

Hesitancy and Refusal of the COVID-19 Vaccine Among Healthcare Professionals: A Cross-Sectional Study in a Portuguese Hospital

Hesitação e Recusa da Vacina Contra a COVID-19 entre Profissionais de Saúde: Estudo Transversal num Hospital Português

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ABSTRACT

Introduction: Vaccine hesitancy is recognized by the World Health Organization as a major global health threat. In the context of the COVID-19 pandemic, this issue has taken on unique dimensions. Healthcare professionals are considered one of the most reliable sources of information regarding vaccination. Their stance on immunization is a determining factor in their likelihood to recommend it to others, with potential repercussions for vaccination uptake rates in the general population. This study aimed to characterize the sociodemographic profile of healthcare professionals at a Portuguese tertiary hospital who declined COVID-19 vaccination and to analyze the reasons for hesitancy/refusal and future vaccination intentions.

Methods: A cross-sectional study was conducted in 2021, targeting healthcare professionals eligible for the completion of the primary COVID-19 vaccination schedule. Those who refused vaccination were asked to complete the "COVID-19 Non-Vaccination Questionnaire", which included a multiple-choice question and an open response field regarding reasons for hesitancy/refusal and future vaccination intentions. Variables analyzed included gender, age, and professional category.

Results: Among the 6648 healthcare professionals in the sample, 2.3% (n = 153) declined to complete the vaccination schedule. The average age was 46 years (SD = 11), with the proportion in each age group being 1.2% aged ≤ 35 years, 2.5% aged 36 - 45 years, and 3.1% aged > 45 years. The vaccine refusal rate among all professionals of each gender was 2.3% for females and 2.4% for males. A higher proportion of refusals was observed among healthcare assistants (n = 53, 4.0%) and technical assistants (n = 13, 3.0%). Sixteen reasons for vaccine hesitancy/refusal were identified, with the most frequently reported being fear of adverse reactions (n = 31), insufficient research on vaccines (n = 22), and distrust in vaccine efficacy (n = 25). Only 28.1% (n = 43) expressed an intention to be vaccinated in the future.

Conclusion: A high acceptance rate for the primary COVID-19 vaccination schedule was observed. The likelihood of vaccine refusal was similar between genders but higher among individuals over 45 years and operational support staff. The reasons for vaccine refusal that implied concerns about the vaccine's safety stood out. Further studies are needed to better understand the dynamics underlying vaccine hesitancy/refusal.

Keywords: Attitude of Health Personnel; COVID-19 Vaccines; Vaccination Hesitancy; Vaccination Refusal

RESUMO

Introdução: A hesitação vacinal é reconhecida pela Organização Mundial da Saúde como uma das principais ameaças à saúde global, tendo adquirido contornos singulares no contexto da pandemia da COVID-19. Os profissionais de saúde são reconhecidos como uma das fontes de informação mais confiáveis relativamente à vacinação. A sua posição perante a imunização constitui um fator determinante da sua intenção de recomendar a terceiros, com potencial repercussão na taxa de adesão à vacina na população geral. O objetivo deste estudo foi caracterizar do ponto de vista sociodemográfico os profissionais de saúde de um hospital terciário português que recusaram a vacinação contra a COVID-19 e analisar os motivos da hesitação/recusa e intenção de vacinação no futuro.

Métodos: Estudo observacional transversal conduzido em 2021, cuja população-alvo compreende os profissionais de saúde propostos a completar o esquema vacinal primário contra a COVID-19. Aos que recusaram a vacinação, foi solicitado o preenchimento do "Questionário de Não-Vacinação COVID-19", que incluía uma questão de escolha múltipla e um campo de resposta livre sobre os motivos da hesitação/recusa e a pretensão de vacinação no futuro. Foram analisadas as variáveis 'sexo', 'idade' e 'categoria profissional'.

Resultados: Entre os 6648 profissionais de saúde da amostra, 2,3% (n = 153) recusaram realizar o esquema vacinal completo. A média de idades foi de 46 anos (DP = 11), sendo a proporção, em cada grupo etário de 1,2% com ≤ 35 anos; 2,5% com 36 - 45 anos; 3,1% com > 45 anos. A taxa de recusa vacinal, entre o total de profissionais de cada sexo, foi de 2,3% no sexo feminino e 2,4% no masculino. Uma maior proporção de recusa ocorreu nos assistentes operacionais (n = 53, 4,0%) e assistentes técnicos (n = 13, 3,0%). Observaram-se 16 motivos de hesitação/recusa vacinal, sendo os mais relatados: receio de reações adversas (n = 31), investigação insuficiente das vacinas (n = 22), desconfiança na eficácia das vacinas (n = 25). Apenas 28,1% (n = 43) demonstraram intenção de vacinação no futuro.

