# ORIGINAL RESEARCH

# Determination of Factors Affecting Covid-19 Vaccine Literacy and in Pandemics Vaccine Hesitation Levels of Adults: A Cross-sectional Study

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## Abstract

**Background**

The vaccination status and risk perception towards the vaccine of individuals varies according to their level of knowledge about the vaccine. But the anti-vaccination or vaccine hesitancy movement that has emerged in pandemic period. It was aimed to evaluate the factors affecting Covid-19 vaccine literacy and vaccine hesitation levels of adults in pandemics.

**Methods**

This study was conducted with individuals working in a public institution between June and September 2022 as a cross-sectional design (n=435). The data were collected through the Introductory Information Form, the Covid-19 Vaccine Literacy Scale and the Vaccine Hesitancy Scale in Pandemics.

**Results**

The rate of the participants who had the Covid-19 vaccine was found to be 96.8%. The total mean score of the Covid-19 Vaccine Literacy Scale was found to be 2.71±.49 and the Vaccine Hesitancy in Pandemics Scale total mean score to be 27.94±5.19. The Covid-19 vaccine literacy level of the participants had a statistically significant effect on the vaccine hesitancy in pandemics ($p<.05$). Vaccine hesitancy may be associated with many different variables; educational status and vaccine literacy are predictors of vaccine hesitancy.

**Conclusion**

Covid-19 vaccine literacy was found to be moderate in the group examined, and it affected the level of vaccine hesitancy and the predictors of them. It is crucial that the health professionals especially nurses and social media resources preferred by the society as a source of information convey accurate and up-to-date information to individuals. Nurses should be a facilitator for community getting right and currrent knowledge of vaccines via social media, face to face contact, scientific programmes.

**Key Words:** Vaccine literacy, Vaccine hesitancy, Covid-19 vaccine.

## Introduction

One of the most efficient and cost-effective public health practices at the global level is vaccination[1,2]. It was defined as a human right and emphasizes that more than 20 life-threatening diseases can be prevented with vaccination by The World Health Organization[3]. The Covid-19 pandemic has shown that infectious diseases will continue to be an important problem both now and in the upcoming years, and once again reminded the whole world of the importance of vaccination[4,5]. On the other hand, the anti-vaccination or vaccine hesitancy movement that has emerged in the world and also for Türkiye with pandemic[6-8]. Vaccination hesitation was defined by WHO as delay or refusal to accept being vaccinated despite having access to the vaccine[9]. The Vaccine Hesitancy Working Group (2012) study in the 3C (confidence, complacency, and compliance) model, to define barriers to access to vaccines[10]. It was stated vaccine hesitancy and vaccine rejection rates are quite high both in Türkiye and around the world[11].

Although there is no scientific basis, rumors on diseases caused by vaccines have been put forward and the public's confidence in vaccination services has been tried to be shaken[12,13]. Unfounded rumors and uncontrolled posts on social media may negatively affect the decision of individuals to have vaccinations and cause vaccination hesitations[14,15]. Vaccine hesitancy may occur due to the fact that individuals do not have correct information about the vaccine[14,16,17]. A positive effect on vaccination rates could be created by improving the vaccination literacy skills of individuals[17]. Vaccine literacy is defined as the level of individuals' capacity to access, understand and interpret health information and services necessary to make appropriate health decisions[18].

The decision to be or not to be vaccinated is a result of the environment of political, social, scientific, religious, geographical[16]. In a national study examining the reasons for vaccine hesitation, participants said that they were not adequately informed about vaccines, their content is harmful and vaccines are useless[14]. The vaccination status of individuals varies according to their level of knowledge about the vaccine, the risk perception towards the vaccine and the disease it protects, and that the confidence of access to the vaccine[16].

The presence of the individuals who are hesitant about vaccination for various reasons, the ones who oppose vaccination and those who postpone vaccination make it difficult to be successful in the fight against pandemics. It is vital to know the vaccination literacy and current vaccination hesitancy levels of the society in the effective management of the current and future pandemics. From this point of view, in this study, it was aimed to the factors affecting Covid-19 vaccine literacy and vaccine hesitation levels of adults in pandemics. Through the findings obtained, it is predicted that nursing interventions suitable for the needs of the society can be made.

## Research Questions:

1. What are the Covid-19 vaccination literacy and vaccination hesitancy levels of adults in pandemics?

2. Do Covid-19 vaccine literacy and vaccine hesitancy levels change according to sociodemographic variables of adults?

3. Is there a relationship between vaccination literacy and vaccination hesitancy levels of adults?

4. Do vaccine hesitancy and vaccine literacy levels have an effect on receiving Covid-19 vaccine?

## Methods

### Study Design

This cross-sectional study was conducted with individuals working in a public institution between June and September 2022. In order to conduct the research, the approval of the Medical Faculty Health Sciences Ethics Committee of a state university (1365/25.05.2022) and permission from the relevant public institution were obtained. The Declaration of Helsinki was complied with at all stages of the research.

