Vaccine Hesitancy Against SARS-CoV-2 in Health Personnel of Northeastern Mexico and Its Determinants

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With the emergence of effective vaccines against SARS-CoV-2, the need to find the determinants for its correct distribution is created, with health personnel being an essential group where coverage must be ensured. Materials and Methods: A cross-sectional study was conducted through an electronic survey that was distributed to health personnel in the state of Nuevo Leon, Mexico. Potential determinants for vaccine hesitancy were covered including their intention to be vaccinated against SARS-CoV-2. Results: A total of 543 responses were collected from health professionals, which 30 (5.5%) of the subjects stated that they would reject SARS-CoV-2 vaccination. How well informed the subjects were was the most determining factor, where misinformation related to vaccination and COVID-19 was the most important cause of vaccine rejection. Conclusion: The implementation of educational strategies for health personnel are required.

The global pandemic of the Coronavirus disease (COVID-19) caused by the severe acute respiratory syndrome coronavirus (SARS-CoV-2) has been declared by the WHO1–3 for almost a year ago, having already claimed millions of deaths around the world.4,5 It is a disease with a high mortality rate among older people, and in those with coexisting conditions, such as hypertension, diabetes, and cardiovascular diseases.6,7

MATERIALS AND METHODS

A cross-sectional study was carried out through a survey applied by Google Forms, which was distributed among health personnel in the state of Nuevo Leon, Mexico, from October to December 2020. After providing informed consent, they were questioned about their intention to be vaccinated against SARS-CoV-2 if they had the opportunity, as well as their perception of the risks, benefits and efficacy of the vaccine. Socioeconomic position was also retrieved using a validated scale in the Mexican population.23 Our questionnaire was proposed based on the literature and was validated reaching a statistical value of Cronbach’s alpha > 0.7. A Likert-type scale of 4 points was used to classify the grade of agreement between the statements; then they were divided into two groups for the statistical analysis.

Learning Objectives

- Identify the percentage of health professionals in one Mexican state who say they would reject vaccination against SARS-CoV-2.
- Summarize the findings on determinants of vaccine rejection.
- Discuss the implications for developing effective public health strategies for COVID-19 control.

Highlights

- Hope for an effective vaccine against the SARS-CoV-2 virus has been present since the beginning of the pandemic, with health personnel being the most directly exposed to infection by this disease.
- A total of 543 responses were collected from health professionals, where 5.5% of the subjects stated that they would reject the SARS-CoV-2 vaccination.
- How well informed the subjects were was the most determining factor, where misinformation related to vaccination and COVID-19 was the most important cause of vaccine rejection.

The only viable strategy for the prevention and control of this disease is vaccination. The scientific community has developed many vaccines for human use,8–11 now we need to achieve a successful distribution of the vaccine with the implementation of strategies to attain a herd immunity and for it, its acceptance is of the utmost importance.12–14

Vaccine hesitancy is a concern that would slow vaccine distribution among people;15–17 it arises from safety concerns, disinformation, and mistrust of its effectiveness.17,18 frontline health personnel play a role in vaccine acceptance because they influence people’s decisions by sharing their personal experience with the vaccine.19–22

Vaccination of health personnel is imperative because they are crucial for the management of the large influx of COVID-19 patients, and they can persuade the general population to accept the vaccine. Knowing the determinants for health personnel to accept vaccination against SARS-CoV-2 will help create an effective public health strategy for COVID-19 control.
For the analysis, the subjects were divided into two groups: the health personnel who were planning to be vaccinated and those who were not. A comparative analysis was performed using the chi-square test or Fisher’s exact test for qualitative variables and the Mann–Whitney U test for quantitative variables and the non-parametric quantitative variables. Subsequently, a univariate analysis was performed using a binary logistic regression to find the predictive factors of vaccination rejection, where their odds ratios (ORs) and confidence intervals (95% CI) were obtained. We did not adjust OR’s with other predicting variables because we considered limited our cases of people refusing vaccine. Statistical analysis was performed using the SPSS v26 program. A value of $P < 0.05$ was interpreted as statistically significant.

RESULTS

A total of 543 responses were collected from health professionals, of which 455 (83.7%) belonged to the medical guild; the rest represented nursing, dental, psychology, and laboratory personnel. The majority were women (65%), and the median age was 21 years (range 18 to 69).