Conclusão: Verificou-se uma elevada taxa de aceitação do esquema vacinal primário contra a COVID-19. A probabilidade de recusa vacinal foi semelhante entre ambos os sexos, mas superior em indivíduos com mais de 45 anos e nos assistentes operacionais. Destacaram-se os motivos de recusa vacinal que pressupunham preocupações relativas à segurança da vacina. Estudos adicionais são necessários para melhor compreensão das dinâmicas subjacentes à hesitação/recusa vacinal.

Palavras-chave: Atitude do Pessoal de Saúde; Hesitação Vacinal; Recusa de Vacinação; Vacinas contra COVID-19

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KEY MESSAGES

- Vaccine hesitancy represents one of the major constraints to global health, having assumed unique characteristics in the context of the COVID-19 pandemic due to the development and approval of vaccines in record setting time.
- This study was mainly focused on healthcare professionals, with a crucial role in promoting public trust in vaccination, making the identification and awareness of the factors associated with vaccine hesitancy very relevant in this group.
- Despite concerns related to the emerging introduction of vaccines, there was a high rate of acceptance of the primary vaccination schedule against COVID-19 among the group of healthcare professionals in the study.
- A similar vaccine refusal rate was found in both genders, even though more prevalent in those aged over 45 and in support staff and was mainly related to concerns regarding safety and efficacy of the vaccines.
- The study was carried out in 2021, shortly after the emergency use of vaccines was approved, so the results fall within a specific context and may not reflect current beliefs and attitudes towards COVID-19 vaccines.

INTRODUCTION

Vaccination plays a crucial role in preventing a wide range of infectious diseases and is one of the most effective and cost-effective public health approaches. It is estimated that around two to three million deaths are prevented every year globally.^{1,2}

Vaccine hesitancy emerged and evolved as vaccination has evolved, has been considered as a major constraint to the potential benefits and has been recognised by the World Health Organization (WHO) as one of the 10 leading barriers to global health.² This complex and dynamic entity was defined in 2015 by the WHO Strategic Advisory Group of Experts (SAGE) on immunisation as the delay in accepting or refusing vaccines despite their availability in healthcare systems.³ Its manifestation is influenced by the epidemiological triad including contextual, individual and/or group factors, in addition to factors specific to the vaccines involved.³⁻⁶ According to the “3Cs Model” developed by the SAGE working group, these are determined by (i) confidence in safety and efficacy of the vaccine or the entity that recommends or provides it, (ii) complacency regarding the need for it and (iii) convenience in accessing vaccination.³⁻⁷

As regards the COVID-19 pandemic, caused by the SARS-CoV-2 coronavirus, the issue of vaccine hesitancy has had unique characteristics. The rapid spread of the virus and the subsequent state of global socioeconomic and humanitarian emergency have led to the urgent need for vaccines^{8,9} which have been developed and approved for use at an unprecedented rate.¹⁰ This urgency led to concerns regarding their efficacy and safety profile,^{8,11} shown in vaccine hesitancy during the implementation of vaccination programs, both in general population and amongst healthcare professionals.¹²⁻¹⁴

Healthcare professionals are widely recognised as one of the most reliable sources of information as regards vaccination.^{15,16} The outlook of this group towards this preventive measure is an important determinant of their intention to

recommend it to others, with potential consequences on the vaccine uptake rate in the general population.^{13,16-18} On the other hand, the vaccination of healthcare professionals during the COVID-19 pandemic has played a significant role in improving the overall epidemiological situation by contributing to a reduction in the incidence of infection among these professionals and the chains of transmission to the patients.^{16,17}

Understanding the reasons behind vaccine hesitancy/refusal among healthcare professionals is crucial for the development and implementation of targeted and potentially more effective strategies against this issue.

This study was aimed at characterising from a sociodemographic perspective a group of healthcare professionals working at a Portuguese tertiary hospital and who have refused vaccination against COVID-19, in addition to the analysis of the reasons for hesitation/refusal, and future vaccination intention.