### Setting and Participants

The population of the research consisted of 6000 individuals working in a public institution where the research was carried out, and the sample was calculated[19].

$n = (N.t^2.p.q)/(d^2.(N-1)+t^2.p.q)$

n: Number of individuals to be sampled

p: The frequency of the investigated event $=\%50$

q: The infrequency of the investigated event $=\%50$

t: $=1.96$ ($\infty = 0.05$ de $\infty$ The theoretical t value found in the degrees of freedom)

d: The standard error of the rate to be determined in the research$= 0.05$

$n = 6000 \times 1.96^2 \times 0,5 \times 0.5 / (0.05^2 \times (6000-1)+1.96^2 \times 0.5 \times 0.5) \approx 362$ individuals formed the minimum number of samples to be reached in the study.

The study included 435 participants who were not on leave/report at the time of the research, were over the age of 18, had comprehension skills, had no verbal communication problems, and volunteered to participate in the research. The response rate of the invited participants was 7.8% and the sample size was calculated with known population size in the Open Epi programme. Although the participation rate in the study seems to be low, obtaining the data was completed by reaching the predicted sample size. In addition, a post-hoc power analysis was performed at the end of the study to assess the adequacy of the sample size. Using G*Power software (version 3.1) and based on a total sample size of n = 438, the power achieved was calculated to be .95 (95%) at an alpha level of .05. This indicates that the study was sufficiently powered to detect statistically significant effects and that the risk of committing a type II error was minimised.

### Outcome Measures

### Data sources/Measurements

Introductory Information Form: In the information form developed by the researchers in line with the literature[20,21], there are 15 questions including sociodemographic questions (age, gender, marital status, education, working status, perception of economic status, place of residence) as well as information resources about Covid-19, the status of having a Covid-19 diagnostic test, having had the Covid-19 disease and vaccination status of her/himself or the individuals s/he lives with.

Covid-19 Vaccine Literacy Scale: The scale was developed by Ishikawa et al. (2008) to evaluate health literacy in chronic diseases and was adapted as Covid-19 Vaccine Literacy Scale (VLS) by Biasio et al. (2019)[22,23]. The scale, which was adapted into Turkish by Durmuş et al. (2021), consists of 12 items and 2 sub-dimensions[14]. The functional skills dimension is based on basic reading and writing skills to be able to perform their daily activities, and individuals who are literate at this level can read materials such as health education and vaccination. This dimension basically consists of four language-related expressions that include the semantic system. The Communicative/Critical skills dimension focuses more on cognitive efforts such as problem solving and decision making and consists of eight items[23]. Scale items were rated on a 4-point Likert scale. The fact that the average of the scores obtained from the scale is close to 4 indicates that the vaccine literacy level is high. The Cronbach alpha coefficient of the original scale is 0.87[14]. Validity measure using confirmatory factor analysis and testing a single-factor model indicate adequate fit for the VLS (CMIN/DF=4.01, p < .0001, RMSEA = .08, AGFI= .89, GFI = .93, IFI= .90).

Vaccine Hesitancy Scale in Pandemics: The scale is the "Vaccination Hesitation Scale in Pandemics" (VHSP), which is a modified version for pandemics of the "Vaccination Hesitation Scale" developed by Larson et al (2015)[24]. Turkish validity and reliability study was carried out by Çapar and Çınar (2021)[25]. The scale is a 5-point Likert type measurement tool. High scores from the scale indicate high hesitancy about vaccination in pandemics. The scale includes a total of 10 items and two sub-dimensions. The first sub-dimension "Lack of Confidence" consists of 8 items (M1-T, M2-T, M3-T, M4-T, M5-T, M6-T, M7-T, M8). Items with the letter "T" next to them are reverse items. High scores obtained from this sub-dimension indicate that the lack of confidence against the vaccine increases in pandemics[25]. The second sub-dimension "Risk" consists of 2 items (M9, M10). High scores in this sub-dimension indicate a high risk of vaccination in pandemics. The Cronbach alpha coefficient of the original scale is .9025. Validity measure using confirmatory factor analysis and testing a single-factor model indicate adequate fit for the VHPS (CMIN/DF=4.16, p < .0001, RMSEA = .08, AGFI= .90, GFI = .95, IFI=.97).

### Variables in the data collection process

The predictor variables of interest the status of having a Covid-19 diagnostic test, having had the Covid-19 disease and vaccination status of her/himself or the individuals s/he lives with.

### Data collection

Data collection tools were filled in by online survey form (Google Forms) in ten minutes during working hours in a public institution which has a large number of employees in a western city of Türkiye. The survey link was sended to health manager of institution and they reached the survey link the personel via special WhatsApp group for themselves. Every employee who agreed to participate in the study was included. The informed consent form is at the beginning of the link, and those who did not agree to participate in the study were not allowed to proceed to other questions. By setting "required" for each of the questions, it was tried to take precautions against the possibility of answering incomplete questions in the study. With the adjustments on the form, it was ensured that each individual participated in the study with only one response. Reminders have been sent once a week except weekend. Before starting data collection, the researchers conducted a pilot study (n=10) to confirm the comprehensibility of the questions, and the data obtained from the pilot study were not included in the research sample.

