Vaccine hesitancy among healthcare professionals at a university hospital

Hesitação vacinal entre profissionais de saúde em hospital universitário

Indecisión a las vacunas entre profesionales de la salud en un hospital universitario

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Abstract

Objective: To analyze the factors associated with vaccine hesitancy among healthcare professionals at a university hospital.

Methods: This is a cross-sectional, descriptive and analytical study, developed at a federal university hospital in Pernambuco, between June and November 2022, with institution healthcare workers with high school and higher education. The predictor variables socioeconomic and occupational aspects, history of vaccine reactions, fears related to vaccines and aspects of 3Cs model (confidence, compliance, convenience) dimensions with the outcome vaccine hesitancy, defined as delay or refusal of vaccination, despite the availability of this service, were analyzed. Binary logistic regression was used, according to the stepwise backward method, to verify associations ($p < 0.05$).

Results: A total of 283 healthcare workers participated, with vaccine hesitancy being statistically associated with fear of Events Supposedly Attributable to Vaccination or Immunization (OR: 2.047; CI: 1.165-3.595; $p = 0.013$), having something happen that made them disbelieve in vaccine effectiveness (OR: 2.964; CI: 1.265-6.944; $p = 0.012$) and immunobiological agent availability in the health unit to update the card (OR: 0.314; CI: 0.136-0.723; $p = 0.006$).

Conclusion: It was observed that: fear of Events Supposedly Attributable to Vaccination or Immunization increases the chance of vaccine hesitancy by two times; the fact that something happened that led to disbelief in vaccine effectiveness increases it by almost three times; and immunobiological agent availability in the health unit to update the card reduces the occurrence of this phenomenon.

Resumo

Objetivo: Analisar os fatores associados à hesitação vacinal entre os profissionais de saúde de um hospital universitário.

Métodos: Estudo transversal, descritivo e analítico, desenvolvido em um hospital universitário federal de Pernambuco, entre os meses de junho e novembro de 2022, com trabalhadores de saúde da instituição com formação de nível médio e superior. Foram analisadas as variáveis preditoras aspectos socioeconômicos, ocupacionais, histórico de reação vacinal, medos relativos às vacinas e aspectos das dimensões do modelo dos 3Cs (confiança, conveniência e complacência) com o desfecho hesitação vacinal, definido como atraso ou recusa da vacinação, apesar da disponibilidade desse serviço. Utilizou-se a regressão logística binária, segundo o método *stepwise backward*, para verificar as associações ($p < 0,05$).

Resultados: Participaram 283 trabalhadores de saúde, sendo estatisticamente associados à hesitação vacinal o medo de eventos supostamente atribuíveis à vacinação ou imunização (OR: 2,047; IC:1,165-3,595; p =

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0,013), ter acontecido algo que os fizesse desacreditar na eficácia das vacinas (OR: 2,964; IC: 1,265-6,944; p = 0,012) e disponibilidade do imunobiológico na unidade de saúde no momento da atualização do cartão (OR: 0,314; IC: 0,136-0,723; p = 0,006).

Conclusão: Observou-se que o medo de eventos supostamente atribuíveis à vacinação ou imunização aumenta em duas vezes a chance de hesitação vacinal; que ter acontecido algo que fizesse desacreditar na eficácia das vacinas eleva em quase três vezes; e que a disponibilidade do imunobiológico na unidade de saúde no momento da atualização do cartão diminui a ocorrência desse fenômeno.

Resumen

Objetivo: Analizar los factores asociados a la indecisión a las vacunas entre profesionales de la salud de un hospital universitario.

Métodos: Estudio transversal, descriptivo y analítico, llevado a cabo en un hospital universitario federal del estado de Pernambuco, entre los meses de junio y noviembre de 2022, con trabajadores de la salud de la institución, cuya formación era de nivel medio y superior. Se analizaron las variables predictoras aspectos socioeconómicos, ocupacionales, antecedentes de reacciones a vacunas, miedos relacionados con las vacunas y aspectos de las dimensiones del modelo de las 3C (confianza, conveniencia y complacencia) con el resultado indecisión a las vacunas, definido como retraso o rechazo a la vacunación, a pesar de la disponibilidad del servicio. Se utilizó la regresión logística binaria, de acuerdo con el método *stepwise backward*, para verificar las relaciones (p<0,05).