METHODS

This was a cross-sectional observational study involving a group of healthcare professionals working at a Portuguese tertiary hospital and was carried out in 2021.

All the hospital staff were offered the opportunity to complete the primary vaccination schedule against COVID-19, consisting of two doses of the Pfizer-BioNtech® vaccine.

Those refusing one or both doses were asked to complete the “COVID-19 Non-Vaccination Questionnaire” provided by the Occupational Health Department, aimed at identifying the reasons for this decision. The questionnaire was based on a comprehensive review of the literature on the reasons frequently described for vaccine hesitancy/refusal in general and in the specific case of COVID-19.

An item regarding the main causes of vaccine hesitancy/refusal was included and multiple choices were offered, including a free response field, allowing the selection of

more than one option (Fig. 1). The future vaccination intention was also addressed.

A descriptive statistical analysis was carried out, including frequencies and/or percentages for categorical variables and mean and standard deviation for continuous variables. The variables included the respondent's gender, age and occupation. Five occupational groups were considered, including nurses, physicians, support staff, administrative staff, and health technicians (including senior diagnostic and therapeutic technicians, pharmacists, and senior health technicians). The remaining professionals ('others' group), with lower sample representation, included managers, teachers, IT specialists among other occupations.

Logistic regression was used to analyse the association between the sociodemographic characteristics of healthcare professionals and vaccine refusal. Using this statistical model, odds ratio (OR) was obtained for each sociodemographic variable, and 95% confidence intervals (95% CI) were considered. The analysis of the association between occupation and vaccine refusal was adjusted for age (in

years) and gender. The statistical analysis used IBM® SPSS Statistics software, version 29.

All data were anonymised to ensure privacy. The study was approved (CES ULSSJ 35/2024) by the Ethics Committee of the *Unidade Local de Saúde de São João* (Porto, Portugal).

RESULTS

Sociodemographic data of the hospital staff

The hospital staff included a total of 6,648 healthcare professionals (mostly female – 73.8%; average age of 41 - SD = 11.11, including 31.5% (n = 2,092) aged 35 or younger, 30.7% (n = 2,039) aged 36–45, and 37.9% (n = 2,517) aged over 45); the primary vaccination schedule against COVID-19 was offered to the whole staff, including 2,495 nurses, 1,716 physicians, 1,347 support staff, 412 administrative staff, 427 health technicians, and 251 professionals ranked as "others." The sociodemographic data of the hospital staff are shown in Table 1.

Why did not you get vaccinated against COVID-19 yet? Reasons for non-vaccination

- ☐ 1. I believe natural immunity is a better option.
- ☐ 2. I do not trust of the *Serviço Nacional de Saúde*.
- ☐ 3. I do not trust in the pharmaceutical industry.
- ☐ 4. Due to pregnancy/breastfeeding.
- ☐ 5. I fear the adverse effects of vaccines.
- ☐ 6. I think vaccines have not been adequately assessed.
- ☐ 7. I am very dubious about the production process of vaccines.
- ☐ 8. I am very dubious about the efficacy of the vaccine.
- ☐ 9. I believe in group immunity and therefore I do not need to get it.
- ☐ 10. I have medical reasons not to get vaccinated.
- ☐ 11. I have already tested positive for COVID-19.
- ☐ 12. I prefer getting a different vaccine brand.
- ☐ 13. Other reason(s). Which?

Figure 1 – Multiple-choice item of the "Non-Vaccination Questionnaire" "*Questionário de Não-Vacinação COVID-19*" regarding the reason for vaccine refusal

Vaccine refusal and sociodemographic variables

A 2.3% (n = 153) vaccine refusal rate [one (n = 3) or both doses (n = 150)] was found - 112 (73.2%) female - 2.3% rate and 2.4% rate in male staff, respectively. The average age in the group of those who refused was 46 (SD = 10.91). A 1.2% vaccine refusal rate by age group was found for those aged 35 or younger (n = 25), 2.5% for those aged 36 - 45 (n = 51), and 3.1% for those over 45 (n = 77). A 4.0% refusal rate has been found (n = 53) in support staff, 3.6% (n = 15) in administrative staff, 3.0% (n = 13) in health technicians, 1.7% (n = 42) nurses, 1.6% (n = 27) in physicians, and 1.2% (n = 3) in those included as "others" (Table 1).