## Ethical Aspect of Research

In order to conduct the research, the approval of the Medical Faculty Health Sciences Ethics Committee of a state university (1365/25.05.2022) and permission from the relevant public institution were obtained. Approval for use was taken via e-mail from the authors who made the validity and reliability of the measurement tools used in the study. Municipal employees were given detailed information about the research team and their purpose, and that the information obtained from the research would be used only for scientific purposes, they could withdraw from the research at any time, their participation in the research would not have any impact on their lives and their information would be kept confidential, and verbally informed volunteer consent was obtained from the participants. The Declaration of Helsinki was complied with at all stages of the research. The researchers did not receive any financial support while conducting this study. Participants did not receive any payment related to their participation in the study.

### Data analysis

The descriptive characteristics of the participants were presented. The normal distribution was determined according to the Skewness and Kurtosis values being in the range of $\pm 1.5$[26]. Comparison of dependent and independent variables was analyzed with t test and ANOVA, and Scheffe analysis was applied to determine the difference in multiple comparisons. Pearson correlation was performed to determine the relationship between the scales. The predictive level of mean scores of vaccine hesitancy and literacy on receiving Covid-19 vaccine; and vaccine hesitancy, literacy and selected independent variables was evaluated by logistic, multipl and multivarite regression analysis via SPSS 21.0 program. In the multivariate logistic regression models, odds ratios (ORs) and their 95% confidence intervals (CIs) were used in the measurement of independent associations between the different variables and the outcomes of interest. For all analyses in this study, two-sided p-values of .05 or less were considered statistically significant.

## Results

### Sample characteristics

The mean age of the participants was $42.39 \pm 3.10$, and 52% were male, 73.8% were married, and 68.1% were higher education graduates. 97.5% of the participants were employed and 51% of them stated that their income was equal to their expenses. While the participants who had Covid-19 were 65.3%, the rate of individuals who had Covid-19 in their households was 63.7%. 82.1% of the participants used the media as a source of information about Covid-19. The rate of the participants who had the Covid-19 vaccine was found to be 96.8% (Table 1).

### Vaccine Literacy and Hesitancy

In this study, the total mean score of the Covid-19 Vaccine Literacy Scale was found to be $2.71 \pm .49$ and the Vaccine Hesitancy in Pandemics Scale total mean score to be $27.94 \pm 5.19$ (Table 2).

A statistically significant difference was found between the VHPS-Lack of Confidence sub-dimension and the VHPS

**Table 1: Distribution of the Sociodemographic Characteristics of the Participants (n=435)**

| Features | Mean±SD | Min-Max |
|---|---|---|
| **Age** | 42.39±3.10 | 18-65 |
| | **n** | **%** |
| **Gender** | | |
| Female | 209 | 48.0 |
| Male | 226 | 52.0 |
| **Marital Status** | | |
| Married | 321 | 73.8 |
| Single | 114 | 26.2 |
| **Educational status** | | |
| Primary school | 29 | 6.6 |
| Secondary school | 20 | 4.6 |
| High School | 90 | 20.7 |
| University and higher | 296 | 68.1 |
| **Working status** | | |
| Employed | 424 | 97.5 |
| Unemployed | 11 | 2.5 |
| **Income status** | | |
| Income less than expenses | 177 | 40.7 |
| Income equals expenses | 222 | 51.0 |
| Income more than expenses | 36 | 8.3 |
| **COVID-19 status** | | |
| Infected | 151 | 34.7 |
| Not Infected | 284 | 65.3 |
| **Household COVID-19 status** | | |
| Infected | 158 | 36.3 |
| Not Infected | 277 | 63.7 |
| **Information resource on COVID-19 *** | | |
| Media (newspaper, TV.) | 357 | 82.1 |
| Social media | 236 | 54.3 |
| Training/course etc. | 37 | 8.5 |
| Colleaguges | 127 | 29.2 |
| Healthcare organizations | 246 | 56.6 |
| **COVID-19 Vaccine dose** | | |
| Not vaccinated | 12 | 2.8 |
| One | 9 | 2.1 |
| Two | 213 | 49.0 |
| Three | 189 | 43.3 |
| Four | 12 | 2.8 |
| * More than one item marked. | | |

**Table 2. Distribution of Participants' COVID-19 Vaccine Literacy and Vaccine Hesitancy in Pandemics Mean Scores**

| | COVID-19 Vaccine Literacy Scale | | | Vaccine Hesitancy Scale in Pandemics | | |
|---|---|---|---|---|---|---|
| | Total | Functional Skill | Communication Skill | Total | Risk | Lack of Confidence |
| Mean±SD | 2.71± .49 | 2.49±.73 | 2.82 ±.60 | 27.94 ± 5.19 | 5.80± 1.91 | 22.14± 4.97 |
| Min- Max | max.=4 | | | 10- 50 | 2- 10 | 8 - 40 |
| Interpretation | the higher the score, the higher the vaccine literacy level | | | The higher the score, the higher the vaccine hesitation in pandemics | the higher the score, the higher the risk of vaccination in pandemics | the higher the score, the higher the level of lack ofconfidence towards the vaccine in pandemics |
| Cronbach α | .755 | | .730 | | .883 | .725 |