TABLE 1. Characteristics of the Population and Predictive Factors for Not Considering Getting Vaccinated

| Characteristics | Consider Getting Vaccinated | Does not Consider Getting Vaccinated | $P$ of $X^2$ | Odds Ratio* |
|----------------|-----------------------------|-------------------------------------|-------------|-------------|
| Age (Q1–Q3)    | 21 (19–23)                  | 23 (20.5–36.5)                     | 0.011       | 1.071 (1.037–1.107) |
| Male gender    | 178 (35.1)                  | 9 (30)                              | 0.568       | 0.746 (0.343–1.620) |
| >40 years old  | 24 (4.7)                    | 5 (16.7)                            | 0.005       | 4.075 (1.435–11.575) |
| <40 years old  | 489 (95.3)                  | 23 (83.3)                           | 0.005       | 0.245 (0.086–0.697) |
| Non-medical guild | 75 (14.6)               | 13 (43.3)                           | <0.0001     | 4.466 (2.083–9.67) |
| Does not have social security | 94 (18.3) | 11 (36.7)                  | 0.013       | 2.581 (1.188–5.604) |
| Socioeconomic status upper class/middle-upper class | 313 (61) | 26 (86.7)                  | 0.009       | 4.153 (1.428–12.079) |
| Refers having children | 48 (9.4)  | 8 (26.7)                  | 0.002       | 3.523 (1.488–8.342) |
| Considers COVID-19 as severe | 452 (88.1) | 18 (60)                  | <0.0001     | 0.202 (0.093–0.441) |
| Considers the vaccine will help prevent Covid-19 | 502 (97.9) | 23 (76.7)                  | <0.0001     | 0.072 (0.026–0.203) |
| Considers that the vaccine will help prevent complications | 502 (97.9) | 24 (80)                  | <0.0001     | 0.088 (0.030–0.257) |
| Considers that the vaccine will lessen his concern about the disease | 475 (92.6) | 17 (56.7)                  | <0.0001     | 0.105 (0.047–0.232) |
| Considers the vaccine dangerous | 59 (11.5) | 22 (73.3)                  | <0.0001     | 21.161 (9.013–49.680) |
| Considers that the vaccine will cause allergic reactions | 159 (31) | 19 (63.3)                  | <0.0001     | 3.846 (1.788–8.271) |
| Considers that the vaccine is worse than the disease | 23 (4.5) | 8 (26.7)                  | <0.0001     | 7.747 (3.116–19.263) |
| The vaccine causes them anxiety and/or fear | 44 (8.6) | 16 (53.3)                  | <0.0001     | 12.182 (5.579–26.601) |
| Considers that the vaccine will help end the pandemic | 499 (97.3) | 21 (70)                  | <0.0001     | 0.065 (0.025–0.168) |
| Considers that the vaccine is needed only in people | 55 (10.7) | 15 (50)                  | <0.0001     | 8.327 (3.862–17.956) |
| with comorbidities | 30 (% )                  | 0.001                                | 12.325 (5.107–29.743) |
| Considers that the vaccine is part of a worldwide conspiracy | 22 (4.3) | 12 (40)                  | <0.0001     | 14.879 (6.384–34.677) |
| Considers that the government should not interfere through vaccination | 148 (28.8) | 14 (46.7)                  | 0.038       | 2.158 (1.027–4.533) |
| They are not willing to get vaccinated if ... | 167 (32.6) | 15 (50)                  | 0.049       | 2.072 (0.989–4.339) |
| Vaccination results painful/uncomfortable | 13 (2.5) | 15 (50)                  | <0.0001     | 38.462 (15.591–94.883) |
| The vaccine has adverse effects | 91 (17.7) | 26 (86.7)                  | <0.0001     | 30.143 (10.270–88.475) |
| Their comments that it is little useful | 18 (3.5) | 15 (50)                  | <0.0001     | 27.500 (11.679–64.751) |
| The vaccine has a monetary cost | 42 (8.2) | 14 (46.7)                  | <0.0001     | 9.812 (4.482–21.484) |
| The vaccination is far from home | 31 (6) | 13 (43.3)                  | <0.0001     | 11.890 (5.298–26.682) |
| Their relatives and/or friends are against vaccination | 22 (4.3) | 14 (46.7)                  | <0.0001     | 19.528 (8.474–45.001) |
| The vaccine is unnecessary, they prefer to generate “natural immunity” | 16 (3.1) | 14 (46.7)                  | <0.0001     | 27.180 (11.352–65.077) |
| Prefer homeopathic medicine over vaccination | 11 (2.1) | 10 (33.3)                  | <0.0001     | 22.818 (8.685–59.951) |
| Vaccination is “unnatural” | 16 (3.1) | 8 (26.7)                  | <0.0001     | 11.295 (4.368–29.209) |
| Medications such as Ivermectin, Hydroxychloroquine, or Dexamethasone | 8 (1.6) | 7 (23.3)                  | <0.0001     | 19.212 (6.414–57.548) |