Resultados: Participaron 283 trabajadores de la salud. La indecisión a las vacunas se relacionó estadísticamente con el miedo de eventos supuestamente atribuibles a la vacunación o inmunización (OR: 2,047; IC:1,165-3,595; p = 0,013), con algún hecho que los hiciera desacreditar de la eficacia de las vacunas (OR: 2,964; IC: 1,265-6,944; p = 0,012) y con la disponibilidad del inmunobiológico en la unidad de salud en el momento da la actualización del carnet (OR: 0,314; IC: 0,136-0,723; p = 0,006).

Conclusión: Se observó que el miedo de eventos supuestamente atribuibles a la vacunación o inmunización aumenta dos veces la probabilidad de indecisión a las vacunas, que la existencia de algún hecho que los hiciera desacreditar de la eficacia de las vacunas eleva casi tres veces la indecisión y que la disponibilidad del inmunobiológico en la unidad de salud en el momento da la actualización del carnet disminuye la incidencia de este fenómeno.

Introduction

In 2023, the Brazilian National Immunization Program (PNI - *Programa Nacional de Imunização*) completed 50 years and, over this time, it has consolidated itself as an important public health strategy in Brazil, recognized for its capillarity throughout the national territory and alignment with the Brazilian Health System (SUS – *Sistema Único de Saúde*) principles. The PNI was responsible for eradicating polio, eliminating rubella, congenital rubella syndrome and neonatal tetanus, in addition to reducing the occurrence of other communicable diseases, such as diphtheria, tetanus and pertussis.[1]

Despite advances, since 2016, Brazil has recorded low vaccination coverage rates (VCR), similar to those found in the 1980s, which has led to the resurgence and imminent risk of reintroduction of diseases already controlled or eradicated,[1-3] a fact aggravated by the COVID-19 pandemic.[4,5]

Among the main reasons for drop in coverage, we can mention: the complexity of the PNI national vaccination calendar; temporary reductions in vaccine supply; difficulties in managing the PNI information system; access barriers due to restrictions on the time and location of vaccination rooms; underfunding of SUS; number of healthcare professionals below demand and with insufficient training; fake news; low perception of disease risk; lack of confidence in vaccine effectiveness; previous negative experience; fear; influence of leaders; and vaccine hesitancy.[6,7]

The Strategic Advisory Group of Experts on Immunization (SAGE), a group of the World Health Organization (WHO), defines the phenomenon of vaccine hesitancy as the delay or refusal of vaccination, despite the availability of this service. It is considered a complex and context-specific event that may vary depending on time, vaccine and location.[8] This group of experts proposed a model for analyzing vaccine hesitancy called "3Cs": complacency (not perceiving diseases as high risk and vaccination as necessary); confidence (lack of confidence in vaccine safety and effectiveness); and convenience (physical availability, geographic accessibility, understandability and quality of immunization services).[8]

Healthcare professionals have the potential to influence vaccination adherence by healthcare service users.[6,9,10] However, the literature points out that recommendations given to patients are more frequent when they trust in their ability to communicate about the risks and benefits and in official sources of information about vaccines, being dependent on their own behavior, attitudes and knowledge about the vaccine safety and efficacy of

these immunobiological agents.[10,11] Societal endorsement, peer support, and patient or caregiver willingness also influence healthcare professionals' confidence in vaccines and willingness to recommend them.[10]

A synthesis study of systematic reviews and meta-analyses on vaccine hesitancy for COVID-19 among healthcare professionals pointed out multifactorial determinants associated with this phenomenon, such as sociodemographic factors (e.g., female sex, black race, lower education, low income), occupational factors (e.g., nurse and nursing assistant categories), health factors (e.g., having chronic health conditions), factors related to vaccine (e.g., being afraid of long-term effects), factors related to lack of confidence (e.g., in the government, in vaccine manufacturers and health authorities) and factors related to information (e.g., lack of sufficient knowledge about the vaccine).[12] A national study that investigated the association between the determinants of the 3Cs model and influenza vaccine hesitancy among healthcare workers observed that the lower the confidence and the greater the complacency, the greater the influenza vaccine hesitancy.[13]

Furthermore, it should be noted that healthcare professionals' immunization is a comprehensive part of occupational health control programs, due to this category's increased risk of exposure to infectious biological agents, constituting a necessary measure for their protection and that of their clientele.[14] As vaccine hesitancy varies depending on the location, it is plausible to think that healthcare workers working at a teaching hospital setting would have a less hesitant attitude, due to the risk of contamination by such agents and the possible influence they exert.