**Table 3. The comparison of the Vaccine Hesitancy Scale in Pandemics /subscale scores of the participants according to their descriptive characteristics (n=435)**

| Features | Vaccine Hesitancy Scale in Pandemics | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total | | | | Risk | | | | Lack of Confidence | | | |
| | x ± SS | F, t | P | Scheffe | x ± SS | F, t | P | Scheffe | x ± SS | F, t | p | Scheffe |
| **Gender*** | | | | | | | | | | - | | |
| Female | 27.86±4.76 | -.331 | .741 | - | 6.07±1.69 | 2.840 | **.005** | - | 21.78±4.14 | 1.452 | .150 | - |
| Male | 28.02±5.57 | | | | 5.55±2.07 | | | | 22.46±5.62 | | | |
| **Marital Status*** | | | | | | | | | | | | |
| Married | 27.95±5.35 | .062 | .950 | - | 5.73±1.94 | -1.251 | .212 | - | 22.21±5.07 | .547 | .585 | - |
| Single | 27.92±4.74 | | | | 6.00±1.83 | | | | 21.92±4.68 | | | |
| **COVID-19 status** | | | | | | | | | | | | |
| Infected | 28.19±4.79 | | | | 6.10±1.82 | | | | 22.08±4.13 | | | |
| Not Infected | 27.81±5.39 | .717 | .474 | - | 5.64±1.95 | 2.382 | **.018** | - | 22.16±5.37 | -.165 | .869 | - |
| **COVID-19 vaccination status *** | | | | | | | | | | | | |
| Vaccinated | 27.76±5.09 | -3.975 | | | 5.77±1.88 | | | | 21.99±4.87 | - | | |
| Not Vaccinated | 33.28±5.52 | | **<.001** | - | 6.71±2.78 | -1.802 | .072 | - | 26.57±6.06 | 3.429 | **.001** | - |
| **Household COVID-19 status** | | | | | | | | | | | | |
| Infected | 27.75±4.85 | | | | 5.94±1.89 | | | | 21.81±4.15 | - | | |
| Not Infected | 28.05±5.38 | -.588 | .557 | - | 5.72±1.93 | 1.117 | .264 | - | 22.32±5.38 | 1.045 | .296 | - |
| **Educational status**** | | | | | | | | High school>primary school; university>primary school; postgraduate>primary school | | | | High school>primary school; university>primary school |
| Primary school | 28.89±7.40 | | | | 3.72±2.03 | | | | 25.17±7.60 | | | |
| Secondary school | 28.90±6.78 | | | - | 5.15±2.39 | 11.286 | **<.001** | | 23.75±7.56 | | | |
| High School | 27.36±5.26 | 1.262 | .284 | | 5.87±2.08 | | | | 21.48±5.09 | 4.276 | **.002** | |
| University | 27.81±4.83 | | | | 6.00±1.68 | | | | 21.80±4.28 | | | |
| Postgraduate | 29.34±4.11 | | | | 6.27±1.68 | | | | 23.06±3.93 | | | |
| **Vaccination Dose**** | | | | | | | | | | | | |
| Not Vaccinated | 34.20±3.67 | 9.127 | **<.001** | 2 dose>0 dose; 3 dose>0 dose; 4 dose > 0 dose | 7.70±1.94 | 4.870 | **.001** | 3 dose>0 dose; 4 dose > 0 dose | 26.50±3.68 | 6.367 | **<.001** | 3 dose >1 dose; 2 dose >1 dose ; 3 dose> 2 dose |
| 1 dose | 34.22±6.66 | | | | 6.11±2.20 | | | | 28.11±6.56 | | | |
| 2 doses | 28.16±4.49 | | | | 5.99±1.68 | | | | 22.16±4.43 | | | |
| 3 doses | 27.04±5.44 | | | | 5.54±2.03 | | | | 21.49±5.10 | | | |
| 4 doses | 27.50±5.69 | | | | 4.83±2.24 | | | | 22.66±6.11 | | | |

*t test; **One way ANOVA was accepted as; p<.05.

total mean scores in terms of being vaccinated against Covid-19; between the VHPS-Risk sub-dimension mean score in terms of gender and having had Covid-19 (p<.05) (Table 3). It was found statistically significant difference between VHPS-Lack of Confidence and VHPS total mean scores according to the education status of the participants (p<.05), and it was determined that the difference in the VHPS-Lack of Confidence sub-dimension was due to the difference between the mean scores of the participants who were high school graduates, university graduates and primary school graduates (Table 3). According to the vaccination status of the participants, a statistically significant difference was found between the VHPS-Lack of Confidence, VHPS-Risk and VHPS total mean scores (p<.05), and it was determined that this situation was caused by the difference between the mean scores of the participants who received more doses of vaccination and those who received less doses of vaccination (Table 3).

