Attitudes of physicians towards COVID-19 vaccines and reasons of vaccine hesitancy in Turkey

Running title: COVID-19 vaccine hesitancy

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Abstract

Aim: The development of safe and effective vaccines against SARS-CoV-2 and successful implementation of a global vaccination programme are prerequisites for a return to normal living conditions. Despite these intensive research efforts, vaccine hesitancy and misinformation in many countries present substantial obstacles to achieving sufficient coverage and community immunity. Here, we report the findings of a survey regarding the likelihood of COVID-19 vaccine acceptance in a sample of physicians in Turkey.

Materials and methods: An anonymous web-based survey was prepared and sent to medical doctors randomly selected from seven parts of Turkey via a text message sent to their mobile phones. Demographic data were collected, including sex (male or female), medical specialty, age, professional experience, COVID-19 history, knowledge of COVID-19 vaccines and behaviours related to vaccines against COVID-19 and other diseases. The survey was conducted over a 1-week period in December 2020.

Results: A total of 1,557 medical doctors responded to the survey. A total of 1,065 (68.4%) respondents were considering COVID-19 vaccination, 374 (24%) were undecided and 118 (7.6%) did not want to be vaccinated. As a result of multivariate analysis, the male gender,
absence of history of COVID-19 infection, and having sufficient information about the vaccine were determined as predictive factors for willingness to vaccination.

**Conclusion:** Although trials tend to focus on the efficacy of vaccines, the results of this study indicated that the most important factor affecting the preference for a given vaccine among Turkish physicians is safety.

**Key words:** acceptance, COVID-19, doctors, hesitancy, vaccine

**What’s known**

- Vaccine hesitancy and misinformation present substantial obstacles to achieving sufficient coverage and community immunity in many countries.

- Anti-vaccine propaganda on social media may have led to increased suspicion and negative attitudes toward vaccination among both medical professionals and the general population.

**What’s new**

- This was the first study to evaluate attitudes towards COVID-19 vaccination among physicians in Turkey.

- The COVID-19 vaccine hesitancy rate was 31.6% among physicians in Turkey.

- The results of this study indicated that the most important factor affecting the preference for a given vaccine among Turkish physicians.

- The male gender, absence of history of COVID-19 infection, and having sufficient information about the vaccine were determined as predictive factors for willingness to vaccination

1. **INTRODUCTION**

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), first reported in Wuhan, China, in December 2019, has subsequently spread around the world and was declared a pandemic by the World Health Organisation in March 2020.¹

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Although no specific treatments have yet been developed for coronavirus disease 2019 (COVID-19) caused by SARS-CoV-2, a number of adjunctive therapies have been used, such as antiviral agents, systemic corticosteroids, low-molecular-weight heparin (LMWH), convalescent plasma, and mesenchymal stem cell therapy, as well as investigational therapies such as interferon-α, ribavirin, intravenous immunoglobulin, etc.2

Successful vaccination strategies have already provided significant protection against at least 31 human diseases, which has had an extraordinary impact on human health worldwide.3 The development of safe and effective vaccines against SARS-CoV-2 and successful implementation of a global vaccination programme are prerequisites for a return to normal living conditions.4 More than 90 vaccines against SARS-CoV-2 are currently under development by research teams in both academia and industry across the world.5

Despite these intensive research efforts, vaccine hesitancy and misinformation present substantial obstacles to achieving sufficient coverage and community immunity in many countries.6,7 Due to the accelerated vaccine approval processes necessitated by the urgency of this pandemic, anti-vaccine propaganda on social media may have led to increased suspicion and negative attitudes toward vaccination among both medical professionals and the general population.

Here, we report the findings of a survey regarding the likelihood of COVID-19 vaccine acceptance and hesitancy in a sample of physicians in Turkey.

