Knowledge and attitude towards the acceptance of vaccination against COVID-19 among healthcare professionals in Morocco

Mohamed Amine Baba 1,2,3 *, Soufiane Bigi 2, Aya Edhaim 1, Hind Bimouh 1, Aziz Naciri 4,5, Abderrahmane Achbani 3,6, Areachk Abderrahmane 7, Ahmed Kharbach 1,7

1 High Institute of Nursing Professions and Health Technics of Agadir, Agadir, MOROCCO
2 Faculty of Medicine and Pharmacy of Agadir, Ibn Zohr University, Agadir, MOROCCO
3 Laboratory of Cell Biology and Molecular Genetics, Department of Biology, Faculty of Sciences, University Ibn Zohr, Agadir, MOROCCO
4 High Institute of Nursing Professions and Health Technics of Laayoune, MOROCCO
5 Multidisciplinary Laboratory in Sciences and Information, Communication and Education Technology, Faculty of Sciences Ben M’Sik, Hassan II University of Casablanca, Casablanca, MOROCCO
6 High Institute of Nursing Professions and Health Technics of Marrakech, MOROCCO
7 Laboratory of Biostatistics, Clinical Research and Epidemiology (LBRC), Faculty of Medicine and Pharmacy of Rabat, Mohammed V University of Rabat, Rabat, MOROCCO
* Corresponding author: Mohamed Amine Baba E-mail: babamedamine2@gmail.com ORCID: 0000-0002-6660-9527
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ABSTRACT

Objectives: To assess the knowledge and acceptance of health professionals in the southern region of Morocco in relation to the anti-COVID-19 vaccines.

Methods: This cross-sectional observational study will make it possible to assess the state of knowledge and acceptance of the vaccine against COVID-19 among health personnel in the prefecture of Agadir Idaoutanane, and to determine the factors influencing them, thanks to a self-administered questionnaire. Vaccine acceptance was determined by individuals who opted for vaccination willingly.

Results: A total of 390 health professionals participated in this study. According to the results, there is a predominance of the female sex with a percentage of 63.2% and a sex ratio equal to 0.57. In addition, more than half of the health personnel participating in this study were between the ages of 20 and 30. 365 health professionals (93.3%) were vaccinated against COVID-19 of which 53.1% chose to be vaccinated of their own free will. Multivariate analysis revealed that age, and the question of the development of immunity to COVID-19 are significantly associated with vaccine acceptance.

Conclusions: These observations are worrying insofar as health personnel have frequent and prolonged contact with patients. Hence the importance of improving their state of knowledge and positively impacting their acceptance of anti-COVID-19 vaccines in order to influence the attitude of their patients and the rest of the population.

Keywords: health professionals, knowledge, acceptance, vaccine, COVID-19
INTRODUCTION

In Wuhan Province of China in December 2019, the novel coronavirus 2019 (COVID-19) caused a severe damage to the lower respiratory tract characterized by dry cough, progressive dyspnea and fever [1, 2]. Subsequently, the virus (SARS-CoV-2) caused a pandemic that was considered as a life-threatening disease [1].

As a result, countries have been forced to impose regulations to restrict contact between individuals, in order to slow the spread of the virus and reduce the risk [3]. Various preventive measures have been implemented, such as hand hygiene and regular disinfection, social distancing, quarantine, confinement and the use of masks … etc. All of these preventive control measures have only flattened the disease curve, while the pandemic continues to grow and mutate with different variants of the virus [4].

Invading every country in the world, it has been found that the end point of this pandemic is either herd immunity or the widespread availability of an effective vaccine [5]. Several COVID-19 vaccines with outstanding safety and efficacy characteristics have been approved for emergency use to prevent the acquisition, spread and halting of severe cases of the virus [6].

Currently, there are thirteen different corona vaccines approved to prevent the spread of the virus [7]. These vaccines can be divided by type (technology) and developers (manufacturers). European Medicines Agency (EMA) and European Commission have approved Pfizer-BioNTech vaccine, Moderna vaccine, AstraZeneca vaccine, Janssen vaccine, Novavax vaccine, and Valneva vaccine in European countries [8].

Despite the diversity and availability of COVID-19 vaccines, the greatest challenge facing vaccines after their development is their acceptance, as vaccine reluctance has been a barrier to vaccination due to doubts about the efficacy and safety of vaccines [9]. World Health Organization (WHO) has considered vaccine hesitancy as one of the top-10 health threats worldwide. In this sense, health professionals are considered as effective vaccine promoters whose willingness to be vaccinated is the key to collective immunity [10].