A statistically significant difference was found between the total mean scores of Covid-19 vaccine literacy according to

**Table 4. The comparison of the COVID-19 Vaccine Literacy scale/subscale scores of the participants according to their descriptive characteristics (n=435)**

| Features | COVID-19 Vaccine Literacy | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total | | | | Functional skill | | | | Communicative skill | | | |
| | x ± SS | F, t | p | Scheffe | x ± SS | F, t | p | Scheffe | x ± SS | F, t | p | Scheffe |
| **Gender*** | | | | | | | | | | | | |
| Female | 2.75±.49 | .937 | .152 | - | 2.51±.76 | | .574 | | 2.86±.60 | | .164 | |
| Male | 2.68±.48 | | | | 2.47±.70 | | | | 2.78±.60 | | | |
| **Marital Status*** | | | | | | | | | | | | |
| Married | 2.69±.49 | .076 | .291 | - | 2.47±.73 | | .427 | | 2.79±.61 | | .095 | |
| Single | 2.78±.47 | | | | 2.53±.74 | | | | 2.90±.59 | | | |
| **COVID-19 status** | | | | | | | | | | | | |
| Infected | 2.73±.50 | .641 | .251 | | 2.54±.74 | | .977 | | 2.82±.62 | | .583 | |
| Not Infected | 2.70±.48 | | | - | 2.46±.73 | | | | 2.82±.59 | | | |
| **COVID-19 vaccination status *** | | | | | | | | | | | | |
| Vaccinated | 2.70±.48 | .889 | .131 | - | 2.48±.72 | | .493 | | 2.81±.60 | | .158 | |
| Not Vaccinated | 2.91±.52 | | | | 2.62±1.00 | | | | 3.05±.61 | | | |
| **Household COVID-19 status** | | | | | | | | | | | | |
| Infected | 2.74±.50 | .388 | | | 2.56±.75 | | .113 | | 2.83±.63 | | .930 | |
| Not Infected | 2.70±.47 | | .441 | - | 2.45±.71 | | | | 2.82±.59 | | | |
| **Educational status**** | | | | | | | | | | | | |
| Primary school | 2.65±.53 | | | | 2.48±.76 | | | | 2.74±.60 | | | |
| | 2.45±.29 | | | | 2.18±.49 | 1.528 | .193 | | 2.58±.53 | 2.082 | .082 | |
| Secondary school | 2.63±.48 | 3.020 | .018 | - | 2.41±.70 | | | | 2.74±.63 | | | |
| | 2.76±.48 | | | | 2.54±.75 | | | | 2.86±.60 | | | |
| | 2.78±.52 | | | | 2.43±.73 | | | | 2.95±.61 | | | |
| **High School** | | | | | | | | | | | | |
| **University** | | | | | | | | | | | | |
| **Postgraduate** | | | | | | | | | | | | |
| **Vaccine Dose**** | | | | | | | | | | | | |
| Not Vaccinated | 3.00±.53 | | | | 2.87±.78 | | | | 3.07±.60 | | | |
| 1 dose | 2.84±.48 | | | | 2.58±.91 | | | | 2.97±.58 | | | |
| 2 doses | 2.68±.50 | 1.571 | .181 | - | 2.44±.75 | 1.510 | .198 | | 2.79±.63 | .673 | .611 | |
| 3 doses | 2.74±.47 | | | | 2.55±.69 | | | | 2.84±.59 | | | |
| 4 doses | 2.63±.40 | | | | 2.29±.64 | | | | 2.80±.44 | | | |

*t test; **One way ANOVA was accepted as; p<.05.

**Table 5. The predictions of Adults' Vaccination Hesitation in the Pandemic and COVID-19 Vaccine Literacy Attitudes towards getting COVID-19 Vaccine**

| Variables | Beta | Standart Error | β | t** | p |
|---|---|---|---|---|---|
| Constant | | .070 | 1.215 | 17.231 | **<.001** |
| The sub dimension of Lack of Confidence | -.183 | .002 | -.007 | -3.848 | **<.001** |
| Sub dimension of Risk | -.103 | .004 | -.010 | -2.185 | **.029** |
| Functuional Skills | .041 | .003 | .002 | .866 | .387 |
| Communication Skills | -.088 | .002 | -.003 | -1.847 | .065 |
| R*** | .215 | | | | |
| R² | .046 | | | | |
| F**** | 5.190 | | | | |
| p | **<.001** | | | | |

the education status of the participants (p<.05) (Table 4).

Examining the correlation between vaccine literacy and vaccine hesitancy had a statistically significant, negatively weak relationship (r=-,135; p=.005).