2. MATERIALS AND METHODS

Study design and data collection

An anonymous web-based survey was prepared and sent to medical doctors randomly selected from seven parts of Turkey via a text message sent to their mobile phones. Demographic data were collected, including sex (male or female), medical specialty, age (<30, 30–40, 40–50, 50–60, > 60 years), geographic location, professional experience, type of hospital, COVID-19 history, knowledge of COVID-19 vaccines and behaviours related to vaccines against COVID-19 and other diseases. The participants were asked whether they intended to vaccinate themselves or their families (if applicable). The survey was conducted over a 1-week period in December 2020.
Statistical analysis

Data were collected via web-based platform (Google Surveys®); percentage and frequency data were obtained.

Statistical analyses were performed using SPSS for Windows® software (version 22.0; SPSS Inc., Chicago, IL, USA). All variables were compared by the Chi-square test. In all analyses, \( p < 0.05 \) was taken to indicate statistical significance. Multinomial logistic regression analysis was performed to identify independent factors associated with acceptance of COVID-19 vaccination. Bonferroni corrected Post-hoc paired comparisons were made to determine from which group the significant relationship originated.

3. RESULTS

A total of 1,557 physicians (medical doctors) responded to the survey, including 854 (55%) men and 703 (45%) women. Of these physicians, 788 (50%) had a medical specialty and 344 (22%) were professoors or associate professors. A total of 665 (42%) responders were > 50 years old, 92 (6%) were under 30 years, 339 (21%) were aged between 30 and 40 years and 461 (30%) were aged between 40 and 50 years. The majority of the respondents were located in Marmara (northwestern Turkey; \( n = 613, 39\% \)), or Middle Anatolia or the Aegean region (western Turkey; \( n = 465, 30\% \) and \( n = 248, 15\% \), respectively). The respondents’ workplaces were as follows: government hospitals, \( n = 560, 36\% \); private hospitals, \( n = 445, 28\% \); family health centres (family physicians), \( n = 280, 18\% \); and university hospitals, \( n = 272, 17.5\% \). The medical specialties of the respondents were as follows: internal branches (internal medicine, paediatrics, dermatology, physical medicine, etc.), \( n = 633, 40.7\% \); surgical branches (surgery, orthopaedics, neurosurgery, anaesthesiology), \( n = 532, 34\% \); family physician, \( n = 334, 21\% \); and non-clinical specialties, \( n = 58, 3.7\% \). In total, 265 of the physicians (17.1%) included in the study had contracted COVID-19 (Table 1).

While 43.9% of the participants had received information from the literature and lectures about COVID-19 vaccine types and development technologies, 41% of them had received information from the press and 12% had received information from the Ministry of Health. A total of 1,317 (84.6%) of the participants felt that phase III trials were required before commencing population vaccination programmes, while 156 (10%) felt that accelerated approval was sufficient in this case. A statistically significant relationship was found between the status of the willingness to get vaccinated and gender (\( \chi^2 = 24.331; p < 0.001 \)), professional seniority (years) (\( \chi^2 = 98.417; p < 0.001 \)), the branch (internal and
surgical units versus basic sciences) ($\chi^2 = 15.431; p<0.001$). Bonferroni corrected Post-hoc paired comparisons were made to determine from which group the significant relationship originated (Table 2).

A total of 1,065 (68.4%) respondents were considering COVID-19 vaccination, 374 (24%) were undecided and 118 (7.6%) did not want to be vaccinated Figure 1. The vaccine hesitancy rate was 31.6% in total. A total of 1,140 (73%) physicians felt that COVID-19 vaccines were not different from other vaccines in terms of side effects. While 21 (1.3%) felt that all COVID-19 vaccines were ineffective, 285 (16.6%) responded that they felt they were definitely effective and 1,129 (72.5%) felt that they would have only limited efficacy. Of the physicians who did not want to be vaccinated, 77 (65.4%) cited insufficient scientific data, 20 (17%) cited disease history and immunity against COVID-19, and (7.6%) expressed concerns regarding side effects of the vaccine. A total of 1,043 (57%) respondents were considering vaccinating their families, 416 (26.7%) were undecided, and 98 (6.3%) did not intend to vaccinate their families. The most important factors affecting the decision to choose a particular vaccine included its safety (n = 898, 57.7%), efficacy. The participants were asked which of the currently available vaccines they would consider choosing, and 573 (39.8%) expressed a preference for BioNTech®, while 426 (29.6%) chose Sinovac®, 145 (10%) chose AstraZeneca®, 57 (4%) chose Moderna, 18 (1.2%) chose the Sputnik V vaccine, and 221 (15.4%) stated that they would be comfortable using any of the available vaccine types A statistically significant relationship was found between the status of the willingness to get vaccinated and the factor affecting the choice of vaccine ($\chi^2 = 118.986; p < 0.001$). Bonferroni corrected Post-hoc paired comparisons were made to determine from which group the significant relationship originated. It was determined that the rate of those who preferred the vaccine due to the safety data was higher than all other groups (Table 3).