The probability of refusal increased with age. Those aged 36 - 45 were more than twice as likely to refuse vaccination when compared to the younger group (OR = 2.12; 95% CI 1.31 - 3.44), and the magnitude of the association was greater for those aged over 45 (OR = 2.61; 95% CI 1.66 - 4.11). As regards occupations, and using support staff as a reference, nurses were less likely to refuse vaccination (OR = 0.45; 95% CI 0.29 - 0.69), as were physicians (OR = 0.48; 95% CI 0.29 - 0.77). There was no clear association between gender and vaccine refusal (OR = 1.00; 95% CI 0.69 - 1.44). The association between the sociodemographic characteristics of the participants and vaccine refusal is shown in Table 2.

Reasons for vaccine refusal

Among those who refused vaccination, 26.1% (n = 40) chose not to respond to the "COVID-19 Non-Vaccination Questionnaire," did not select any option in the question regarding the reason for refusal or mentioned that they had no specific reason (free response field).

Regarding the number of reasons given, one reason was given by 51.0% (n = 78) of those who refused vaccination, two reasons by 17.7% (n = 27), and three or more reasons by 5.2% (n = 8).

Sixteen different reasons for vaccine refusal were described, including three that were described in the free response field. The most commonly described reasons for refusal included (i) fear of adverse effects (n = 31), (ii) sub-optimal research on vaccines (n = 22), (iii) mistrust in the effectiveness of vaccines (n = 25), (iv) medical reasons (n = 16), (v) pregnancy or breastfeeding (n = 15), (vi) previous infection with COVID-19 (n = 13), and (vii) preference for natural immunity (n = 11).

The reasons for refusal and their frequencies are shown in Table 3.

Reasons for vaccine refusal and occupation

Mistrust of the effectiveness of vaccines was mostly described by physicians (n = 5) and administrative staff (n = 3), fear of adverse effects was mostly described by support

Table 1 – Sociodemographic characteristics of the total hospital staff and of those who refused vaccination

Variables	Total hospital staff* n (%)	Those who refused vaccination** n (%)	Rate of vaccine refusal*** %
Gender			
Female	4909 (73.8)	112 (73.2)	2.3
Male	1739 (26.2)	41 (26.8)	2.4
Age (years)			
≤ 35	2092 (31.5)	25 (16.3)	1.2
36 - 45	2039 (30.7)	51 (33.3)	2.5
> 45	2517 (37.9)	77 (50.3)	3.1
Occupation			
Physicians	1716 (25.8)	27 (17.6)	1.6
Nurses	2495 (37.5)	42 (27.5)	1.7
Support staff	1347 (20.3)	53 (34.6)	4.0
Administrative staff	412 (6.2)	15 (9.8)	3.6
Health technicians	427 (6.4)	13 (8.5)	3.0
Others	251 (3.8)	3 (2.0)	1.2
Total	6648	153	2.3

*: As a percentage of the hospital staff (n = 6,648)

**: As a percentage of those who refused vaccination (n = 153).

***: Vaccine refusal rate for each of the different variables according to each occupation, obtained as the number of refusals divided by the staff within each occupation, reflecting the impact of vaccine refusal in each group.

Table 2 – Association between the sociodemographic characteristics of the participants and vaccine refusal

	OR	95% CI
Gender		
Female	1	
Male	1.00	0.69 - 1.44
Age		
≤ 35	1	
36 - 45	2.12	1.31 - 3.44
> 45	2.61	1.66 - 4.11
Occupation*		
Support staff	1	
Nurses	0.45	0.29 - 0.69
Health technicians	0.81	0.43 - 1.50
Administrative staff	0.87	0.48 - 1.56
Physicians	0.48	0.29 - 0.77
Others	0.39	0.14 - 1.09

Note: Odd ratio (OR) and 95% confidence intervals (CI) are estimated by logistic regression models.

*: Age-adjusted rates (years) and adjusted to gender.

staff (n = 17) and health technicians (n = 4), while pregnancy or breastfeeding was mostly described by nurses (n = 10).

The characteristics of the reasons for refusal of vaccination according to the occupation of respondents are shown in Table 4.