Vaccine Hesitation Scale in Pandemic sub-dimensions and Covid-19 Vaccine Literacy Scale sub-dimensions together explain 4.6% of adults' attitudes toward getting Covid-19 vaccine. When the variables were examined individually, it was determined that the sub-dimensions of the vaccine hesitancy scale significantly affected their percepitons during the pandemic period (p <.001; p=.029). By examining which one is more affect, vaccine hesitancy explains the risk sub-dimension (β = −0.010) and then the lack of confidence sub-dimension (β = −0.007).(Table 5).

Table 6 shows the results of multiple regression analysis done within the scope of the study. The model which included the sociodemographic, some Covid 19 features and vaccine literacy scores accounted for 41% of the Adults' Vaccination Hesitation in the Pandemic.

When the variables were analyzed, it was found that the education level predicted the level of vaccination hesitation in the pandemic in a statistically significant and positive manner (β: .283, p <.001). It was found that the vacination literacy scores (β: .207, p=.049) predicted the level of vaccination hesitation in the pandemic in a statistically significant and positive manner.

**Table 6. The predictions of Adults' Vaccination Hesitation in the Pandemic, Relationship between sociodemografic features and Vaccine Literacy**

| Variables | B | Standart Error | ß | t** | p |
|---|---|---|---|---|---|
| (Constant) | 24.864 | 6.397 | | 3.887 | **<.001** |
| Gender | -1.101 | .860 | -.122 | -1.281 | .204 |
| Marital status | -.905 | .845 | -.098 | -1.072 | .287 |
| Educational Status | 1.637 | .530 | .283 | 3.090 | **.003** |
| Working status | .355 | 1.478 | .021 | .240 | .811 |
| Income status | .067 | .653 | .009 | .103 | .918 |
| COVID-19 status | -.852 | .980 | -.090 | -.870 | .387 |
| COVID-19 vaccination status | 3.488 | 2.389 | .244 | 1.460 | .148 |
| Vaccine dose | -.968 | 1.044 | -.152 | -.927 | .357 |
| Household COVID-19 status | .939 | .999 | .099 | .940 | .350 |
| COVID-19 vaccination status of relatives | -.055 | .185 | -.026 | -.295 | .769 |
| Vaccine literacy score | 1.807 | .903 | .207 | 2.001 | **.049** |
| R | .642 | | | | |
| R² | .413 | | | | |
| F | 4.744 | | | | |
| p | **<.001** | | | | |

B: Unstandardize Coefficient Beta  ß: Standardize Coefficient Beta  **: p < 0.05 (2-tailed)

**Table 7. Multinominal factors associated with Adults' Vaccination Hesitation in the Pandemic and Vaccine Literacy**

| Model 1. Vaccine Hesitancy | OR | SE | %95 CI | p |
|---|---|---|---|---|
| Log likelihood= 464.753; x²=146.991 (25df); p<0.001 | | | | |
| **Gender** | | | | |
| Male | 1.426 | .086 | 2.537-8.019 | **.003** |
| Female | 1 | | | |
| **Marital Status** | | | | |
| Married | .940 | 1.122 | 1.003-8.806 | .810 |
| Single | 1 | | | |
| **COVID-19 Infected Status** | | | | |
| Yes | 1.066 | .726 | 1.245-9.140 | .087 |
| No | 1 | | | |
| **COVID-19 Vaccination Status** | | | | |
| Yes | 1.494 | .057 | 1.166-6.603 | **.026** |
| No | 1 | | | |
| **Model 2. Vaccine Literacy** | **OR** | **SE** | **%95 CI** | **p** |
| Log likelihood= 544.992; x²=102.207 (30df); p=.878 | | | | |
| **Gender** | | | | |
| Male | 3.973 | 1.57 | .183-86.143 | .547 |
| Female | 1 | | | |
| **Marital Status** | | | | |
| Married | .258 | 1.55 | .012-5.428 | .337 |
| Single | 1 | | | |
| **COVID-19 Infected Status** | | | | |
| Yes | 1.236 | 1.43 | .073-19.939 | .959 |
| No | 1 | | | |
| **COVID-19 Vaccination Status** | | | | |
| Yes | 1.127 | 3.21 | 1.127-1.180 | .746 |
| No | 1 | | | |

OR: Odds Ratio SE: Standart Error  CI: onfidence Interval p < 0.05 (2-tailed)

In multivariate analysis was presented, vaccine hesitancy was significantly higher in males (OR=1.426) and who reported Covid-19 vaccination not uptake (OR= 1.494). Model 2 is not statistically significant in these selected variables (Table 7).

## Discussion

This section discusses adult vaccine literacy and hesitancy in relation to the literature and research questions. Previous studies have reported that 56% of participants believed vaccines were ineffective without scientific basis, with negative attitudes often stemming from religious beliefs and limited knowledge about vaccines and diseases[20]. Vaccine-related information was found to be primarily obtained through the internet and social media[15]. Low vaccine literacy levels, both in Türkiye and globally, combined with the uncontrolled spread of misinformation on social media, threaten the public health achievements gained through vaccination[20,27]. Over the past two decades, negative perceptions about vaccination have reportedly increased. A study conducted in France revealed regional differences in vaccine hesitancy despite the availability of vaccination services, highlighting the significance of addressing this issue at the population level and within healthcare systems[17]. Although participants in this study demonstrated above-average levels of vaccine literacy, notable levels of risk perception, lack of confidence, and vaccine hesitancy were also observed (Table 2). These findings, when considered in the context of existing literature, indicate a potential public health concern.