Considering the above and the fundamental role they play in encouraging the population to adhere to vaccination, in addition to the scarcity of national studies that address vaccine hesitancy issues among healthcare workers and the setting chosen for this investigation (teaching hospital), this study aimed to analyze the factors associated with vaccine hesitancy among healthcare professionals at a university hospital (UH).

Methods

This is a cross-sectional study, of quantitative in nature, with descriptive and analytical objectives, guided by the STrengthening the Reporting of OBservational studies in Epidemiology (STROBE) initiative, developed at a federal UH in the state of Pernambuco with a profile for teaching, research and innovation. It provides outpatient and inpatient care in various specialties, and has Intensive Care Units (adult, surgical and neonatal), surgical, obstetric and dialysis centers, totaling 418 beds. In the pediatric outpatient clinic, there is a vaccination room that assists employees, patients and the general population. Since 2014, it has been managed by a public company that provides hospital services.[15]

The study population was made up of healthcare workers from the institution aged 18 years or older and with high school and higher education (nurses, doctors, physiotherapists, social workers, nutritionists, pharmacists, psychologists, occupational therapists, nursing technicians, nutrition technicians, nursing assistants and radiology technicians). Technical-administrative professionals were excluded.

For the sample calculation, a population of 2,195 workers was considered (1,120 with high school and 1,075 with higher education). Among them are employees of the university and the company providing hospital services, with a frequency of vaccine hesitancy of 25.4%,[13] margin of error of 5% and confidence interval (CI) of 95%. The calculation was carried out using the Epi info 7 statistical software StatCalc tool. The sample obtained was 257 workers, with 10% added for possible refusals/losses, thus 283 workers made up the final sample. Participant sampling was non-probabilistic and for convenience.

Data collection took place in a virtual environment between June and November 2022. The UH communication sector was asked to collaborate in disseminating the research on the institution's website and social networks. The electronic address was sent containing the invitation to participate in the research, the Informed Consent Form (ICF) and the form (Google Forms®).

The form was self-administered and contained 24 objective questions, which addressed the variables of interest in the study. The predictor variables were socioeconomic aspects (age group in years, sex, highest level of education, color/race, income in minimum wage), occupational aspects (professional category, job tenure in years, type of employment relationship), history of vaccine reaction, fears related to vaccines (application and Events Supposedly Attributable to Vaccination or Immunization (ESAVI)) and aspects of 3Cs model dimensions. Confidence involves knowledge and perception on issues related to vaccine safety and effectiveness, in addition to taking into account the history of adverse reactions and the credibility of healthcare professionals, institutions and services associated with the vaccination process. Convenience assesses access to information and individuals' ability to understand, in addition to vaccine and supply availability and accessibility to vaccination services. Complacency encompasses individual perception about vaccines and the perception of risk of vaccine-preventable diseases.[8]

The outcome variable vaccine hesitancy was defined as a self-reported situation of vaccination delay or refusal, despite the availability of this service.[8] In relation to the dichotomous categorical variable (yes/no), a yes answer to the question "Do you have any overdue vaccinations?" was considered. The delay referred to any vaccine, according to the Ministry of Health's current recommendation to healthcare professionals.

The PNI advises this group to receive the following vaccines, according to their vaccination status: adult dT/dTap; Hepatitis B; triple viral; influenza; COVID-19; and chickenpox.[16]

Statistical analyzes were performed using the Statistical Package for the Social Sciences (SPSS) version 23 for Windows®. Initially, bivariate analysis was carried out to test the associations between predictor variables and outcome, using Pearson's chi-square (X^2) and Fisher's exact tests, obtaining unadjusted estimates of Odds Ratio (OR) with the respective 95% CI. The variables that presented a minimum value of $p < 0.20$ were submitted to binary logistic regression, with the stepwise backward method being adopted. In this type of regression, all predictors are included in the equation at once, and then removed, one by one, until the best predictors are identified.