As a result of the logistic regression analysis based on the status of the willingness to get vaccinated the optimal model is created. In the current model, it was determined that males wanted to get vaccinated 2.051 times more than females (p=0.001). The occupational working time classes was an effective parameter on gender desire to get vaccinated (p <0.05). The participants who worked for 6-10 years wanted to get vaccinated 4.151 times more than those who worked for ≤5 years ( p = 0.004). It was determined that employees working for 11-15 years wanted to get vaccinated 4,800 times more than those who worked for ≤5 years (p=0.001). It has been determined that employees working for> 15 years want to get vaccinated 8,540 times more than those who have worked for ≤5 years (p=0.001).
Participants who did not have Covid-19 wanted to get vaccinated 3,262 times more than those who had Covid-19 (p <0.001). The physicians who knew the vaccine content wanted to get vaccinated 1.944 times more than those who did not know the vaccine content (p=0.033). It was determined that those who intend to vaccinate their family wanted to get vaccinated 27,193 times more than those who were undecided (p <0.001) (Table 4).

4. DISCUSSION

The main purpose of this study was to document and analyse the views of healthcare professionals in Turkey towards COVID-19 vaccines, where ultimately the goal is to minimise anti-vaccination sentiments and prejudices. It will be necessary to determine the views of healthcare professionals regarding vaccines against COVID-19 around the world, to better inform the public and allow promote guidance by health authorities.

This study included 1,557 physicians, most of whom were senior specialists or lecturers, including professors and associate professors, which make the findings presented here more compelling. In addition, the majority of the physicians had 15 years or more of clinical experience.

In a study conducted with 384 non-healthcare professionals in Turkey, the vaccine hesitancy rate was found to be 45.3%. In our study, this rate was 31.6%, which was relatively low. However, considering that healthcare workers are in a higher risk group for COVID-19 than the general population, the vaccine hesitancy rate (31.6%) found in our study may still be higher than expected. A recently published Canadian study supported our prediction. It reported that 19.1% of 2761 healthcare workers who were planned to be vaccinated with the Pfizer-BioNTech mRNA vaccine by government refused to be vaccinated. It was stated that 74% of the healthcare workers who refused to be vaccinated could change their opinions and accept vaccination in the future. Janssens et al. evaluated the vaccine willingness levels before and after the vaccination program in a survey conducted with healthcare workers. In this study, they found that the rate of willingness to vaccinate increased significantly after vaccination compared to before vaccination (63.8% vs. 75.9%). They also showed that the participants' concerns about side effects and long-term harm related to the vaccine decreased significantly after vaccination, and they thought that this situation contributed to the increase of willingness to vaccinate ratio. Similarly, in present study, the reasons given by the majority of physicians for their opposition to vaccination were
the low level of evidence and data quality in vaccine studies. We believe that this rate will decrease with the publication of the results of phase III trials.

Our study determined that having COVID-19 infection is an independent predictive factor that increases vaccine hesitancy. The rate of physicians with COVID-19 infection was 17.1%, and this rate may be one of the other reasons that could explain the high vaccine hesitancy in our study.