A study conducted in Ireland (n=1041) and the United Kingdom (n=2025) reported vaccine hesitancy or resistance in 35% and 31% of adults, respectively. In both populations, individuals who resisted Covid-19 vaccination were less likely to seek information, a behavior attributed to distrust in available information sources. These findings are consistent with existing literature that associates vaccine hesitancy with mistrust in health institutions and exposure to misinformation[28]. The same study found that hesitancy was more prevalent among women, individuals under the age of 65, and those with lower income levels. Similarly, another study (n=1942) showed that 28.8% of participants preferred not to be vaccinated, with hesitancy particularly common among women and younger individuals. Although no significant relationship was observed between educational level and vaccine rejection in that study, a lower perceived risk of COVID-19 and the absence of prior infection within close social circles were associated with greater hesitancy[28]. In France, 29.4% of respondents refused vaccination, with this resistance linked to national vaccination strategies, community immunization procedures, and perceptions regarding the origin and characteristics of the vaccines used[21]. In this study, it was determined that the risk perceived by women about the vaccine, the risk subscale of vaccine hesitation perceived by those who had Covid-19 with the vaccine, the lack of confidence and the vaccine hesitations were higher, and that the risk perception and vaccine literacy increased as the education increased, and the risk perception, lack of confidence and hesitancy decreased as the dose of the vaccine to be applied increased (Table 3). Otherwise in total score of vaccine hesitation is significantly higher in male and not received Covid-19 vaccination (Table 7). Further supporting this, a 2024 study found that lower levels of vaccine uptake were associated with younger age, male gender, and lower socioeconomic status[29], mirroring the findings from Ireland and the UK. The study indicated that sociodemographic factors continue to play a central role in vaccine hesitancy, especially when considering the interaction between gender, age, and income. These results are consistent with prior research showing that women, younger individuals, and those from lower-income

groups are more likely to hesitate or refuse vaccination. In our country, opposition to vaccination has come to the fore in recent years, especially through parents who do not want their children to be vaccinated, and it was stated that the number of cases of vaccine rejection has increased[30]. The administration of vaccines, consultations with nurses and national policies have been identified as factors influencing hesitancy and rejection of vaccines. Conducting individual/group interviews, carrying out scientific research, and addressing this issue on a social level play a significant role in understanding and addressing this phenomenon.

Vaccine hesitancy is widely recognized as a global public health threat[31,32]. In this study, a positive correlation was observed between vaccine literacy and education level (Table 4). Inaccurate or unverified information obtained from unreliable news sources contributes to the widespread dissemination of misinformation[33]. Such misinformation and hesitancy continue to pose substantial obstacles to achieving community-wide immunity in many countries[24]. Considering the pre-pandemic period of the anti-vaccination process, parents should be provided with concrete data about the problems to be experienced when there is no vaccination, and they should be given information about the contents and side effects of the vaccines[2]. The findings of this study are consistent with existing literature, indicating a relationship between vaccine literacy and vaccine hesitancy. In this context, the role of nurses in shaping public attitudes toward vaccination becomes noteworthy. A study conducted with nurses (n=255) found that 32.5% of participants who were undecided or unwilling to be vaccinated reported a lack of trust in vaccine content, 22% questioned vaccine effectiveness, and 40.4% were hesitant due to concerns about side effects. Additionally, 33.3% reported being positively influenced by the vaccination of public figures during the Covid-19 pandemic[34]. These findings suggest that healthcare professionals' perceptions can influence public confidence in vaccination programs. In new vaccination initiatives such as Covid-19, clear communication and consistent messaging from authorities are essential for building public trust[11,32]. Current studies further emphasize the importance of accurate information and transparent communication in addressing vaccine hesitancy. As observed in the literature and reinforced by the findings of this study, increasing vaccine literacy and building public trust through consistent messaging and reliable sources are essential for overcoming barriers to vaccination and achieving community immunity. Having knowledge about the vaccine has a limited effect on vaccine hesitancy. When the effect of vaccine literacy and hesitancy on Covid-19 vaccination is evaluated, it is possible to talk about a limited effect, although it is significant (Table 5). In this context, according to the results of the study, there may be other variables that cause individuals to have vaccine hesitation other than having knowledge. In-depth individual or focus group interviews can be conducted to reveal these variables. Exhibiting positive and negative behaviors that may affect health in society can be affected by the social environment. Social norms and conformism affect the sustainability of many health behaviors; this is reflected in mortality and morbidity rates[35]. WHO (2022) highlight vaccination failures are defined as a serious public health threat and social media is contributing to the spread of vaccine misinformation[36]. Current strategies may be insufficient in addressing this challenge; however, previous studies have highlighted the influential role that nurses and other healthcare professionals can have on public vaccine literacy, both in online and offline contexts.

