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Original Research Article

Acceptability of COVID-19 Vaccination by Doctors: Cross-Sectional Survey from Mohammed VI University Hospital in Marrakech

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Abstract

Covid-19 has rapidly became a major public health crisis. Several public health and containment measures were deployed to contain this epidemy; however, a return to a normal life could only be expected after the generalization of anti-Covid 19 vaccination, allowing a global collective immunity. The success of this campaign depends essentially on the acceptance of the new Covid-19 vaccines. We conducted a descriptive and analytical observational cross-sectional study to evaluate the acceptability of Covid-19 vaccines, among resident and intern doctors at the Mohammed VI University Hospital in Marrakech, to determine the factors associated with vaccine acceptance, and the reasons for hesitation or nonacceptance of vaccination. Out of 145 participants (59.1% female, mean age 26.6 years), 89.7% received the vaccine at least partially. 49% of our population did not delay their vaccination and intended to complete it, so we considered them accepting. However, 40.7% were considered hesitant because of delayed or abandoned Covid-19 vaccination. People living alone and resident physicians in medical or biological specialties were the most likely to accept vaccination. Factors influencing refusal or hesitation included: speed of vaccine development, fear of adverse effects, lack of information on vaccine efficacy, acquisition of natural immunity following previous infection with Covid-19, lack of confidence in the pharmaceutical industry. Doctors' general attitudes towards COVID-19 vaccination, in our study, are positive, but specific concerns about the COVID-19 vaccine are widespread. Addressing barriers to vaccination in these groups will be essential to avoid exacerbating the health inequalities highlighted by this pandemic.

Keywords: COVID-19, vaccine acceptance, vaccine hesitancy, healthcare professionals.

INTRODUCTION

Covid-19 has rapidly became a major public health crisis. It caused over 500 million cases of infection and 6 million deaths worldwide in a two-year period [1]. Several public health and containment measures were deployed to contain this epidemy; however, a return to a normal life could only be expected after the generalization of anti-Covid 19 vaccination, allowing a global collective immunity.

The success of this campaign depends essentially on the acceptance of the new Covid-19 vaccines. Unfortunately, vaccine hesitation remains a public health problem not only among the general population, but even among healthcare professionals.

Morocco was one of the first countries to be convinced of the benefits of vaccination to face the Covid-19. It, therefore, established a vaccine acquisition and development strategy to ensure a collective immunity and it aimed to vaccinate at least 80% of its population [2]. However, this vaccination campaign was subject to rejection and hesitation among a significant proportion of the general population, and even among medical staff, who, despite their exposure to the virus, remained reticent.

We conducted an inquiry to evaluate the acceptability of Covid-19 vaccines, among resident and intern doctors at the Mohammed VI University Hospital in Marrakech, eight months after the deployment of anti-Covid 19 vaccination, to determine the factors associated with vaccine acceptance, and the reasons for hesitation or nonacceptance of vaccination. Since most previous

studies on vaccine acceptance by medical staff were conducted before the availability of vaccines and were focused on the intention of healthcare professionals to be vaccinated; Hence, the interest of our studies.

METHODS

We carried out a descriptive and analytical observational cross-sectional study over a 15-day period from 06 to 22 October 2021, using an anonymous questionnaire developed from similar study forms. The questionnaire was written in French with 28 multiple-choice questions subdivided principally into 4 categories:

- Socio-demographic data: personal and professional characteristics of respondents: sex, age, professional status, specialty, marital status, housing situation, medical history, vaccination history (for viral hepatitis B, influenza and according to the national immunization program NIP).
- Exposure to the Covid-19: personal or family history of infection with Covid19, or death in the family due to this disease, participation in the management of Covid 19, and compliance with sanitary measures.
- Vaccination knowledge: Self-assessment of their information level about Covid19 vaccines and the most commonly used sources of information on this subject.
- Acceptability of anti-Covid 19 vaccines: Anti-Covid 19 vaccination status, vaccination delay, presence of side effects, and reasons for hesitancy or refusal of anti-Covid 19 vaccination.

First, we divided our population into 2 groups according to their SARS-CoV-2 vaccination status:

- Vaccinated: having received at least one dose of Covid 19 vaccine.
- Unvaccinated: Not having received any dose of Covid 19 vaccine

In order to improve our assessment of vaccine acceptance, we defined 3 subgroups in our population:

- Accepting: Any doctor vaccinated against Covid-19 immediately or after given the opportunity.
- Hesitant: Any doctor delaying vaccination or starting Covid-19 vaccination and not intending to complete it.
- Refusing: Any doctor not yet vaccinated at the time of the study.