In many countries, however, a considerable fraction of these professionals are affected by reluctance to be vaccinated, fostered by a lack of confidence in the health authorities. Most health care professionals are not truly experts on immunization: they may share uncertainties about the benefits and safety of vaccines with laypersons, which may negatively affect their own adherence to vaccines that are recommended to protect themselves and their patients. It could also lead to a reluctance to vaccinate in the general population. Hence the need of initial training of health professionals in vaccination [11]. Nevertheless, few studies have been carried out in Morocco on the knowledge of medical staff, nurses and health technicians about the coronavirus vaccine, which led us to conduct this study. The purpose of this study is to evaluate the state of knowledge and acceptance of the COVID-19 vaccine among health personnel in the prefecture of Agadir.

METHODS

Study Design & Setting

Cross-sectional observational study aimed at descriptive, which was carried out at the level of health establishments in the prefecture of Agadir Idaoutanan and which was spread over a period of three months from 1 March 2022 until 30 June 2022.

Study Population

This is a cross-sectional study included healthcare workers (physicians and nurses) at the level of health establishments in the prefecture of Agadir Idaoutanan using both convenient and snowball sampling techniques.

Data Collection

The questionnaire consisted of 60 questions in French divided into two parts; socio-demographic characteristics and state of knowledge and acceptance of the anti-COVID-19 vaccine. Socio-demographic characteristics include gender, age, marital status, number of children, profile, number of years of experience, place of work, smoking status, existence of a chronic disease. The second part includes several questions to assess the level of knowledge of health personnel concerning the anti-COVID-19 vaccine as well as attitudes towards the acceptance of vaccination. The development of the questionnaire was based on a review of the literature and questionnaires used in previous similar studies. Vaccine acceptance was determined by individuals who opted for vaccination willingly.

Statistical Analysis

Quantitative variables were expressed as mean (M) ± standard deviation (SD). The qualitative variables are presented in tables of numbers and frequencies.
Univariate and multivariate logistical regression analyzes were conducted to identify factors associated with the vaccination decision. All independent variables with a p-value < 0.250 in the univariate analysis were considered in the multivariate logistic regression analysis. P-values < 0.050 were considered to indicate statistical significance.

Data management and statistical analysis were performed using the SPSS package for Windows (ver. 13.0; SPSS Inc., Chicago, IL, USA).

RESULTS

A total of 390 health professional participated in the study. According to the results, there is a predominance of the female sex with a percentage of 63.2% and a sex ratio equal to 0.57. In addition, more than half of the health personnel participating in this study were between the ages of 20 and 30 (Table 1). Regarding the profile of respondents, 67.9% were nurses and health technicians, and 32.1% physics. Among 390 health personnel, 52.0% suffer from a chronic illness (13.4%) and 61.6% have already been infected with COVID-19. More than 25.6% declared that one of their relatives has been hospitalized in the intensive care unit following the attack of the virus. Majority said they had not received any training on anti-COVID-19 vaccines (Table 1).

The results of the present study revealed that the majority of healthcare personnel perceive the coronavirus as a serious illness (70.8%), and that 287 assume that COVID-19 is more dangerous than influenza (Table 2). The purpose of vaccination differs according to the level of knowledge of every health professional; 44.2% assume that it is intended to reduce the risk of developing the disease, 47.8% for the purpose of protection against serious forms. In addition, 59.1% stated that the vaccine cannot interact with DNA.

Despite the appearance of virus variants, more than half of the staff affirmed that it is important to be vaccinated with a percentage of 69.6. However, 246 of the respondents declare that the vaccinated does not completely protect against the COVID-19 virus. In addition, 45.8% declare that the information received about the vaccines are not reliable and that the third dose is not currently necessary. Compared to pregnant women, almost half of health professionals perceived that it is dangerous to have them vaccinated (Table 2).

In the present study, the vaccination rate is very high, 365 participants have been vaccinated against COVID-19, which represents a percentage of 93.3%, more than half of whom said it was by vocation and not by summons, with a percentage of 53.1% (Table 2). The following study found very similar results regarding the perception of COVID-19 vaccines; 33.8% of participants suspect the effectiveness of vaccines and 33.5% expect them to be effective in protecting against disease, while 31.5% had no information.