Table 3 – Reasons for vaccine refusal

Reasons for refusal	n	%*
Preference for natural immunity	11	7.2
Mistrust of the <i>Serviço Nacional de Saúde</i> (Portuguese National Healthcare System)	1	0.7
Mistrust of the pharmaceutical industry	5	3.3
Pregnancy/Breastfeeding	15	9.8
Fear of adverse effects	31	20.3
Suboptimal research on vaccines	22	14.5
Mistrust of the production of vaccines	5	3.3
Mistrust of vaccine efficacy	25	16.3
Belief in group immunity	5	3.3
Medical reasons	16	10.5
Prior COVID-19 infection	13	8.5
Preference for a different vaccine	2	1.3
Scepticism regarding severity of COVID-19	3	2.0
Religious/spiritual beliefs	2	1.3
Mistrust of the vaccine safety	3	2.0
Adverse effect upon the first dose of the vaccine	1	0.7
Undetermined personal reason	40	26.1

Note: Considering that multiple reasons for refusal could have been selected, the sum of the different rates is > 100%.

*: The denominator that was used corresponds to the total of those who refused vaccination (n = 153).

Vaccine hesitancy vs. refusal

Non-vaccination intention was described by 45.1% of the respondents, compared to 28.1% (n = 43) who described a vaccination intention; 4.6% (n = 7) did not know and 22.2% (n = 34) did not respond; 30.4% (n = 34) of the female respondents among the 153 healthcare professionals who refused one or both doses have described their vaccination willingness, compared to 22.0% (n = 9) of male respondents.

A 100.0% (n = 3) vaccination willingness was described by those included in 'others', 46.2% (n = 6) by health technicians, 38.1% (n = 16) by nurses, 22.6% (n = 12) by support staff, 18.5% (n = 5) by physicians and 6.7% (n = 1) by administrative staff.

The distribution of the vaccination intention of healthcare professionals by gender and occupation is shown in Table 5.

DISCUSSION

Vaccination represents one of the most efficient mitigation strategies of COVID-19, reflected into the significantly favourable progression of the pandemic upon its introduction.¹⁹ Even though vaccine hesitancy is not a novelty regarding public health, this issue was enhanced by the unique conditions that have involved COVID-19 vaccines.²⁰

Considering the role of healthcare professionals as the most reliable agents in the promotion of vaccination, vaccine hesitancy could have a negative influence on the remaining population towards vaccines.^{13,15-18}

Table 4 – Reason for refusal by respondents' occupation

	P* n (%)	N* n (%)	SS* n (%)	HT* n (%)	TS* n (%)	O* n (%)	Total** n (%)
Preference for natural immunity	-	3 (7.1)	4 (7.6)	3 (20.0)	1 (7.7)	-	11 (7.2)
Mistrust of the SNS	-	-	1 (1.9)	-	-	-	1 (0.7)
Mistrust of the pharmaceutical industry	-	-	2 (3.8)	1 (6.7)	1 (7.7)	1 (33.3)	5 (3.3)
Pregnancy/breastfeeding	1 (4.4)	11 (26.2)	3 (5.7)	-	-	-	15 (9.8)
Fear of adverse effects	2 (8.7)	5 (11.9)	17 (32.1)	2 (13.3)	4 (30.8)	1 (33.3)	31 (20.3)
Suboptimal research on vaccines	3 (13.0)	4 (9.5)	12 (22.6)	2 (13.3)	1 (7.7)	-	22 (14.4)
Mistrust of the production of vaccines	2 (8.7)	1 (2.4)	1 (1.9)	-	-	1 (33.3)	5 (3.3)
Mistrust of the vaccine efficacy	5 (21.7)	3 (7.1)	14 (26.4)	3 (20.0)	-	-	25 (16.3)
Belief in group immunity	-	1 (2.4)	2 (3.8)	1 (6.7)	1 (7.7)	-	5 (3.3)
Medical reasons	2 (8.7)	5 (11.9)	6 (11.3)	1 (6.7)	1 (7.7)	1 (33.3)	16 (10.5)
Prior COVID-19 infection	2 (8.7)	3 (7.1)	5 (9.4)	-	2 (15.4)	1 (33.3)	13 (8.5)
Preference for a different vaccine brand	-	-	1 (1.9)	-	-	1 (33.3)	2 (1.3)
Scepticism about the severity of COVID-19	1 (4.4)	-	2 (3.8)	-	-	-	3 (2.0)
Religious/spiritual beliefs	-	-	1 (1.9)	-	1 (7.7)	-	2 (1.3)
Mistrust of the vaccine safety	-	1 (2.4)	1 (1.9)	-	1 (7.7)	-	3 (2.0)
Adverse effect upon the 1 st dose of vaccine	-	-	-	-	1 (7.7)	-	1 (0.7)
Undetermined personal reason	11 (47.8)	11 (26.2)	10 (18.9)	5 (33.3)	3 (23.1)	-	40 (26.4)

SS: support staff; AS: administrative staff; N: nurses; P: physicians; O: others; HT: health technicians.