The questionnaire was distributed in its electronic version by Google Forms link via social networks, particularly the Facebook groups of the target population.

Descriptive results were reported via Google Forms and then reproduced on Microsoft Office Excel 2019. The statistical study was carried out using SPSS software version 25.0.

We performed a bivariate analysis, using the Chi-2 statistical test to compare qualitative variables and the T-test for quantitative variables. The significant value corresponds to a p-value less than 0.05.

RESULTS

I) Descriptive analysis

1. Socio-demographic data

We had 145 participants in our survey, from a total of 726 doctors in formation at the Mohammed VI University Hospital of Marrakech, interns (120) and residents (606), the participation rate was 20%. The mean age of participants was 26.6, with a female predominance (59.1%). Of the 144 respondents, 52.1% were interns and 47.9% were residents. 62.3% of residents were in medical disciplines, while 34.8% were in surgical disciplines and 2.9% in biology. 78.6% of participants were single, 20.7% married and 0.7% divorced. We noted that 57.2% of participants lived with their families or in shared accommodation (6.9%), and only 35.9% lived alone.

In our study, 81.4% had no medical history, the majority of participants were vaccinated against hepatitis B virus (HBV) (71.7%) and only 2.1% of respondents were vaccinated annually against influenza, while 80.6% had never received a flu vaccine, the majority of doctors 93.1% were correctly vaccinated according to the National Immunization Program (NIP).

2. Exposure to Covid-19

We noted a history of Covid-19 in 69.7% of participants, requiring hospitalization in 4% of cases, as well as a family history of Covid-19 in 94% of participants, requiring hospitalization in 28.7% of cases, and leading to death in 29.7% of participants families.

A large proportion of our sample (84.8%) reported having been implicated in the management of Covid-19. However, only 33.1% of doctors reported constant compliance with hygiene and safety instructions concerning Covid-19.

3. Knowledge of Covid-19 vaccines

For the knowledge level about Covid-19 vaccines, 35.9% of our sample felt very well informed about Covid-19 vaccines. 44.8% felt fairly well informed. 18.6% were poorly informed. Only 0.7% of participants were uninformed. Social networks, scientific journals and the media were the most frequent sources of information, with frequencies of: 66.2%, 58.6% and 55.2% respectively. On the other hand, presence or distance medical training courses were less

frequently reported, with respective percentages of 33.8% and 22.1% (Table 1).

Table 1: The different sources of information on Covid 19 vaccination reported by our participants

	Total (n)	Percentage %
Social networks	96	66.2%
Medical journals and articles	85	58,6%
Television/radio/magazines/newspapers	80	55.2%
Distance medical training: Webinar, Zoom meeting	49	33.8%
Entourage: family, friends, neighbors.	32	22.1%
Presential medical training: University Hospital or Faculty of Medicine and Pharmacy or other	31	22,1%

4. Acceptability of the Covid -19 vaccine:

Regarding the acceptability of the Covid 19 vaccine among our respondents, the majority (73.9%) were fully vaccinated, 11.7% had begun vaccination and intended to complete it, 4.1% had begun Covid 19 vaccination and did not intend to complete it, while 10.3% were not yet vaccinated (Figure 1).