95% CI, 95% confidence interval; OR, odds ratio; Q1–Q3, quartile 1 to quartile 3.

*Odds ratio for not contemplating getting vaccinated.

* $P$ value from binary logistic regression.

Only 5.5% of the participants stated that they would reject the SARS-CoV-2 vaccine. The characteristics of the groups that intended and did not intend to be vaccinated are shown in Table 1.

In the binary logistic regression analysis, the variables that had a greater association as a risk factor for not considering vaccination were: not wanting to be vaccinated because it could be uncomfortable (OR = 38.462, 95% CI 15.591 to 94.883), that the vaccine could produce adverse effects (OR = 30.143, 95% CI 10.270 to 88.475), that people around them say that the vaccine is not very useful (OR = 27.5, 95% CI 11.679 to 64.751), prefer to generate a “natural immunity” (OR = 27.18, 95% CI 11.352 to 65.077), prefer homeopathic medicine before vaccination (OR = 22.818, 95% CI 8.685 to 59.951), consider that the vaccine is dangerous (OR = 21.161, 95% CI 9.013 to 49.68), among others. Likewise, this rejection increased significantly among older adults (over 40 years of age, OR = 4.075, 95% CI 1.435 to 11.575), among those from the upper-middle/upper economic class (OR = 4.15, 95% CI 1.42 to 12.07), among those with children (OR = 3.52, 95% CI 1.488 to 8.342), and among people not belonging to the

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FIGURE 1. Forest plot of the major predictive variables for not considering vaccination among health personnel. (A) Major risk factors. (B) Protective factors. It is possible to conclude that the major risk factors are directly related to the correct knowledge about vaccination and SARS-CoV-2, while the protective factors are related precisely to the opposite. SARS-CoV-2, severe acute respiratory syndrome coronavirus.
The work presented by Esteves-Jaramillo et al. evaluated the acceptance of the vaccine among health professionals. The results showed that the most common reasons for rejection were: considering that the vaccine will help end the pandemic, thinking that the vaccine will help prevent COVID-19, and believing that the vaccine will reduce their concern about the disease. The study also found that economic class may play a role in vaccine acceptance. We found that those health personnel belonging to the upper-middle/economic class were more likely to refuse to vaccinate.

Economic class may play a role in vaccine acceptance. We found that those health personnel belonging to the upper-middle/economic class were more likely to refuse to vaccinate. This finding is difficult to interpret because the refusal was present only between those of the upper-middle class and not in the upper economic class, and because our survey did not register any response among people with the lowest incomes, where previous studies have shown a high refusal rate.

Gender was not a determinant factor in our population to accept COVID-19 vaccination. A previous study in health personnel found that being male was a protective factor against COVID-19 vaccine hesitancy, while others found gender to be irrelevant. Women show a stronger hesitancy to COVID-19 vaccine in the general population, but this effect seems to weaken among health personnel, and this may be due to better information about vaccines.

Religion in health personnel shows no effect on vaccine acceptance. In a previous study on health personnel just 5% considered religion as a reason to not getting vaccinated, so its effect may be weak.

Our main limitation is age bias, since most participants were less than 30 years old. Selection bias could also be a limitation, since people with negative perceptions of the vaccine may be less likely to answer the survey.

CONCLUSION
Our study takes place within an important historical context in which the Mexican population has been hard-hit by COVID-19. The health sector is expected to be the first to receive the vaccine, and therefore, to evaluate its acceptance and the factors that influence are essential. Factors related to misinformation and a misperception of the risks and benefits of the vaccine were found to be important causes of its rejection. This study is the first to evaluate these factors in Mexico, and it is hoped that their better understanding can help to develop information plans among health personnel, especially in subgroups that were at high risk of refusing the vaccine. Additional studies are needed to understand the determinants of vaccination in different geographic regions.

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