Note: Considering that the participants multiple reasons for refusal could be selected, the sum of the different rates is > 100%.

*: The denominator that was used corresponds to the total of those who refused vaccination within each occupational group.

**: The denominator that was used corresponds to the total of those who refused vaccination (n = 153).

The understanding of the reasons underlying this issue as a starting point towards efficient strategies is therefore crucial.

This study was aimed at the sociodemographic characterisation of the healthcare professionals working at a Portuguese tertiary hospital who have refused to take the COVID-19 vaccine, in addition to the reasons for refusal and the intention of get vaccinated.

Vaccine refusal and the sociodemographic variables

A 2.3% vaccine refusal was found in our study population, in line with most studies of vaccine hesitancy amongst healthcare professionals, showing high rates of accep-

tance.^{13,17,21} Nevertheless, a prevalence rate of vaccine hesitancy ranging from 4.3% to 72% was found in a review including 35 studies from different countries,¹⁷ which may reflect different socio-cultural background and/or data collection in different moments in time.^{22,23} A 15% rate of vaccine hesitancy was found in another study involving 3,295 healthcare professionals from 23 countries, showing a 4% refusal against 24.8% hesitancy found in a study from the same authors involving the general population.¹³

No statistically significant association has been found between gender and vaccine hesitancy, while a higher likelihood of vaccine refusal was found as age increased. These trends were not found in different studies, in which male

Table 5 – Vaccination intention

Vaccination intention*	Yes n (%)	No n (%)	Does not know n (%)	Does not respond n (%)
Gender				
Female	34 (30.4)	46 (41.1)	6 (5.4)	26 (23.2)
Male	9 (22.0)	23 (56.1)	1 (2.4)	8 (19.5)
Occupation				
Physicians	5 (18.5)	13 (48.2)	-	9 (33.3)
Nurses	16 (38.1)	15 (35.7)	2 (4.8)	9 (21.4)
Support staff	12 (22.6)	28 (52.8)	2 (3.8)	11 (20.8)
Administrative staff	1 (6.7)	10 (66.7)	1 (6.7)	3 (20.0)
Health technicians	6 (46.2)	3 (23.1)	2 (15.4)	2 (15.4)
Others	3 (100.0)	-	-	-
Total	43 (28.1)	69 (45.1)	7 (4.6)	34 (22.2)

*: The denominator that was used corresponds to the total of those who refused vaccination (n = 153).

gender and higher age were significantly associated with vaccination willingness.^{13,24,25}

Whenever vaccine hesitancy was analysed according to occupation, results have shown that nurses and physicians had a significantly lower likelihood of vaccine refusal, when compared to support staff. Even though a lower vaccine refusal was found amongst health technicians, administrative staff and other healthcare professionals, when compared to support staff, this was not statistically significant.

Different studies have shown differences regarding vaccination willingness amongst different occupational groups.²⁶⁻²⁹ Lower levels of health literacy were associated to a higher susceptibility to misinformation and mistrust, related to higher vaccine hesitancy.^{25,30-32}

Considering the heterogeneity of occupations included in the 'healthcare professionals' group, different levels of health literacy could exist.³³ Studies have shown that higher education is associated to a lower vaccine hesitancy.³⁴ However, this was not a consistent evidence, as higher levels of education were associated to higher vaccine refusal according to some studies,^{35,36} while a significant relationship between both variables has been found in others.³⁷ In our study, even though the participants' education was not assessed, a higher vaccine refusal has been found in support staff, in whom lower education levels and health literacy are expected. In addition, a revision study has shown that the direct contact with patients affected by COVID-19 was predictive of a higher acceptance of the vaccine by healthcare professionals,¹⁷ showing a significant variability amongst different occupations and even within the same occupational group, according to the type of hospital department or to the specific work. Medical profession was also significantly associated to a positive attitude towards vaccines,^{13,38} in line with what has been found in this study.