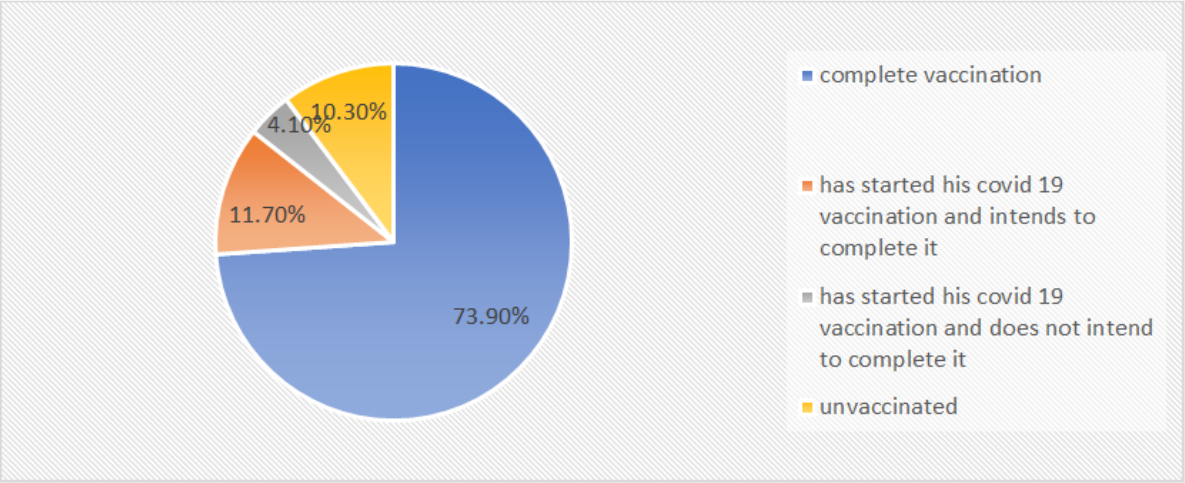

Figure 1: Participants' Covid-19 vaccination profile

Our study revealed a delay of a few weeks for 27.9% of vaccinated doctors and a few months for 14.7%, while 54.7% of vaccinated doctors received the first dose immediately after having had the opportunity (Figure 2).

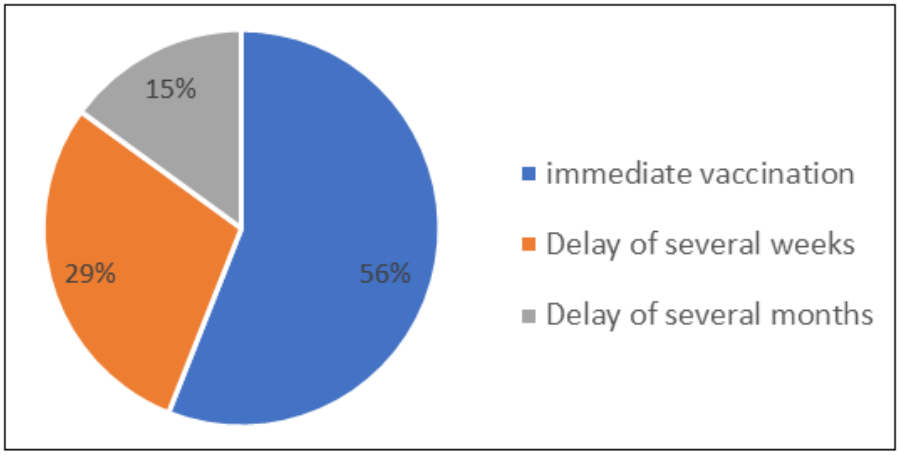

Figure 2: The delay by doctors in anti covid 19 vaccination

In all, 42.6% of participants chose to wait before being vaccinated. For the non-vaccinated, 53% intended to be vaccinated at a later date, 27% were still hesitant to be vaccinated and 20% had no intention of being vaccinated (Figure 3).

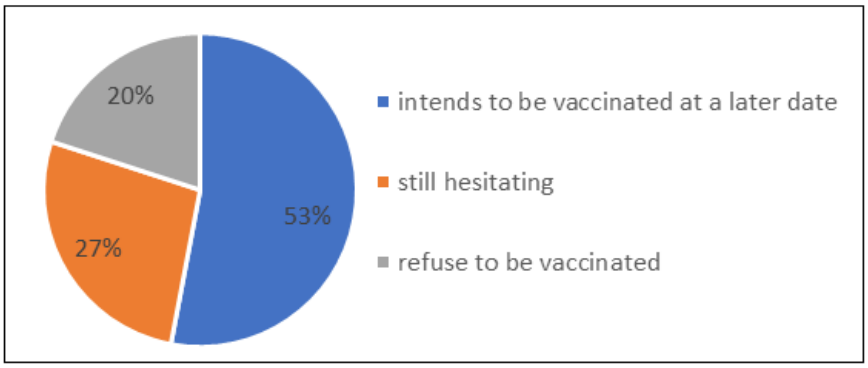

Figure 3: Intention of participants not yet vaccinated to be vaccinated against Covid-19

Concerning side effects of Covid 19 vaccine: 63% of vaccinated physicians reported side effects such as fever, fatigue, headache, muscle aches, chills, diarrhea and pain at the injection site, while only 2% of participants reported severe side effects.

In our study, we collected 38 responses relating to the reasons for hesitation or refusal of SARS-CoV-2 vaccines, they were as follows: the speed of vaccine development in 16%, the fear of side effects in 10%. 8% of doctors felt immunized following a history of Covid-19, 7% did not trust the pharmaceutical industry and 5% found anti-Covid-19 vaccines ineffective, 4% did not feel concerned by vaccination or found Covid-19 safe, pregnancy and fertility concerns were cited in 2% of cases. Finally, fear of injections, lack of time, fear of developing Covid-19 following vaccination and the presence of contraindications were reported by 1% of our participants (Figure 4).