The research respected the ethical principles of Resolution 466/2012, and was approved by a Research Ethics Committee (REC), under Opinion 5,385,880 and Certificate of Presentation for Ethical Consideration (CAAE - *Certificado de Apresentação para Apreciação Ética*) 58045622.9.0000.8807.

Results

The sample consisted of 283 UH healthcare workers. Participants' mean age was 42.4 years (SD: 10.10), the majority of whom were nursing technicians (n= 101; 35.6%). The frequency of vaccine hesitancy was 31.8%. In the bivariate analysis, none of the sociodemographic and occupational variables showed statistical significance ($p < 0.05$), as seen in Table 1.

When the associations between predictor variables of vaccination history, fears, 3Cs model dimensions and the vaccine hesitancy outcome were verified, statistical significance was found for fear of ESAVI and the items in the confidence dimension "something that happened that would disbelieve in vaccine effectiveness" ($p < 0.001$), "have sufficient information about the risks and benefits of vaccines" ($p < 0.036$) and "immunobiological agent availability the last time attended the health unit to update the card" ($p < 0.04$) (Table 2).

Table 3 presents the final adjusted model of the binary logistic regression. It was observed that fear of ESAVI increases the chance of vaccine hesitancy by two times (OR: 2.047; CI: 1.165-3.595; $p = 0.013$); having something happen that made people disbelieve in vaccine effectiveness increases it by almost three times (OR: 2.964; CI: 1.265-6.944; $p = 0.012$); and that immunobiological agent availability in the health unit to update the card reduces vaccine hesitancy (OR: 0.314; CI: 0.136-0.723; $p = 0.006$).

Table 1. Association between sociodemographic, occupational aspects and vaccine hesitancy in healthcare professionals at a university hospital

Variables	Vaccine hesitancy		Total n(%)	p-value(X^2)
	Yes n(%)	No n(%)		
Age (years)				0.356*
20 - 29	9(30)	21(70)	30(10.6)	
30 - 39	28(32.6)	58(67.4)	86(30.5)	
40 - 49	32(33.7)	63(66.3)	95(33.7)	
50 - 59	18(34.6)	34(65.4)	52(18.4)	
60 and older	2(2.2)	17(8.8)	19(6.7)	
			282(99.6)≈	
Sex				0.723
Female	75(33.7)	164(66.3)	239(84.5)	
Male	15(34.1)	29(65.9)	44(15.5)	
			283(100)	
Education				0.449
Vocational training	18(33.3)	36(66.7)	54(19.1)	
Graduation	27(37.5)	45(62.5)	72(25.4)	
Lato sensu graduate education	32(31.1)	71(68.9)	103(36.4)	
Stricto sensu graduate education	13(24.1)	41(75.9)	54(19.1)	
			283(100)	
Race				0.254*
Black	13(43.3)	17(56.7)	30(10.6)	
White	35(34.3)	67(65.7)	102(36)	
Yellow	3(50)	3(50)	6(2.1)	
Brown	39(27.3)	104(72.7)	143(50.5)	
Indigenous	-(-)	2(100)	2(0.7)	
			283(100)	
Income (in MW)				0.664*
1 - < 2	3(27.3)	8(72.7)	11(4)	
2 – 4	39(34.2)	75(65.8)	114(41.9)	
5 and more	43(29.3)	104(70.7)	147(54)	
			272(96.1)≈	
Professional category				0.678
Nursing professionals	56(30.9)	125(69.1)	181(64)	
Other professionals	34(33.3)	68(66.7)	102(36)	
			283(100)	
Job tenure (years)				0.409
< 5	30(35.3)	55(64.7)	85(30)	
≥5	60(30.3)	138(69.7)	198(70)	
			283(100)	
Employment relationship				
Permanent (SLR)**	26(27.1)	70(72.9)	96(35.4)	0.372
Permanent (company)#	49(34)	95(66)	144(53.1)	
Temporary (company) #	12(38.7)	19(61.3)	31(11.4)	
			271(95.7)≈	

* Fisher's exact test; **SLR: Single Legal Regime; MW: minimum wage; # Company providing hospital services; ≈ The total for some variables may be lower than n=283 (100%) due to lack of information from participants.