Reasons for vaccine refusal

In the present analysis,¹⁶ different reasons for vaccine refusal were described. Fear of adverse drug reactions, insufficient research on vaccines, distrust regarding efficacy, medical reasons, pregnancy or breastfeeding, previous COVID-19 infection, and preference for natural immunity were mostly described.

The different reasons for refusal can be grouped into broader categories, in line with other studies, including concerns about safety and efficacy, devaluation of the need for vaccination, systematic distrust, spiritual/religious beliefs, among others.^{20,39}

Vaccine safety

Concern regarding vaccine safety is one of the factors most frequently described underlying COVID-19 vaccine hesitancy.³⁹⁻⁴¹

The rapid development and emerging approval of vaccines, in addition to the belief that recent mRNA technology has not been sufficiently researched have contributed to these concerns.^{13,20,39,42,43} In this context, many healthcare professionals chose to postpone vaccination until more data on its safety were available.^{39,44} In the present study, insufficient research on the vaccine (n = 22) and uncertainty about the vaccine production process (n = 5) were described as reasons for vaccine refusal.

Among the reasons related to distrust regarding vaccine safety, issues related to adverse effects, comorbidities, and pregnancy or breastfeeding were often described.^{25,39}

Fear of adverse effects (n = 31) was mostly described in the present study. This concern was often described as one of the main causes of vaccine refusal, both in the general population and among healthcare professionals.^{17,33,45} The lack of studies on long-term adverse effects was

presented as the main cause for this concern.⁴² In addition, the experience of adverse effects in the context of previous COVID-19 vaccination was a predictor of the refusal of a booster dose.⁴⁶

Medical reasons ($n = 16$) were another significant issue in vaccine refusal. The immunisation of patients with underlying medical conditions is a complex issue arising from the balance between increased susceptibility to COVID-19 in these patients and concerns about the potential impact of the vaccine on the disease,⁴⁷ with mixed evidence in literature on the relationship between health status and vaccination intention.⁴⁸

Despite the Centers for Disease Control and Prevention's recommendations regarding COVID-19 vaccination in pregnant or breastfeeding women,⁴⁹ this was considered in this analysis of vaccine refusal ($n = 15$). A systematic review showed that the major determinants of vaccine hesitancy in this population include the lack of sufficient information and concerns about safety for both mother and child.⁵⁰

Vaccine efficacy

Mistrust in vaccine efficacy, a concern frequently described in literature,¹⁷ particularly regarding durability of the immunity,⁵¹ was significantly included among the reasons indicated by healthcare professionals at the hospital under analysis ($n = 25$).

Unnecessary vaccination

The perception that the COVID-19 vaccine is unnecessary is one of the reasons for lower vaccine uptake among the general population and healthcare professionals,^{20,52} arising from aspects related to the disease and individual factors.⁴⁹ Previous COVID-19 infection ($n = 13$), the preference for natural immunity ($n = 11$), or belief in herd immunity ($n = 5$) were among the reasons described by those who refused the vaccine, frequently associated with the belief that the vaccine is unnecessary.^{14,53-55} A study involving over 65,000 healthcare professionals in the United States found a statistically significant lower vaccination rate among individuals with previous SARS-CoV-2 infection.⁵⁶ This can be attributed to a perception of greater protection against COVID-19 among these individuals.³⁹

Scepticism about the potential severity of COVID-19 ($n = 3$) was also present. Studies have shown that a reduced perception of risk is predictive of lower adoption of preventative behaviours and a greater tendency to take risks,⁴¹ which is more evident among young, healthy individuals or those with previous COVID-19 infection associated with mild symptoms.²⁰

Systemic mistrust

Distrust of the *Serviço Nacional de Saúde* (National

Health Service) ($n = 1$) or pharmaceutical companies ($n = 5$) was also among the reasons for vaccine refusal. Distrust of the integrity of organisations and institutions involved in regulating and promoting vaccination—namely government agencies, the pharmaceutical industry, and the healthcare system in general—has been previously described, due to suspicions of subversion by these entities in pursuit of secondary economic gains.^{20,39,57} The recommendation of booster doses of the vaccine also seems to have contributed to this perception.³⁹