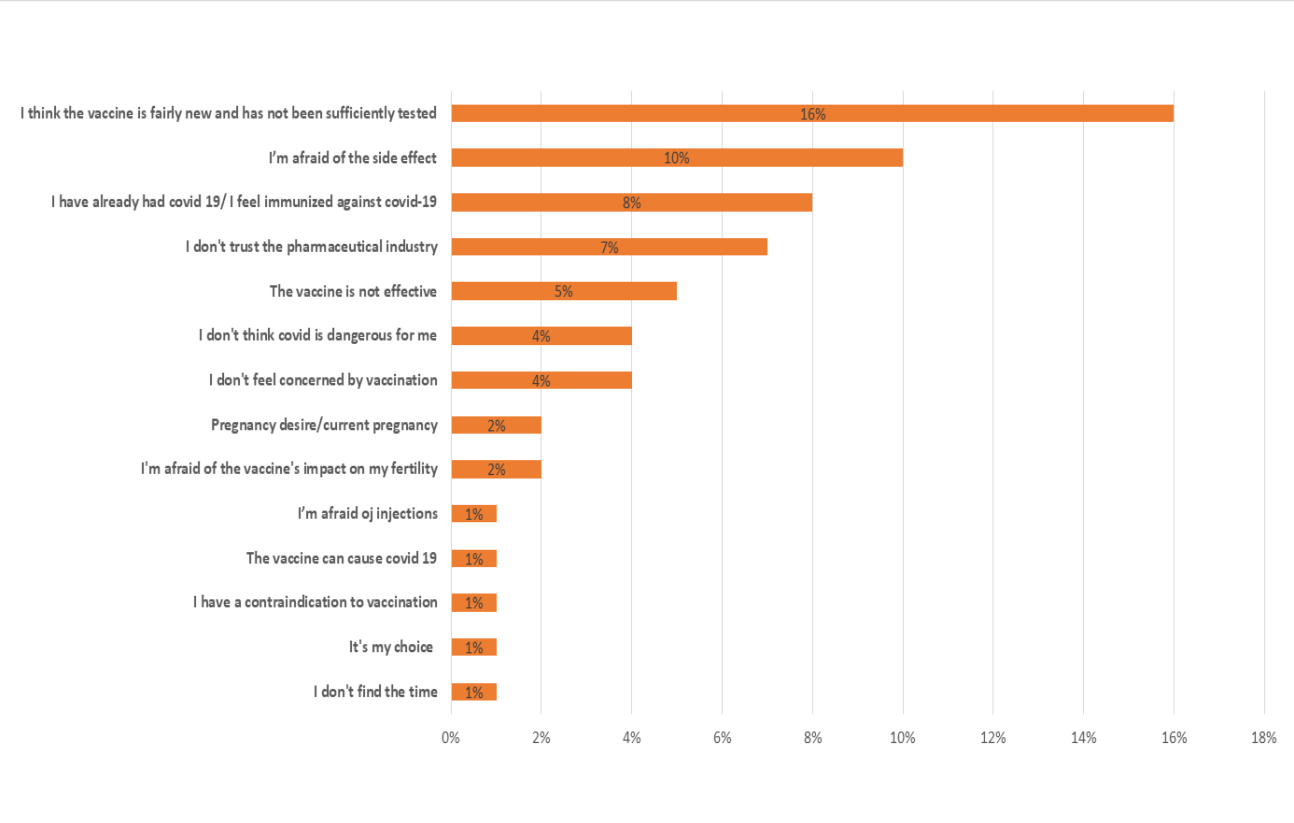

Figure 4: Intention of participants not yet vaccinated to be vaccinated against Covid-19

However, most participants intended to recommend the Covid 19 vaccine to their families (92.1%), and to their patients (92.9%).