Current study showed that among physicians, female gender might be a predictive factor for COVID-19 vaccine hesitancy. Dzieciolowska et al. also obtained similar results in their study with healthcare workers and showed that the vaccine acceptance rate is higher among male healthcare workers.9 Janssens et al. showed that the female gender was significantly associated with a restricted willingness to vaccinate. The results obtained in all these studies suggest that women healthcare workers have a special place in programs aimed at reducing vaccine hesitancy.10

Improving the design of clinical trials for existing vaccines, and sharing the data thereof instead of waiting for the results of new COVID-19 vaccine trials, will reduce the current uncertainty. In our study, the majority of physicians expressed a preference for BioNTech and Sinovac vaccines, and it was striking that the most important factor affecting their preference was safety rather than efficacy data.

One of the limitations of this study was that it included a heterogeneous population of medical doctors from all surgical and internal specialties, rather than being limited to specialties related to COVID-19 treatment. In addition, other healthcare professionals and members of the general population were not included in this study. Dror et al. reported that the rates of vaccine hesitancy were higher among nurses, other medical workers and the general population than among physicians.11 Therefore, studies including these populations are required. The best known COVID-19 vaccines in Turkey (BioNTech, Sputnik V, Moderna, Sinovac, AstraZeneca and Oxford) were listed in the questionnaire.12-16 No other vaccines were listed by name, which may represent a limitation of the study. BioNTech and Sinovac were preferred by most of the respondents. These two vaccines were derived using completely different techniques, and the preference for them was most likely because the health authority provided Sinovac vaccine from China and BioNTech managers were of Turkish origin.
This study was planned before commencement of a COVID-19 vaccination programme in Turkey, and the results revealed varying opinions about the vaccine among physicians; as mentioned above, the prevalence of prejudices and misconceptions will likely be much higher in the general population.\(^{11}\)

5. CONCLUSION

This was the first study to evaluate attitudes towards COVID-19 vaccination among physicians in Turkey. By designing similar studies in other countries and evaluating the attitudes of healthcare professionals therein, health authorities will be able to develop more effective vaccination strategies and public education programmes pertaining to vaccination. Health authorities must take measures to counteract anti-vaccine propaganda. Although trials tend to focus on the efficacy of vaccines, the results of this study indicated that the most important factor affecting the preference for a given vaccine among Turkish physicians is safety.

Figure Legend

Figure 1. Position of physicians and willingness to get vaccinated

Table Legends

Table 1. Characteristic features of the participants

Table 2. Examination of the relationships between the status of the willingness to get vaccinated and some parameters

Table 3. Examination of the relationships between the status of the willingness to get vaccinated and some parameters

Table 4. Logistic Regression model based on the status of the willingness to get vaccinated

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Table 1. Characteristic features of the participants

|              | Sex          | n (%)         |
|--------------|--------------|---------------|
| Male         | 854 (54.8%)  |               |
| Female       | 703 (45.2%)  |               |
| Age (y)      |              |               |
| <30          | 92 (5.9%)    |               |
| 30-40        | 339 (21.8%)  |               |
| 40-50        | 461 (29.6%)  |               |
| >50          | 665 (42.7%)  |               |
| Position     |              |               |
| Assistant    | 92 (5.9%)    |               |
| General practitioner | 333 (21.4%) |               |
| Specialist   | 788 (50.6%)  |               |
| Professor or associate professor | 344 (22.1%) |               |
| Specialty    |              |               |
| Non-clinical specialties (pharmacology) | 58 (3.7%) |               |
| Family physician | 334 (21%)  |               |
| Internal branches (internal medicine, paediatrics, dermatology, physical medicine etc) | 633 (40.7%) |               |
| Surgical branches (surgery, orthopaedics, neurosurgery, anaesthesiology) | 532 (34.2%) |               |
| Regions      |              |               |
| Southeast Anatolia region | 27 (1.7%)  |               |
| Eastern Anatolia region | 58 (3.7%)  |               |
| Black Sea region | 70 (4.5%)  |               |
| Mediterranean region | 76 (4.9%)  |               |
| Aegean region | 248 (15.9%) |               |
| Middle Anatolia region | 465 (29.9%) |               |
| Marmara region | 613 (39.4%) |               |
| Workplace                                      | Count (Percentage) |
|-----------------------------------------------|--------------------|
| University hospital                           | 272 (17.5%)        |
| Family health centre (family physician)       | 280 (18%)          |
| Private hospital                              | 445 (28.5%)        |
Table 2. Examination of the relationships between the status of the willingness to get vaccinated and some parameters