Religious/spiritual beliefs

Religious and/or spiritual beliefs were also evoked among healthcare professionals ($n = 2$), an aspect often cited when the moral cost of vaccination is perceived to outweigh the potential health benefits.^{56,58}

Future vaccination intention

As regards vaccination intention, only 28.1% of the respondents said they were willing to do so. Vaccine hesitancy or refusal can be overturned by measures reducing constraints to acceptance,¹³ improving the outcomes of strategies targeting specific populations and concerns.⁵⁹ Vaccination intention has increased over time, and this trend is expected to continue, together with the continuous updating of information on vaccine safety and efficacy.^{13,39}

Study limitations

This study has some limitations. The short sample size and the fact that a single hospital was involved do not allow the representativeness in healthcare professionals. In addition, sharing the same workplace may encourage inter-peer dissemination of opinions and positions among peers, introducing a potential selection bias.

On the other hand, the study was carried out in 2021, shortly upon the emergency use of vaccines was approved. Therefore, the results reflect a specific moment in time and may not reflect current beliefs and attitudes regarding COVID-19 vaccines.

The multiple-choice format chosen for the questionnaire may have influenced the responses regarding the reasons for vaccine refusal.

It was also found that a significant percentage of participants did not specify the reason for vaccine refusal, which may have influenced the relative frequencies obtained for the different reasons given, limiting the comprehensive interpretation of results. In addition, the study was conducted over one year, so changes in respondents' positions and perceptions regarding vaccination that may have occurred subsequently were not assessed. It is therefore unknown whether the vaccination intention at the time of the study corresponds to the attitude assumed.

Practical implications

Considering the relevance of vaccine hesitancy among healthcare professionals, strategies for the dissemination of information, reducing misinformation, and promoting greater acceptance of vaccination in this group are very relevant. The active involvement of heads of department and other institutional leaders, as well as occupational health departments, could have a central role in strengthening confidence in vaccination. Approaches based on open dialogue, respect for individual experiences and concerns, and the sharing of scientific evidence should be encouraged. Personalised interventions tailored to the most hesitant groups and different levels of health literacy should be prioritised, focused on building transparent and honest communication acknowledging and explaining any potential side effects of vaccines. It is also crucial to highlight the role healthcare professionals play as models of vaccine adherence, emphasising that their decisions and behaviours have a direct impact on public confidence and serve as an example to society. In addition, the dissemination of educational materials aimed at increasing vaccination literacy—through internal communication channels, posters, leaflets, and lectures—could reinforce acceptance and contribute to the greater success of vaccination campaigns.

CONCLUSION

A high acceptance rate for the primary COVID-19 vaccination schedule has been found among our group of healthcare professionals. A similar rate of vaccine refusal was found regarding gender, even though higher rates have been found in respondents aged over 45 and in support staff.

Different reasons for vaccine refusal were found, particularly those involving concerns about vaccine safety. Undervaluing the need for the vaccine and doubts regarding effectiveness were also common. Less than one-third of the participants acknowledged their intention to get vaccinated. The changing landscape of the COVID-19 pandemic and the increasing availability of information about vaccines may have changed the vaccine hesitancy reality

found in this study. Given the limitations of this study, further research aimed at understanding the dynamics underlying vaccine refusal could be relevant. The development of actions based on objective data and therefore tailored to the target audience, will enable more effective responses in similar contexts.

AUTHOR CONTRIBUTION

VT: Study concept and design, data acquisition, analysis and interpretation, writing of the manuscript.

JA: Critical statistical data analysis, writing of the manuscript.

PM, PP: Study design, data collection.

SM, MM: Writing and critical revision of the manuscript.

RR: Writing and critical revision of the manuscript.

SP: Writing of the manuscript.

FS, CA: Literature revision, writing and critical revision of the manuscript.

PN: Study design, critical revision of the manuscript.

The final version for publication was approved by all the authors.

PROTECTION OF HUMANS AND ANIMALS

The authors declare that the procedures were followed according to the regulations established by the Clinical Research and Ethics Committee and to the 2024 update of the Helsinki Declaration of the World Medical Association.

DATA CONFIDENTIALITY

The authors declare having followed the protocols in use at their working centre regarding patients' data publication.

COMPETING INTERESTS

The authors declare not having any conflicts of interest related to the manuscript.

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