Social norms to prevent vaccine hesitancy make it possible to prevent polarization within society and increase social cohesion[37]. Therefore, it can be stated that there is a need for targeted programs and policies that include peer mentoring to maintain positive health behaviors at the individual and societal level[38]. Previous studies have identified healthcare professionals, particularly nurses, as key actors in shaping public awareness regarding vaccination, especially in addressing misunderstandings about vaccine safety, efficacy, and potential side effects[38-40]. The attitudes and knowledge levels of healthcare professionals toward vaccines have been shown to significantly influence public perceptions and behaviors. Findings in the literature also highlight that vaccine hesitancy among healthcare workers may have broader societal implications. Public health strategies that take into account the sociocultural characteristics of communities tend to be more effective when supported by well-informed health professionals[41].

The results indicated that education level and mean vaccine literacy scores were statistically significant predictors of vaccine hesitancy during the pandemic (Table 6). Additionally, variables such as employment status, income level, and previous experiences with Covid-19 were identified as part of the explanatory model. Collectively, these factors accounted for nearly half of the variance in vaccine hesitancy. Furthermore, the findings showed that being male and unvaccinated were associated with higher levels of hesitancy (Table 7). Supporting this, another study conducted at the beginning of the pandemic reported that willingness to be vaccinated was associated with being male and single[39]. In contrast, a study from China found no significant relationship between gender or education level and willingness to receive the Covid-19 vaccine[42]. Meanwhile, a study in Italy identified statistically significant associations between female gender, education level, perceived vaccine safety, and willingness to be vaccinated[43]. These differences highlight how vaccine perceptions can be shaped by community-specific dynamics. The adoption of health-related behaviors is influenced not only by knowledge acquisition but also by a range of other predictors, particularly psychological factors that shape public perceptions. A scoping review examining predictors of Covid-19 vaccine acceptance and hesitancy highlighted global disparities and emphasized that changes in perceptions related to vaccination are shaped by sociodemographic characteristics and temporal factors, both at the societal and global levels[44]. The findings of the present study align with this perspective, illustrating the multifactorial nature of vaccine hesitancy and the role of diverse individual and contextual variables in influencing vaccination decisions.

## Limitations
Although our sample size is appropriate, we wish we had more participants, but we think that vaccine hesitation or mistrust may even affect participation in this study. In this cross sectional study design not allow to show the direct influence of vaccine hesitancy and literacy. Although sampling was made with appropriate methods, the study remains limited by the use of data collected only deciding to participate the study; otherwise the partication rate couldn't rising with efforts of researchers. The responses of questions was self-reported by participants, that is a potential bias. This study was carried out in an institution located in the western

part of Türkiye, so its national generalisability is limited. The individuals participating in the study may have wanted to positively influence the results of this study during the data collection process and may have given the expected answers instead of presenting their real opinions. These situations are intended to be expressed as the limitations of the study. Considering these limitations, it can be ensured that future studies will be more comprehensive and generalisable with purposive sampling within the framework of vaccinated and unvaccinated.

## Conclusion

This study indicates that the level of knowledge about the Covid-19 vaccine among participants was moderate and significantly associated with vaccine hesitancy. The findings suggest that, although vaccine hesitancy can be influenced by various factors, educational status and vaccine literacy are key predictors. As nurses and social media are commonly preferred sources of health information, it is particularly important that content shared through these channels is accurate and reliable. As they are well-placed to build strong relationships with the community, nurses can play a central role in identifying and addressing gaps in vaccination practices. Therefore, involving nurses in the planning, implementation and evaluation of vaccination programmes could improve their effectiveness. It is also important that the content of such programmes is regularly updated in line with public needs and that periodic studies are conducted to evaluate changes in health-related attitudes and behaviours. To raise awareness among future health professionals, nursing education curricula should incorporate comprehensive and up-to-date information on vaccines. Addressing vaccine hesitancy will likely require a multifaceted strategy incorporating improvements to vaccination infrastructure, consultation opportunities with healthcare professionals and supportive, coherent national policies. Social interventions, such as interviews with vaccine-hesitant individuals and public campaigns aimed at building trust in vaccines, may also help to mitigate hesitancy. In the long term, public health policies that promote vaccine literacy, support social cohesion and consider population-specific needs could inform broader discussions, including the potential implementation of mandatory vaccination programmes.

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### Conflict of Interest statement

No conflict of interest has been declared by the author(s). The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Author Contribution Table

| Criteria | Author Initials |
| --- | --- |
| Made substantial contributions to conception and design, or acquisition of data, or analysis and interpretation of data; | DA,AÇ,BC |
| Involved in drafting the manuscript or revising it critically for important intellectual content; | DA,AÇ |
| Given final approval of the version to be published. Each author should have participated sufficiently in the work to take public responsibility for appropriate portions of the content; | DA,AÇ,BC |
| Agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. | DA, AÇ |

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