| Willingness to get vaccinated Variables (N=1557) | Yes (n=1065) | No (n=118) | Undecided (n=374) | Statistical analysis* Probability |
|-----------------------------------------------|--------------|------------|------------------|----------------------------------|
|                                         | n, (%)       | n, (%)     | n, (%)           |                                  |
| Gender                                      |              |            |                  |                                  |
| Male                                        | 629 (%59.1)  | 56 (%47.5) | 169 (%45.2)      | $\chi^2=24.331$ p<0.001          |
| Female                                      | 436 (%40.9)  | 62 (%52.5) | 205 (%54.8)      |                                  |
| Status of training                          |              |            |                  |                                  |
| Trainer                                     | 189 (%17.7)  | 11 (%9.3)  | 46 (%12.3)       | $\chi^2=10.200$ p=0.006          |
| Non-trainer                                 | 876 (%82.3)  | 107 (%90.7)| 328 (%87.7)      |                                  |
| Task                                        |              |            |                  |                                  |
| Practitioner                                | 201 (%18.9)  | 32 (%27.1) | 100 (%26.7)      |                                  |
| Assistant                                   | 34 (%3.2)    | 12 (%10.2) | 46 (%12.3)       | $\chi^2=69.715$ p<0.001          |
| Expert                                      | 566 (%53.1)  | 59 (%50.0) | 163 (%43.6)      |                                  |
| Lecturer                                    | 264 (%24.8)  | 15 (%12.7) | 65 (%17.4)       |                                  |
| Age groups                                  |              |            |                  |                                  |
| <30                                         | 28 (%2.6)    | 16 (%13.6) | 48 (%12.8)       | $\chi^2=103.424$ p<0.001         |
| 30-40                                       | 202 (%19.0)  | 37 (%31.4) | 100 (%26.7)      |                                  |
| 41-50                                       | 317 (%29.8)  | 29 (%24.6) | 115 (%30.7)      |                                  |
| >50                                         | 518 (%48.6)  | 36 (%30.4) | 111 (%29.8)      |                                  |
| Professional seniority (years)              |              |            |                  |                                  |
| ≤5                                          | 31 (%2.9)    | 16 (%13.6) | 54 (%14.4)       |                                  |
| 6-10                                        | 78 (%7.3)    | 18 (%15.3) | 43 (%11.5)       | $\chi^2=98.417$ p<0.001          |
| 11-15                                       | 141 (%13.2)  | 21 (%17.7) | 59 (%15.8)       |                                  |
| >15                                         | 815 (%76.6)  | 63 (%53.4) | 218 (%58.3)      |                                  |
| Area of duty                                |              |            |                  |                                  |
| Western regions                             | 604 (%56.7)  | 65 (%55.1) | 192 (%51.3)      | $\chi^2=14.086$ p<0.007          |
| Central regions                             | 410 (%38.5)  | 39 (%33.1) | 162 (%43.3)      |                                  |
| Eastern regions                             | 51 (%4.8)    | 14 (%11.8) | 20 (%5.4)        |                                  |
| Place of duty                               |              |            |                  |                                  |
| Family medicine                             | 173 (%16.2)  | 22 (%18.6) | 85 (%22.7)       |                                  |
| Public Hospital                             | 372 (%34.9)  | 47 (%39.8) | 141 (%37.7)      | $\chi^2=14.464$ p=0.025          |
| Private hospital                            | 319 (%30.0)  | 34 (%28.8) | 92 (%24.6)       |                                  |
| University                                  | 201 (%18.9)  | 15 (%12.6) | 56 (%15.0)       |                                  |
| Branch                                      |              |            |                  |                                  |
| Basic sciences                              | 238 (%22.3)  | 37 (%31.4) | 117 (%31.3)      | $\chi^2=15.431$ p<0.004          |
| Internal units                              | 453 (%42.5)  | 47 (%39.8) | 133 (%35.6)      |                                  |
| Surgical units                              | 374 (%35.2)  | 34 (%28.8) | 124 (%33.1)      |                                  |
| Having the Covid                            |              |            |                  |                                  |
| Yes                                         | 155 (%14.6)  | 43 (%36.4) | 67 (%17.9)       | $\chi^2=36.310$ p<0.001          |
| 910 (%85.4)                                 | 75 (%63.6)   | 307 (%82.1) |                  |                                  |
| Having information about Covid vaccine | Yes, from the literature | Yes, from the press | Yes, from the ministry | No | χ² | p |
|--------------------------------------|-------------------------|--------------------|-----------------------|----|-----|---|
| Yes                                  | 526 (%49.4)             | 47 (%39.8)         | 111 (%29.7)           |    |     |   |
| No                                   | 380 (%35.7)             | 51 (%43.2)         | 209 (%55.9)           |    |     |   |
| Yes, from the ministry               | 147 (%13.8)             | 12 (%10.2)         | 37 (%9.9)             |    |     |   |
| No                                   | 12 (%1.1)               | 8 (%6.8)           | 17 (%4.5)             |    |     |   |
| Asking for more information about the vaccine | χ²=36.310 | p<0.001 |
| Yes                                  | 965 (%90.6)             | 101 (%85.6)        | 355 (%94.9)           |    |     |   |
| No                                   | 100 (%9.4)              | 17 (%14.4)         | 19 (%5.1)             |    |     |   |