Discussion

The frequency of vaccine hesitancy among healthcare professionals at the investigated UH was high and was associated with the fear of ESAVI, the fact that something had happened that made them disbelieve in vaccine effectiveness and immunobiolog-

Table 2. Association between vaccination history, fears, confidence, convenience, complacency and vaccine hesitancy in healthcare professionals at a university hospital

Variables	Vaccine hesitancy		Total n(%)	p-value(X^2)
	Yes n(%)	No n(%)		
History of vaccine reaction				0.936
Yes	27(32.1)	57(67.9)	84(29.7)	
No	63(31.7)	136(68.3)	199(70.3)	
Fear of applying the vaccine				0.157
Yes	20(40)	30(60)	50(17.7)	
No	69	163	232(82.3)	
Fear of ESAVI				0.006
Yes	41(42.3)	56(57.7)	97(34.3)	
No	49(26.3)	137(73.7)	186(65.7)	
Welcomed by vaccinators on their last visit to the health unit				1.000*
Yes	88(31.9)	188(68.1)	276(97.5)	
No	2(28.6)	5(71.4)	7(2.5)	
Confidence				
Something happened that made me stop believing in vaccine effectiveness				0.001
Yes	17(58.6)	12(41.4)	29(10.3)	
No	73(29)	179(71)	252(89.7)	
Believe that the government offers the best vaccines on the market				0.790
Yes	73(32.4)	152(67.6)	225(83)	
No	14(30.4)	32(69.6)	46(17)	
Trust the information that professionals give about vaccines				0.315
Yes	82(31.1)	182(68.9)	264(96)	
No	5(45.5)	6(54.5)	11(4)	
Feel safe receiving new vaccines				0.116
Yes	72(30)	168(70)	240(85.7)	
No	12(42.5)	27(57.5)	40(14.3)	
Trust the professionals who take care of the vaccination process				0.611
Yes	85(31.7)	163(68.3)	268(95.4)	
No	5(38.5)	8(61.5)	13(4.6)	
Convenience				
Consider that have enough information about vaccines to decide whether to be vaccinated				0.108
Yes	73(30)	170(70)	243(86.8)	
No	16(43.2)	21(56.8)	37(13.2)	
Feel sufficiently informed about the risks/benefits of vaccines				0.036
Yes	66(28.9)	162(71.1)	228(80.6)	
No	24(43.6)	31(56.4)	55(19.4)	
Updated the vaccination card because a vaccination campaign was carried out at the workplace				0.484
Yes	51(29.7)	121(70.3)	172(61.6)	
No	36(33.6)	71(66.4)	107(38.4)	
Updated the vaccination card after hearing information about the benefits of vaccines in the media				0.653
Yes	35(30.2)	81(69.8)	116(41.7)	
No	53(32.7)	109(67.3)	162(58.3)	
Vaccine availability the last time that went to the health unit to update the vaccination card				0.004
Yes	72(28.6)	180(71.4)	252(90.3)	
No	15(55.6)	12(44.4)	27(9.7)	

Continue...

Continuation.

Variables	Vaccine hesitancy Yes n(%)	Vaccine hesitancy No n(%)	Total n(%)	p-value(X^2)
Having a vaccination room at the workplace makes it easier to receive vaccines				0.384*
Yes	86(31.2)	190(68.8)	276(97.9)	
No	3(50)	3(50)	6(2.1)	
Complacency				
Working at a hospital increases the risk of vaccine-preventable diseases				0.226
Yes	78(30.7)	176(69.3)	254(90.7)	
No	11(42.3)	15(57.7)	26(9.3)	
Think that have something to gain by being vaccinated				1.000*
Yes	89(31.9)	190(68.1)	279(98.9)	
No	1(33.3)	2(66.7)	3(1.1)	
Would give up conceptions about vaccination usefulness, benefits and risk to decide to be vaccinated				0.161
Yes	15(41.7)	21(58.3)	36(12.9)	
No	73(30)	170(70)	243(87.1)	

*Fisher's exact test.

ical agent availability in the health unit to update the card.