II) Determinants of anti-Covid 19 vaccine acceptance:

We compared the various parameters collected from our participants and looked for correlations, to determine the factors associated with Covid 19 vaccine acceptance (Table 2):

Table 2: Factors influencing the acceptability of SARS-CoV-2 vaccines

		Acceptant		Hésitant		Refusant		Significative p-Value
		Number	Percentage %	number	Percentage %	Number	Percentage %	
Epidemiological data								
Sex	**Female**	40	**51.3%**	33	**42.3%**	5	**6.4%**	**0.281**
	Male	25	**46.3%**	21	**38.9%**	8	**14.8%**	
Age	**Overage**	26.8		26.1		28.067		**0.08**
	Ecart-type	2.9		2.7		3.5		
Marital situation	**Single**	53	**46,70%**	50	**45,30%**	11	**8,00%**	**0.351**
	Maried	17	**52,20%**	9	**34,80%**	4	**13,00%**	
Housing situation	**Alone**	31	**59.6%**	19	**36.5%**	2	**3.8%**	**0.004**
	With family	39	**47%**	35	**42.2%**	9	**10.8%**	
	Colocation	1	**10,00%**	5	**50,00%**	4	**40,00%**	
Statut at the university hospital	**Intern**	35	**46.7%**	34	**45.3%**	6	**8%**	**0.35**
	Resident	36	**52.2%**	24	**34.8%**	9	**13%**	
Medical spéciality	**Medecine / Biology**	29	**64,40%**	10	**22,20%**	6	**13,30%**	**0.008**
	Surgery	7	**29,20%**	14	**58,30%**	3	**12,50%**	
Medical history	**At least one antécédent**	13	**48.1%**	8	**29.6%**	6	**22.2%**	**0.06**
	Aucun antécédent		**49.2%**		**43.2%**		**7.6%**	
Hepatitis B vaccination	**Vaccinated**	50	**48.1%**	45	**43.3%**	9	**8.7%**	**0.432**
	Unvaccinated	21	**51.2%**	14	**34.1%**	6	**14.6%**	
Influenzae vaccination	**Regulary Vaccinated or at least one**	11	**39,3%**	14	**50,0%**	3	**10,7%**	**0.518**
	Never vaccinated	59	**50.9%**	45	**38.8%**	12	**10.3%**	
Vaccination according to NIP	**Correctely vaccinated**	68	**50.4%**	55	**40.7%**	12	**8.9%**	**0.058**
	Unvaccinated or ignore his status	3	**30%**	4	**40%**	3	**30%**	

Table 3: Factors influencing the acceptability of SARS-CoV-2 vaccines "Continued"

	Acceptant		Hésitant		Refusant			Significative p-Value
	number	Percentage %	Number	Percentage %	Number		Percentage %	
knowledge about Covid-19 vaccination.								
Level of knowledge about Covid-19 vaccination.	**Well enough informed**	22	**42,30%**	23	**44,20%**	7	**13,50%**	**0.644**
	Fairly well informed	33	**50,80%**	27	**41,50%**	5	**7,70%**	
	No or poorly informed	16	**57,10%**	9	**32,10%**	3	**10,70%**	
Information sources	**Social networks**	49	**51,00%**	38	**39.6%**	9	**9.4%**	**0.743**
	TV, RADIO	42	**52.5%**	29	**36.3%**	9	**11.3%**	**0.482**
Covid 19 exposure								
Participation in the management of Covid19	**Yes**	62	**50,40%**	47	**38,20%**	14	**11,40%**	**0.300**
	No	9	**40,90%**	12	**54,50%**	1	**4,50%**	
Personal history of COVID-19 disease	**Yes**	47	**46,50%**	42	**42%**	12	**11,90%**	**0.410**
	NO	15	**51,70%**	13	**44,80%**	1	**3,40%**	

	Acceptant		**Hésitant**		**Refusant**			**Significative p-Value**
	number	**Percentage %**	**Number**	**Percentage %**	**Number**		**Percentage %**	
Family history of COVID-19 disease	**Yes**	65	**47,8%**	56	**41,2%**	15	**11,0%**	*
	NO	6	**66,7%**	3	**33,3%**	0	**0,0%**	
Personal history of hospitalization related to Covid 19	**Yes**	2	**50,0%**	1	**25,0%**	1	**25,0%**	*
	NO	45	**46,4%**	41	**42,3%**	11	**11,3%**	
-6Family history of hospitalization related to Covid 19	**Yes**	21	**53,80%**	16	**41,00%**	2	**5,10%**	**0.342**
	NO	44	**45,4%**	40	**41,2%**	13	**13,4%**	
Death in the family related to Covid 19	**Yes**	22	**51,2%**	20	**46,5%**	1	**2,3%**	**0.113**
	NO	49	**48,0%**	39	**38,2%**	14	**13,7%**	
Compliance with barrier measures	**Always**	23	**47,90%**	20	**41,70%**	5	**10,40%**	*
	Occasionally	35	**47,30%**	32	**43,20%**	7	**9,50%**	
	Rarely or never	13	**56,50%**	7	**30,40%**	3	**13,00%**	
Post-vaccination side effects and promotion of anti-Covid 19 vaccination								
Presence of post-vaccination side effects	**Yes**	56	**65,90%**	29	**34,10%**	#	#	**0.000**
	No	15	**33,30%**	30	**66,70%**	#	#	
Do you recommend vaccination to your patients?	**Yes**	70	**53,80%**	49	**37,70%**	11	**8,50%**	**0.022**
	NO	1	**10,00%**	8	**80,00%**	1	**10,00%**	
Do you recommend vaccination to your family?	**Yes**	69	**53.5%**	49	**38%**	11	**8.5%**	**0.049**
	No	2	**18.2%**	8	**72%**	1	**9.1%**	