*Pearson-χ² cross-tables were used to examine the relationships of the two qualitative variables.*
Table 3. Examination of the relationships between the status of the willingness to get vaccinated and some parameters

| Willingness to get vaccinated Variables                      | Yes (n=1065) | No (n=118) | Undecided (n=374) | Statistical analysis* |
|--------------------------------------------------------------|--------------|------------|-------------------|-----------------------|
| (N=1557)                                                     | n, (%)       | n, (%)     | n, (%)            | Probability          |
| **Opinion about vaccine studies**                            |              |            |                   |                       |
| Uninformed                                                  | 32 (3.0)     | 13 (11.0)  | 26 (7.0)          | $\chi^2$=65.559      |
| Phase 2/3 required                                          | 889 (83.5)   | 99 (83.9)  | 342 (91.4)        | p<0.001              |
| Accelerated approval is sufficient                         | 144 (13.5)   | 6 (5.1)    | 7 (1.6)           |                       |
| **Thinking vaccines have side effects**                     |              |            |                   |                       |
| Yes                                                         | 759 (71.3)   | 109 (92.4) | 332 (88.8)        | $\chi^2$=64.899      |
| No                                                          | 306 (28.7)   | 9 (7.6)    | 42 (11.2)         |                       |
| **Thinking corona vaccines have side effects more than other vaccines** |          |            |                   |                       |
| Yes                                                         | 140 (13.1)   | 72 (61.0)  | 205 (54.8)        | $\chi^2$=321.378     |
| No                                                          | 925 (86.9)   | 46 (39.0)  | 169 (45.2)        |                       |
| **The effect of corona vaccines**                           |              |            |                   |                       |
| Ineffective                                                 |              |            |                   |                       |
| Some are good, some are bad                                 | 49 (4.6)     | 28 (23.7)  | 72 (19.3)         | $\chi^2$=280.362     |
| Limited protector                                          | 774 (72.7)   | 72 (61.9)  | 283 (75.7)        | p<0.001              |
| Effective                                                  | 242 (22.7)   | 4 (3.5)    | 12 (3.1)          |                       |
| **Having family vaccinated**                                |              |            |                   |                       |
| Yes                                                        | 997 (93.6)   | 18 (15.3)  | 28 (7.5)          | $\chi^2$=1775.314    |
| No                                                         | 10 (0.9)     | 76 (64.4)  | 12 (3.2)          | p<0.001              |
| Undecided                                                  | 58 (5.5)     | 46 (39.0)  | 334 (9.3)         |                       |
| **Vaccination advice for patients**                         |              |            |                   |                       |
| Yes                                                        | 1034 (97.1)  | 28 (23.7)  | 92 (24.6)         | $\chi^2$=1141.749    |
| No                                                         | 3 (0.3)      | 31 (26.3)  | 8 (2.1)           | p<0.001              |
| Undecided                                                  | 28 (2.6)     | 59 (50.0)  | 274 (73.3)        |                       |
| **Knowing the vaccine contents**                            |              |            |                   |                       |
| Yes                                                        | 1009 (94.7)  | 99 (83.9)  | 269 (71.9)        | $\chi^2$=143.515     |
| No                                                         | 56 (5.3)     | 19 (16.1)  | 105 (28.1)        | p<0.001              |
| **Preferred vaccine**                                      |              |            |                   |                       |
| Biontech (Pizer-USA)                                       | 390 (36.6)   | 54 (45.8)  | 175 (46.8)        |                       |
| Sinovac (CHINA)                                            | 368 (34.6)   | 20 (16.9)  | 73 (19.5)         |                       |
| Astra zeneca (England)                                     | 87 (8.1)     | 10 (8.5)   | 59 (15.8)         | $\chi^2$=80.990      |
| SPutnik V (Russia)                                         | 6 (0.6)      | 6 (5.1)    | 6 (1.6)           | p<0.001              |
| Moderna (USA)                                              | 44 (4.1)     | 2 (1.7)    | 17 (4.5)          |                       |
| It does not matter                                         | 170 (16.0)   | 26 (22.0)  | 44 (11.8)         |                       |
| **The factor affecting the decision in vaccination choice** |              |            |                   |                       |
| Activity data                                              | 280 (26.3)   | 23 (19.5)  | 70 (18.7)         | $\chi^2$=118.986     |
| Security data                                              | 541 (50.8)   | 78 (66.1)  | 279 (74.6)        | p<0.001              |
| Reaching the vaccine                                       | 208 (19.5)   | 4 (3.4)    | 9 (2.4)           |                       |
| Production place                                           | 34 (3.4)     | 13 (11.0)  | 16 (4.3)          |                       |