The percentage of vaccine delays was higher than that observed for influenza vaccine[13] and lower than that observed for dT, Hepatitis B and influenza vaccines[17] among Brazilian healthcare workers. A systematic review study showed variable acceptance rates for COVID-19 vaccine in this population (20.7% - 81.1%), with the lowest among nurses (20.7% - 40%).[12]

The high rate identified is possibly due to non-specification of hesitancy for a given vaccine. It is noteworthy that vaccine hesitancy varies according to time, place and vaccine, and lies in the gap between total acceptance and total refusal, i.e., individuals can accept some, delay or refuse certain vaccines.[8] In this investigation, the term "hesitation" was adopted, despite the question to define the outcome being "Do you have any overdue vaccinations?", understanding that, if research participant rejected a certain vaccine, vaccine delay would be present.

Sociodemographic and occupational aspects showed no association with the vaccine hesitancy outcome. However, the literature points to greater

Table 3. Unadjusted and adjusted binary logistic regression between fears, confidence, convenience, complacency and vaccine hesitancy in healthcare professionals at a university hospital

Variables	Unadjusted model OR (95% CI)	Unadjusted model p-value	Adjusted model OR (95% CI)	Adjusted model p-value
Fear of applying the vaccine		0.157		0.411
Yes	1.575(0.837-2.963)		1.350(0.660-2.759)	
No	1		1	
Fear of ESAVI		0.006		0.013
Yes	2.047(1.219-3.438)		2.047(1.165-3.595)	
No	1		1	
Confidence				
Something happened that made me stop believing in vaccine effectiveness		0.001		0.012
Yes	3.474(1.580-7.635)		2.964(1.265-6.944)	
No	1		1	
Feel safe receiving new vaccines		0.116		0.634
Yes	0.580(0.292-1.150)		1.238(0.515-2.997)	
No	1		1	
Convenience				
Consider that have enough information about vaccines to decide whether to be vaccinated		0.108		0.665
Yes	0.564(0.278-1.142)		0.821(0.335-2.008)	
No	1		1	
Feel sufficiently informed about the risks/benefits of vaccines		0.036		0.156
Yes	0.526(0.287-0.964)		0.614(0.313-1.206)	
No	1		1	
Vaccine availability the last time that went to the health unit to update the vaccination card		0.004		0.006
Yes	0.320(0.143-0.717)		0.314(0.136-0.723)	
No	1		1	
Complacency				
Give up conceptions about vaccination usefulness, benefits and risk to decide to be vaccinated		0.161		0.785
Yes	1.663(0.812-3.407)		1.140(0.445-2.923)	
No	1		1	

acceptance of influenza vaccine among older and male healthcare workers[18] and for COVID-19 vaccine among white healthcare professionals with higher education and income.[12]

When considering professional categories, some studies indicate that nurses have low levels of vaccine acceptance for influenza[19-21] and COVID-19[12,22,23] when compared to other occupational functions. These findings seem paradoxical, given the close relationship between nursing and this important disease prevention measure. In this study, nursing professionals are more hesitant; however, the data needs to be interpreted with caution, as hesitancy for a specific vaccine was not investigated, and the phenomenon varies depending on the vaccine.[8]

It is still important to consider that nursing is a profession mostly composed of women, and represents more than half of the healthcare workforce worldwide,[24] and that this finding may be masked by the influence of sex, since the sample was composed of female people.

Meta-analysis that analyzed gender differences in the intention to be vaccinated against COVID-19 found a lower chance of vaccination among women and a greater effect of sex among healthcare professionals.[25] Issues related to fertility and procreation can weigh on vaccine decision-making and deserve to be studied.[12]

Fear of ESAVI was associated with vaccine hesitancy, in line with results of a study on factors associated with vaccination against influenza in healthcare workers at a hospital complex in Bahia, in which greater acceptance was found among those who did not fear vaccine post-vaccination effects (OR = 1.93; 95% CI: 1.26-2.95).[17] The findings support international studies that assessed vaccine hesitancy for COVID-19 among healthcare workers.[12,26,27]

Especially regarding COVID-19 vaccine, although rare, events supposedly attributable to the viral vector and mRNA vaccines, respectively, thrombolytic syndrome and myocarditis/pericarditis, caused the Ministry of Health to review the guidance on the type of vaccine for use in pregnant and postpartum women as well as reinforce the recommendation for vaccination of children and adolescents between 12 and 17 years old.[28,29] These events were widely publicized, and it is possible that they contributed to increasing vaccine hesitancy among the Brazilian population, including among healthcare professionals, although there are no scientific studies that support this inference.