1) Socio-demographic data:

- Our analysis did not reveal any statistically significant difference in anti-Covid 19 vaccine acceptance between the sexes, despite a discreet predominance of acceptance among women (51.3%) compared with men (46.3%).
- The mean ages of vaccine acceptors (26.8 years) and vaccine hesitators (26.1 years) were close to those of vaccine refusers (28.06 years), with no significant statistical difference.
- Housing situation was strongly correlated with vaccine acceptance, with p=0.004 value. The acceptance percentages were as follows:
  - 53% for doctors living alone.
  - 47% for those living with their families.
  - 10% for those living with a roommate.
- Married and single doctors had acceptance percentages of 52.2% and 46.7% respectively, with no significant statistical difference.
- Interns were accepting in 46.7% of cases, and residents in 52.2%. However, medical and biology residents were more likely to accept (64.4%), compared with surgical residents (29.2%); this correlation was statistically significant with a p=0.008 value.
- Medical history as well as vaccination history against influenza, HBV and adherence to NIP were not correlated with vaccine acceptance.

2) Covid-19 exposure:

Personal or family history of Covid-19 or hospitalization for Covid-19 was not associated with vaccine acceptance. The presence of a death in the family related to Covid-19 was not associated with acceptance either.

Doctors involved in the management of Covid-19 (50.4%) were more accepting than those not involved (40.9%), with no significant association.

3) Knowledge of Covid 19 vaccine:

The knowledge level about Covid 19 vaccines, as well as the variability of information sources, did not influence the acceptance of these vaccines.

4) Post-vaccin side effects and promotion of anti-Covid 19 vaccination

Our study showed that acceptors were more likely to report side-effects of SARS-Cov-2 vaccination (65.9%) than hesitants (34.1%), and this association was highly significant.

5) Doctors' intention to recommend Covid 19 vaccination to their families and patients:

Accepting participants were more likely to recommend Covid 19 vaccination to their families (53.5%) and patients (53.8%) than hesitants (38%; 37.7%) and refusers (8.5%; 8.5%).

DISCUSSION

In our study, the proportion of doctors who had received at least one dose of the vaccine was 89.6%, while the proportion of unvaccinated doctors was 10.3%. We therefore report a higher prevalence of vaccination

than reported in the Moroccan population (64.1%) during the same period as our survey (October 2021) [3]. We relate this to the fact that health professionals in Morocco were the first to benefit from Covid 19 vaccine.

The percentage of acceptance of Covid 19 vaccines in our series was: 49%, this finding is close to the literature data. In America, Sekhar *et al*., [4] found an acceptance rate of 36% among healthcare workers, while Gadoth *et al*., [5] found an acceptance rate of 33.2% among healthcare workers in Los Angelos. However, in a study conducted by Dzieciolowska *et al*., [6] in Canada, 80.9% of healthcare workers accepted the Covid 19 vaccination within the first 3 weeks of the vaccination campaign inauguration. Similarly, a national survey by Mazin *et al*., [7] in Saudi Arabia of 1,058 healthcare professionals revealed that 33.3% of respondents had received the vaccine or registered an appointment within 3 weeks of its availability, while 50% of the respondents preferred to wait. However, a study conducted by the same author [8], prior to vaccine availability, found that 52.6% of healthcare workers intended to be vaccinated immediately. We can therefore conclude that intention to vaccinate does not really reflect vaccine coverage or acceptance, this conclusion highlights the interest of our study.

Our study found no correlation between sex and vaccine acceptance. A survey by Dambadarjaa *et al*., of 2875 people in Mongolia found no correlation between intention to vaccinate and the sex of the respondent [9]. On the other hand, Malik et al concluded that female sex favored acceptance of Covid 19 vaccines [10]. While a meta-analysis of anti-Covid 19 vaccine hesitancy among healthcare professionals found that male sex was a positive factor in anti-Covid vaccine acceptance in 71.4% of included studies [11].