*Pearson-$\chi^2$ cross-tables were used to examine the relationships of the two qualitative variables.
Table 4. Logistic Regression model based on the status of the willingness to get vaccinated

| Variables                        | B      | S.E.   | Wald   | p-value | OR    | 95% C.I. (OR) |
|----------------------------------|--------|--------|--------|---------|-------|--------------|
| Gender                           | 0.719  | 0.211  | 11.634 | 0.001   | 2.051 | 1.357 - 3.100|
| Professional seniority (years)   |        |        |        | <0.001 | 1     |              |
| 6-10                             | 1.423  | 0.497  | 8.203  | 0.004   | 4.151 | 1.567 - 10.996|
| 11-15                            | 1.569  | 0.454  | 11.933 | 0.001   | 4.800 | 1.971 - 11.689|
| >15                              | 2.145  | 0.404  | 28.131 | <0.001  | 8.540 | 3.886 - 18.866|
| Having Covid-19                   | 1.182  | 0.278  | 18.041 | <0.001  | 3.262 | 1.890 - 5.630 |
| Knowing the vaccine contents     | 0.665  | 0.311  | 4.563  | 0.033   | 1.944 | 1.056 - 3.576 |
| Having family vaccinated          |        |        |        | <0.001  | 1     |              |
| Yes                              | 5.119  | 0.245  | 43.804 | <0.001  | 27.193 | 10.319 - 70.031 |
| No                               | -0.445 | 0.373  | 1.422  | 0.233   | 0.641 | 0.308 - 1.331 |
| Constant                         | -5.656 | 0.536  | 11.487 | <0.001  | 0.003 |              |

* Reference categories: A: Female; B: ≤5; C: (+); D: No; E: Undecided

CCR = 92.7% \( \chi^2(7) = 6.290; p = 0.506 \)
Task-Willingnes to get vaccinated (%)