The fact that something happened personally or with people around healthcare professionals that made them disbelieve in vaccine effectiveness was also significantly associated with vaccine hesitancy in this study. Prior personal experience of ESAVI or the fact that healthcare workers witnessed a serious event, although it cannot explain COVID-19 vaccine hesitancy, may impact vaccine receipt.[30,31] A systematic review of qualitative studies with nurses reported the fear of possible adverse events and the occurrence of bad personal experiences or those of people close to them with the influenza vaccine as determinants of vaccine hesitancy.[32]

The variable "feel sufficiently informed about the risks/benefits of vaccines" did not maintain a significant association ($p < 0.05$) in the final model. It is noteworthy that the source of this news interferes with hesitation. Healthcare professionals who used social media or non-scientific sources showed more hesitant behavior towards the COVID-19 vaccine.[12] The low risk of transmission and death from influenza and the development of the disease when receiving the vaccine were some of the mistaken beliefs reported by nurses for not receiving the vaccine.[32]

In this study, "immunobiological agent availability in the health unit to update the card", a variable related to the convenience dimension, was also associated with the phenomenon of vaccine hesitancy among healthcare workers. These access barriers may correspond to irregularities in immunobiological agent supply due to production and logistics problems in input distribution and storage due to the complexity of supplying vaccination rooms in a continental country like Brazil.[1] In 2021, for instance, inequity was observed in COVID-19 vaccine distribution and application in the North and Northeast regions, which had lower vaccination coverage.[33]

Another reason that may contribute to vaccine unavailability in the health unit is vaccine losses,

which can be technical or physical. The first correspond to the loss of doses from opened vials that were not used due to expiration date. Physical losses are those in closed vials resulting from non-compliance with good vaccination practices (e.g., vial breakage, failure in the cold chain, lack of electricity, expired expiration date, transportation failure, etc.), therefore considered avoidable, being associated with high costs and the possibility of losses in immunobiological agent supply.[34] Thus, there was a need for continuing education actions for professionals who work in the vaccination service network.

It is reiterated that the 2022/2023 occupational vaccination calendar of the Brazilian Society of Immunization (SBIm) recommends to healthcare workers triple viral vaccines, hepatitis A, B or A and B, double adult (dT) or triple acellular bacterial adult type (dTap), chickenpox, influenza, conjugated meningococcal ACWY or C, meningococcal B and COVID-19.[35] With the exception of combined hepatitis A and B and meningococcal B vaccines, these immunobiological agents are available in the public network in Basic Health Units or in Special Immunobiological Reference Centers (CRIE).

The study of vaccine hesitancy among healthcare professionals predates COVID-19, with most previous research focusing on seasonal influenza vaccination.[31] With the new coronavirus pandemic, interest is directed towards investigating hesitancy towards vaccines against COVID-19. This fact is evident in the references used, and the comparison of findings with the literature on the topic among healthcare workers related to other vaccines may even be mentioned as a limitation of this study, given the scarcity of studies. Possible limitations include carrying out the study at a single hospital, lack of information regarding the number of each professional category and, consequently, the type of sampling adopted to recruit participants, which made it impossible to analyze the representativeness of each category in the sample. Despite these notes, there is no compromise in external validation of results, and they are recommended for future investigations in a similar setting.

Conclusion

Vaccine hesitancy among UH healthcare professionals was associated with fear of ESAVI, the fact that something had happened that made them disbelieve in vaccine effectiveness and immunobiological agent availability in the health unit to update the card. It is hoped that these results can add efforts to understanding this phenomenon among healthcare workers and support strategies for coping with this problem.

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Collaborations

Fidelis RV, Paula WKAS, Bezerra JLO and Coriolano-Marinus MWL collaborated with project design, data analysis and interpretation, article writing, relevant critical review of intellectual content and approval of the final version to be published.

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