The same goes for the reliability of vaccines; 129 participants appreciated this reliability (33.9%), and 126 do not appreciate it at all (32.2%). However, 49.6% said they have not vaccinated their children against COVID-19. Finally, more than half of respondents said they recommend people to be vaccinated against COVID-19 (Table 2).

Factors Associated with Vaccination Decision

According to univariate logistic regression analysis: age; marital status; perceived vaccine reliability; perceived vaccine efficacy; concern about side effects; and the issue of COVID-19 immunity were significantly associated with the

### Table 1. Sociodemographic & general information of participants

<table>
<thead>
<tr>
<th>Variables</th>
<th>Distribution: n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
</tr>
<tr>
<td>20-30</td>
<td>273 (69.8)</td>
</tr>
<tr>
<td>31-40</td>
<td>58 (14.8)</td>
</tr>
<tr>
<td>41-50</td>
<td>31 (7.9)</td>
</tr>
<tr>
<td>&gt;50</td>
<td>28 (7.2)</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>247 (63.2)</td>
</tr>
<tr>
<td>Male</td>
<td>143 (36.6)</td>
</tr>
<tr>
<td>Profession</td>
<td></td>
</tr>
<tr>
<td>Physician</td>
<td>125 (32.1)</td>
</tr>
<tr>
<td>Nurses &amp; health technicians</td>
<td>265 (67.9)</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>270 (69.2)</td>
</tr>
<tr>
<td>Married</td>
<td>114 (29.2)</td>
</tr>
<tr>
<td>Others</td>
<td>6 (1.5)</td>
</tr>
<tr>
<td>Experience (years)</td>
<td></td>
</tr>
<tr>
<td>0-5</td>
<td>256 (65.5)</td>
</tr>
<tr>
<td>6-10</td>
<td>49 (12.5)</td>
</tr>
<tr>
<td>&gt;10</td>
<td>85 (21.7)</td>
</tr>
<tr>
<td>Chronic disease</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>53 (13.5)</td>
</tr>
<tr>
<td>No</td>
<td>337 (86.4)</td>
</tr>
<tr>
<td>Previously worked in COVID-19 isolation wards*</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>81 (20.7)</td>
</tr>
<tr>
<td>No</td>
<td>306 (78.3)</td>
</tr>
<tr>
<td>Previously infected with COVID-19*</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>241 (61.6)</td>
</tr>
<tr>
<td>No</td>
<td>147 (37.4)</td>
</tr>
<tr>
<td>Family member or friend infected with COVID-19*</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>307 (78.5)</td>
</tr>
<tr>
<td>No</td>
<td>82 (21)</td>
</tr>
<tr>
<td>One of your family or friends hospitalized in COVID-19 resuscitation</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>100 (25.6)</td>
</tr>
<tr>
<td>No</td>
<td>289 (73.9)</td>
</tr>
<tr>
<td>Already followed a training on anti-COVID-19 vaccines*</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>106 (27.1)</td>
</tr>
<tr>
<td>No</td>
<td>276 (72.9)</td>
</tr>
</tbody>
</table>

Note. *Questions with missing answers
### Table 2. Knowledge & attitudes on anti-COVID-19 vaccination

