemographic characteristics and factors potentially associated with vaccine hesitancy were examined.

Previous vaccination experiences are known to influence individuals' willingness to accept new vaccines (12). To explore this relationship, participants were asked about their seasonal influenza vaccination status. Our findings revealed

that participants who had previously received or intended to receive the influenza vaccine had significantly lower COVID-19 vaccine hesitancy scores and higher positive attitude scores on the COVID-19 Vaccine Attitudes Scale compared to those who had never received and did not intend to receive influenza vaccination.

This finding supports the broader understanding that vaccine acceptance is closely tied to individual cognitive frameworks, suggesting that attitudes toward vaccines for different infectious diseases with similar transmission dynamics and clinical features may be interrelated (13). Consistently, studies conducted in Kuwait—where vaccine acceptance is among the lowest globally—and in France among 2,046 healthcare workers demonstrated a positive association between prior influenza vaccination and COVID-19 vaccine acceptance (14, 15). In line with our results, recent studies have confirmed that a history of influenza vaccination is positively associated with COVID-19 vaccine acceptance among healthcare workers (16).

Participants who followed COVID-19-related news more frequently showed greater willingness to receive the vaccine, with lower vaccine hesitancy scores. Similarly, positive attitudes toward vaccination were higher among those who followed pandemic updates more often. These findings align with a study in Iran, which found that individuals not regularly following COVID-19 news were more likely to have safety concerns. (17). Trust in the Ministry of Health and vaccination campaigns likely helped increase public awareness and reduce vaccine hesitancy. However, it should not be overlooked that the widespread dissemination of conspiracy theories, misinformation, and inaccurate social media content may also contribute to greater hesitancy (18).

In our study, vaccine hesitancy was significantly higher among contact tracing teams than community residents, with 49.1% of contact tracing teams and 33% of community residents scoring above the mean. Although healthcare workers are trusted sources of vaccine information, previous studies have also reported hesitancy among them (6, 19-21). Subgroup analysis revealed the highest hesitancy among allied health personnel, followed by dentists, community residents, and physicians. Key reasons included fear of side effects, concerns about vaccine research, and short-term efficacy, which are consistently reported as major drivers of hesitancy (22-24). Fear of side effects was more pronounced among female participants, aligning with research suggesting women are more risk-averse (25). Among community residents, hesitancy was mainly driven by concerns about vaccine protection duration, lack of knowledge, and distrust toward vaccine-producing countries. Transparent communication about vaccine side effects and protection duration remains crucial for promoting vaccine acceptance (26, 27).

It is well-established that the novelty of a vaccine itself can serve as a source of hesitancy. In our study, concerns regarding the insufficiency of vaccine trials, along with potential side effects and safety risks, were identified as major reasons for vaccine hesitancy among the contact tracing teams. Skepticism towards newly developed vaccines has been reported not only for COVID-19 vaccines but also for other vaccines (28). Similarly, a study conducted in Japan found that rapid development and the novelty of the COVID-19 vaccine were among the primary reasons for vaccine hesitancy (29).

Vaccine confidence includes trust in the vaccine, healthcare providers, and the institutions responsible for its production and distribution. Increased vaccine hesitancy, marked by vaccine delay or refusal, is closely tied to a decline in vaccine confidence (30). In our study, nearly half of the contact tracing team participants doubted or were uncertain about the vaccine's safety, compared to 83.5% of community members who trusted it. Furthermore, only 30% of contact tracing teams trusted the vaccine-producing countries and companies. Similar findings were reported in studies from the U.S. (31) and China (32), where higher trust was shown in domestically developed vaccines.

The data for this study were collected during the critical phases of the COVID-19 pandemic (March–April 2021), a period when vaccine rollout efforts were intensifying worldwide. Therefore, the findings provide valuable insights into early vaccine hesitancy patterns and can inform future public health strategies for newly developed vaccines (9).

Perceived individual risk and illness severity are key determinants of vaccine acceptance (33). In our study, as Fear of COVID-19 Scale scores increased among contact tracing teams, vaccine hesitancy decreased. Over half of hesitant community participants believed COVID-19 was not serious and that they were unlikely to contract it. Those agreeing with these beliefs had higher vaccine hesitancy scores. Similar findings were reported in China (32) and Turkey (34) where lower perceived risk led to less willingness to vaccinate.

Vaccine hesitancy is influenced by a complex mix of personal and social factors, and studies show it varies across different stages of the pandemic (35). While this study offers insights into early resistance to COVID-19 vaccines, it also provides valuable information about potential hesitancy toward newly developed vaccines in the future. The findings may guide future research on how to address vaccine hesitancy for emerging vaccines. A major strength of this study is the comparison between two distinct sample groups, which allows for a broader understanding of hesitancy, supported by a robust analysis using various sociodemographic factors and validated scales.

Conclusions

This study identified the complex factors contributing to COVID-19 vaccine hesitancy. The findings demonstrate that various factors, including sociodemographic characteristics, prior vaccination experiences, health status, beliefs about vaccines, and being a healthcare worker, play significant roles in both vaccine acceptance and hesitancy. When a new vaccine is introduced, it is essential to implement targeted public awareness efforts to prevent misinformation and build public trust.

To reduce vaccine hesitancy in the population, interventions should be developed specifically for each group, taking into account social and demographic determinants such as gender, age, education level, and socioeconomic status, as well as individuals' motivations for getting vaccinated. Physicians, who are widely regarded as reliable sources of vaccine-related information, and other healthcare workers in various roles should be informed about the importance of immunization, introduced to new vaccines, and provided with relevant training. Doing so can help address their own hesitations and enable them to provide the public with accurate information, ultimately contributing to greater public confidence in vaccination.

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