Some authors explain this disparity between the sexes by the severity of Covid-19 in men, the greater susceptibility to misinformation observed in women and the fear of the effects of anti-Covid 19 vaccines on pregnancy and fertility [12].

We didn't find any correlation between age and acceptance of SARS-CoV-2 vaccines, since our participants were young, with extremes ranging from 22 to 36. However, the literature describes a strong association between age and vaccine acceptance. The healthcare workers aged over than 50 years were the most adherent to anti-Covid 19 vaccines [13], we generally attribute this to their medical experience, their vulnerability and high associated Covid-19 morbidity and mortality.

In our study, we found an increased acceptability among medical and biology residents (64.4%), compared with surgical residents (29.2%). This is in concordance with the results reported by Malik *et al*., who reported that healthcare professionals with a medical specialty were more accepting (91.9%) compared with their surgical colleagues (83.8%) [10].

We found little agreement in the literature regarding socio-demographic data such as marital status and housing situation. Malik et al concluded that single healthcare professionals were more likely to be vaccinated than their married colleagues [10], while Barry *et al*., found that married healthcare professionals and those living alone were more likely to be vaccinated [8].

In our analysis, we found no statistically significant difference between single and married doctors regarding Covid 19 vaccination, but single doctors were more likely to be vaccinated. In fact, they were vaccinated in 96% of cases and accepting in 59.6% of cases, in contrast to those living with their families (89.2% vaccination and 60% acceptance) and those in shared accommodation (47% vaccination and 10% acceptance).

The absence of a medical history was correlated with covid 19 vaccination. We found that 92.4% of doctors with no medical history were vaccinated, compared with 77.8% of those with at least one history. This may be explained by the vulnerability of those with a history to developing post-vaccination side-effects. However, we found no difference between the vaccine acceptance percentages of participants with at least one medical history (48.1%) and those with none (49.2%).

In the literature, the correlation between acceptance of the Covid 19 vaccine and the presence of a medical history varies according to context. Schrading *et al*., reported that the presence of a medical history was the third most common reason for refusal of the Covid 19 vaccine among healthcare professionals in the US emergency department [14]. While Malik *et al*., associated the presence of chronic diseases, principally diabetes, cancer and heart disease, with vaccine acceptance [10]. In this pakistan study, the healthcare workers who felt most exposed to severe Covid-19 infection were more likely to accept the vaccination.

For the impact of Covid-19 history on vaccine acceptance, the literature describes discordant responses to this hypothesis, according to Martin et al, in the UK, healthcare workers with a history of positive SARS-CoV-2 polymerase chain reaction (PCR) results (64.7%) had significantly lower vaccination rates than those with only negative PCR results (75.2%). This was attributed to the impression that Covid-19 would be naturally immunizing, or, to the delay in vaccination following isolation of seropositive personnel, or to the first recommendations requiring a 28-day delay between any active infection and Covid-19 vaccination [15], these results concord with our study, since vaccine acceptance

among physicians with medical antecedents of covid 19 was 46.5%.

We didn't find any significant difference in vaccine acceptance between participants with a family history of Covid-19, hospitalization or infection-related death. We also found that participants reporting a death in the family were more likely to be vaccinated (90%) than their colleagues without such a history (72%). Similarily, an Asian study of healthcare professionals (China, India, Indonesia, Singapore, Vietnam and Bhutan) found no significant difference in the vaccine intention of individuals whose families did or did not suffer from Covid-19 or its complications [16].

We also noted a low compliance with influenza vaccination in our population: 80.6% of participants had never received a vaccination, 17.4% had been vaccinated at least once, and only 2.1% were vaccinated annually. This variable was not related to vaccine acceptance in our analysis. This agrees with Saied *et al*.,'s study of Egyptian medical students [17].

In the other hand, Shekhar *et al*., reported that influenza vaccination promoted acceptance of SARS-CoV-2 vaccines [4]. Similarly, a Saudi Arabian survey by Barry *et al*., revealed that healthcare personnel immunized against influenza in the previous two years were more likely to receive Covid 19 vaccination (88.4%) [18]. However, influenza vaccination rates in these two studies (USA and Saudi Arabia) were: 97% and 83.9% respectively, so this difference in the adherence to influenza vaccination compared with our study could explain the variability in results in addition to our participants' young age.

In our study, 28.3% of doctors were not vaccinated for hepatitis B virus. This was not related to anti-Covid 19 vaccination. NIP vaccination history was related to SARS-CoV-2 vaccination, with 91.1% of NIP-correctly vaccinated physicians vaccinated against Covid-19, compared with 70% of those who were not or were unaware of their vaccination status. This may reflect the adherence of our participants' families to vaccination in general.