<table>
<thead>
<tr>
<th>Variables</th>
<th>Distribution: n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corona is not a serious illness?</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>110 (28.1)</td>
</tr>
<tr>
<td>No</td>
<td>277 (70.8)</td>
</tr>
<tr>
<td>Corona is more dangerous than influenza</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>278 (71.3)</td>
</tr>
<tr>
<td>No</td>
<td>52 (13.2)</td>
</tr>
<tr>
<td>No answer</td>
<td></td>
</tr>
<tr>
<td>Vaccine against COVID-19 is intended for</td>
<td></td>
</tr>
<tr>
<td>Reduce number of new cases</td>
<td>173 (44.2)</td>
</tr>
<tr>
<td>Protect against serious forms</td>
<td>187 (47.8)</td>
</tr>
<tr>
<td>No answer</td>
<td>30 (8.0)</td>
</tr>
<tr>
<td>Vaccine interact with our DNA</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>125 (31.9)</td>
</tr>
<tr>
<td>No</td>
<td>231 (59.1)</td>
</tr>
<tr>
<td>No answer</td>
<td>34 (9.0)</td>
</tr>
<tr>
<td>It is important to get vaccinated even if</td>
<td></td>
</tr>
<tr>
<td>there are variants</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>272 (69.6)</td>
</tr>
<tr>
<td>No</td>
<td>114 (29.2)</td>
</tr>
<tr>
<td>No answer</td>
<td>5 (1.3)</td>
</tr>
<tr>
<td>Vaccination is important for public health?</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>290 (74.2)</td>
</tr>
<tr>
<td>No</td>
<td>23 (5.9)</td>
</tr>
<tr>
<td>No answer</td>
<td>65 (16.6)</td>
</tr>
<tr>
<td>Do you think that vaccines against COVID-19</td>
<td></td>
</tr>
<tr>
<td>can have serious long-term adverse effects?</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>190 (48.6)</td>
</tr>
<tr>
<td>No</td>
<td>59 (15.1)</td>
</tr>
<tr>
<td>I do not know</td>
<td>139 (35.5)</td>
</tr>
<tr>
<td>You will find information received on anti-</td>
<td></td>
</tr>
<tr>
<td>COVID-19 vaccine is reliable?</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>96 (24.5)</td>
</tr>
<tr>
<td>No</td>
<td>179 (45.8)</td>
</tr>
<tr>
<td>I do not know</td>
<td>115 (29.7)</td>
</tr>
<tr>
<td>Immunity better after a COVID-19 vaccine</td>
<td></td>
</tr>
<tr>
<td>or after a natural infection with COVID-19 ?</td>
<td></td>
</tr>
<tr>
<td>After vaccine</td>
<td>132 (33.8)</td>
</tr>
<tr>
<td>After infection</td>
<td>247 (63.2)</td>
</tr>
<tr>
<td>Do you think vaccines against COVID-19 are</td>
<td></td>
</tr>
<tr>
<td>effective?</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>131 (33.5)</td>
</tr>
<tr>
<td>No</td>
<td>132 (33.8)</td>
</tr>
<tr>
<td>I do not know</td>
<td>123 (31.5)</td>
</tr>
<tr>
<td>Do you think anti-COVID-19 vaccine is</td>
<td></td>
</tr>
<tr>
<td>reliable?</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>129 (33.0)</td>
</tr>
<tr>
<td>No</td>
<td>126 (32.2)</td>
</tr>
<tr>
<td>I do not know</td>
<td>131 (33.5)</td>
</tr>
<tr>
<td>Do you feel fully protected against</td>
<td></td>
</tr>
<tr>
<td>infections of COVID-19 &amp; its variants after</td>
<td></td>
</tr>
<tr>
<td>receiving vaccine</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>62 (15.9)</td>
</tr>
<tr>
<td>No</td>
<td>246 (62.9)</td>
</tr>
<tr>
<td>I do not know</td>
<td>82 (21.2)</td>
</tr>
<tr>
<td>Have you ever been vaccinated against</td>
<td></td>
</tr>
<tr>
<td>COVID-19?</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>365 (93.4)</td>
</tr>
<tr>
<td>No</td>
<td>25 (6.6)</td>
</tr>
<tr>
<td>Your vaccination was by</td>
<td></td>
</tr>
<tr>
<td>Summons</td>
<td>183 (46.9)</td>
</tr>
<tr>
<td>Vocation</td>
<td>207 (53.1)</td>
</tr>
<tr>
<td>Are you worried about side effects of</td>
<td></td>
</tr>
<tr>
<td>COVID-19 vaccine</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>266 (68.2)</td>
</tr>
<tr>
<td>No</td>
<td>77 (19.7)</td>
</tr>
<tr>
<td>No answer</td>
<td>47 (12.1)</td>
</tr>
</tbody>
</table>

### Table 2 (Continued). Knowledge & attitudes on anti-COVID-19 vaccination

<table>
<thead>
<tr>
<th>Variables</th>
<th>Distribution: n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have you vaccinated your children?</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>80 (20.5)</td>
</tr>
<tr>
<td>No</td>
<td>194 (49.6)</td>
</tr>
<tr>
<td>Have you recommended vaccination against</td>
<td></td>
</tr>
<tr>
<td>COVID-19 to your relatives &amp; patients?</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>244 (62.4)</td>
</tr>
<tr>
<td>No</td>
<td>141 (36.1)</td>
</tr>
</tbody>
</table>

Note. *Questions with missing answers

decision to be vaccinated against COVID-19 among health workers.

In multivariate analysis, only age and the question of development of COVID-19 immunity were significantly associated with the decision to vaccinate against COVID-19 among healthcare workers (Table 3).

### DISCUSSION

Vaccination against COVID-19 is still a subject of a global debate, especially among health professionals. The latter play a key role in the success of vaccination programs against COVID-19, because they constitute a high-risk population and immunity within this group will reduce the transmission of the virus within and outside the health care institutions. Moreover, they are considered as a reliable source of information about the vaccines for the general population. Moreover, their attitude towards vaccination will have a direct impact on the attitudes of other individuals.

Based on the analysis of the data collected, the majority of study participants are women (n=247). The dominant age group is between 20 and 30 years old (n=273). Most of them are single (n=270), and more than half of the participants are nurses 67.9%.

In the present study, the majority of health professionals perceive COVID-19 disease as a serious disease (n=277), and more serious than influenza (n=278). More than 70.0% of participants declare the importance of vaccination against the virus despite the appearance of the different variants of the virus and that the majority foresee vaccination as being important for public health in the measure of control and prevention at the pandemic level. This is also the case in a recent study, where the majority of participants said that vaccines are generally safe tools for protecting public health [12].

In the present study, the vaccination rate is very high, 365 participants has been vaccinated against COVID-19, which represents a percentage of 93.3% of which 210 (53.1%) were
Table 3. Factors influencing acceptance of anti-COVID-19 vaccines

<table>
<thead>
<tr>
<th>Variable</th>
<th>OR (95% CI)</th>
<th>p-value</th>
<th>aOR (95% CI)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Participant profile</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physicians</td>
<td>0.970 (0.633-1.485)</td>
<td>0.887</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nurses</td>
<td>1</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>0.725 (0.481-1.104)</td>
<td>0.321</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>1</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20-30</td>
<td>3.860 (1.510-9.810)</td>
<td>0.005</td>
<td>5.627 (1.496-21.160)</td>
<td>0.011</td>
</tr>
<tr>
<td>31-40</td>
<td>2.580 (0.910-7.340)</td>
<td>0.074</td>
<td>2.300 (0.620-8.490)</td>
<td>0.210</td>
</tr>
<tr>
<td>41-50</td>
<td>2.640 (0.830-8.360)</td>
<td>0.970</td>
<td>3.200 (0.790-12.920)</td>
<td>0.100</td>
</tr>
<tr>
<td>&gt;50</td>
<td>1</td>
<td>-</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td><strong>Marital status</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>0.150 (0.016-1.390)</td>
<td>0.096</td>
<td>0.162 (0.015-1.742)</td>
<td>0.130</td>
</tr>
<tr>
<td>Married</td>
<td>0.250 (0.028-2.260)</td>
<td>0.218</td>
<td>0.142 (0.013-1.567)</td>
<td>0.110</td>
</tr>
<tr>
<td>Others</td>
<td>1</td>
<td>-</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td><strong>Chronic disease</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1.126 (0.626-2.027)</td>
<td>0.692</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>1</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Previously infected with COVID-19</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1.190 (0.788-1.797)</td>
<td>0.407</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>1</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Already followed a training on anti-covid vaccines</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1.130 (0.722-1.769)</td>
<td>0.594</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>1</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Do you think anti-COVID-19 vaccine is reliable?</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>0.615 (0.373-1.012)</td>
<td>0.056</td>
<td>0.664 (0.342-1.280)</td>
<td>0.220</td>
</tr>
<tr>
<td>No</td>
<td>1.744 (1.063-2.862)</td>
<td>0.028</td>
<td>1.516 (0.802-2.863)</td>
<td>0.200</td>
</tr>
<tr>
<td>I do not know</td>
<td>1</td>
<td>-</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td><strong>Do you think vaccines against COVID-19 are effective?</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>0.814 (0.494-1.340)</td>
<td>0.418</td>
<td>1.124 (0.580-2.170)</td>
<td>0.730</td>
</tr>
<tr>
<td>No</td>
<td>1.577 (0.962-2.586)</td>
<td>0.071</td>
<td>1.129 (0.590-2.130)</td>
<td>0.700</td>
</tr>
<tr>
<td>I do not know</td>
<td>1</td>
<td>-</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td><strong>Are you worried about side effects of COVID-19 vaccine?</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1.847 (0.962-3.547)</td>
<td>0.065</td>
<td>1.674 (0.828-3.384)</td>
<td>0.150</td>
</tr>
<tr>
<td>No</td>
<td>1.562 (0.735-3.323)</td>
<td>0.246</td>
<td>1.912 (0.848-4.310)</td>
<td>0.110</td>
</tr>
<tr>
<td>No answer</td>
<td>1</td>
<td>-</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td><strong>Immunity better after a COVID-19 vaccine or after a natural infection with COVID-19?</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>After vaccine</td>
<td>0.421 (0.271-0.655)</td>
<td>0.001</td>
<td>0.478 (0.297-0.772)</td>
<td>0.002</td>
</tr>
<tr>
<td>After infection</td>
<td>1</td>
<td>-</td>
<td>1</td>
<td>-</td>
</tr>
</tbody>
</table>