The development of social networks facilitates the propagation of false information about Covid-19 vaccines. A Loomba et al study in the UK and the USA found that exposure to false information reduced willingness to vaccinate against Covid-19, even among people who had already declared an "absolute" intention to be vaccinated [19].

Only 35.9% of our sample felt well-informed about Covid-19 vaccination, 66.2% used social networks as their principal source of information, followed by scientific journals (58.6%), while distance medical training (33.8%) or presential training (22.1%) were the least cited sources . However, we didn't find any correlation between the level of information, the sources used and vaccine hesitancy. Saied *et al*., reported that medical students in their study relied mainly on the media and scientific journals for information about Covid-19 and its vaccines. This study concluded that lack of information about the vaccine and its side effects was a considerable obstacle to vaccination against Covid-19 [17].

It is usually assumed that healthcare professionals have positive attitudes to vaccination. Nevertheless, they are not a homogeneous group, and most of them are not experts in vaccination. Several studies have shown that doctors vaccine acceptance varies according to their education level on the subject [20]. Vaccination hesitancy among healthcare workers could have worrying consequences. A review of the literature revealed that healthcare professionals were more likely to recommend vaccination if they were themselves vaccinated and well-informed about it. This was also confirmed in our study, where we found a strong association between acceptance of Covid 19 vaccination and intention to recommend it to family and patients. This hypothesis has been confirmed by several studies, including those by Shekhar and Verger *et al*., [21].

Several studies carried out before and after vaccine availability investigated the reasons for hesitancy to vaccinate against Covid-19. Shekhar *et al*., found that the most reported reasons by participants were:

- The speed of vaccine development (74%).
- Vaccine efficacy (69%).
- Fear of side effects (69%).
- Lack of trust in information from the US government (46%).

Schrading et al found that vaccine safety, the presence of a medical history, a history of Covid-19 and fertility or pregnancy concerns were the most frequent causes of hesitation [14].

Dzieciolowska *et al*., identified a several reasons for refusal of the Covid 19 vaccine as "important" or "very important" for more than half of their participants [6]. These were essentially:

- The newness of the vaccine (82%).
- Delaying vaccination in order to anticipate side effects (77%).
- Lack of information (74%).
- Lack of time to make this decision (60%).
- Lack of trust in experts and the pharmaceutical industry (35%).
- Covid-19 is sufficient to develop natural immunity (25%) (57).

The results of our survey concurred with the literature, and the reasons for hesitation or refusal were:

- The newness of the Vaccines and not tested sufficiently (16%)
- Fear of side effects (10%)
- Covid-19 is naturally immunizing (8%)
- Lack of confidence in the pharmaceutical industry.

CONCLUSION

Doctors' general attitudes towards COVID-19 vaccination, in our study, are positive, but specific concerns about the COVID-19 vaccine are widespread. Addressing barriers to vaccination in these groups will be essential to avoid exacerbating the health inequalities highlighted by this pandemic.

RECOMMENDATION

At the end of our study, we drew up recommendations to improve vaccine acceptance and overcome the hesitancy of medical staff:

- Provide adequate training and education on the efficacy, safety and necessity of Covid 19 vaccination to physicians, to allow them to offer consistent recommendations to their patients, and address the attitudes and beliefs that contribute to vaccine hesitancy.
- Use a wide range of platforms, including social networks, to simplify communication about vaccine types and their deployment process.
- Assess vaccine hesitancy and confidence in real time.
- Use social, behavioral and communications science data to better target efforts against vaccine hesitancy at individual, interpersonal and organizational levels.
- Respond to people's questions and concerns in the context of immunization-related activities.
- Combating the Covid-19 infodemic by reminding the public to act responsibly and to be well-informed before publishing or sharing information on social networks.

Limitations

- Sample size: the current study sample was from doctors in only one university hospital, and we stopped collecting responses 15 days after launching the questionnaire, following the introduction of the vaccination pass in Morocco, in order to maintain the homogeneity of our population.
- Possibility of selection bias: our study population may not be representative of all doctors, and those who are hesitant would be less likely to respond to the survey

Conflict of Interest: Authors declare no known competing conflicts of interest.

Ethical Considerations:

The research was not submitted to the ethics committee, as it is an opinion poll with no risk for the participants, in reference to the law on biomedical research in Morocco. Throughout the study, we took care to ensure anonymity and confidentiality of data.

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