Note: CI: Confidence interval; %: Percentage; OR: Odds ratio (95% CI); aOR: Adjusted odds ratio (95% CI)

vaccinated voluntarily, which indicates a high acceptance of the vaccine among health professionals in the prefecture of Agadir.

These results are identical to two previous studies carried out in Greece and a recent study in Morocco [9, 12, 13]. Contrary to the results of a study carried out in the Republic of Congo, which revealed a very low rate of acceptance of the vaccine (27.7%) among the 613 health personnel [14].

The current study found similar results between participants regarding the perception of COVID-19 vaccines; 33.8% of participants doubt the effectiveness of vaccines and 33.5% expect them to effectively protect against disease, while 31.5% have no information. The same goes for the reliability of vaccines, 129 participants appreciate this reliability (33.0%), and 126 do not appreciate it (32.2%). With the same idea, several previous studies have assessed the perception of the effectiveness and reliability of anti-COVID-19 vaccines. The results revealed a great regional variability [15-17]; high-
income countries were the least sure about the effectiveness of vaccines. Large percentage of respondents in Northern Europe and North America agreed that vaccines are safe, however a lower rate identified in Eastern Europe (50.0%), and Western Europe (59.0%). However, the majority of people in low-income areas agreed that the vaccines are safe and effective, with the highest proportions seen in East Africa (92.0%) and South Asia (95.0%) [16]. The same study shows that more than 63.0% of participants felt that the immunity provided by natural infection is greater than that acquired against COVID-19 disease by vaccination. A contradictory sentiment was reflected in a survey conducted in France, Belgium and Canada, which found that 89.1% of participating healthcare workers opted for vaccine-induced protection over immunity acquired through natural infection [18].

In the present study and following the multivariate analysis, only age and the belief that the acquisition of immunity against COVID-19 through natural infection or by the vaccine were factors significantly associated with the decision to be vaccinated against COVID-19 among healthcare workers. However, in a recent study the only factors that remained significant were the following: being a parent (odds ratio OR=4.19, p=0.003), being a physician (OR=2.79, p=0.040), and treating confirmed/suspect COVID-19 patients (OR=2.87, p=0.036). The deterioration of the economic situation during the pandemic did not affect the results (OR=1.12, p=0.820) [9]. In another study the factors associated with a stronger intention to get a COVID-19 vaccine were younger age, stronger trust, lower complacency and collective responsibility [19]. While another recent study showed that the decision-making process regarding vaccination acceptance may be influenced by perceptions of the risk posed by COVID-19 [20]. The present study did not reveal gender as a predictor of the intention to accept vaccination, however several previous studies observed a positive association between male gender and vaccine acceptance [21-24], which could be due to a predominance of the female sex in our sample.

CONCLUSIONS

The main limitation of this study is the potential selection bias in the sample, with a majority of nurses compared to physicians. Despite the acceptance of vaccines by health professionals estimated by the number of vaccinated by vocation, the effectiveness of the vaccine is questioned. This may be due to the large number of professionals not trained in anti-COVID-19 vaccines. In this sense, continuing education sessions are strongly recommended to improve the knowledge of health professionals. Additionally, further research on knowledge and acceptance of COVID-19 vaccination among the general population is needed to identify potential issues that could affect the achievement of collective immunity against COVID-19 in Morocco.

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Declaration of interest: The authors declare no competing interest.

Data sharing statement: Data supporting the findings and conclusions are available upon request from the corresponding author.

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