

Perceptions, knowledge and attitudes regarding vaccination during the COVID-19 pandemic: a cross-sectional study

Percepções, conhecimentos e posturas em relação à vacinação durante a pandemia do COVID-19: um estudo transversal

Gabriela Carneiro Neves¹, Thaís Costa de Almeida², Yasmin Neves Vieira Sabino², Thamires Siqueira Rocha¹, Maria Eduarda Ferreira Naves¹, Isabelle de Fátima Fernandes¹, Aripuanã Sakurada Aranha Watanabe², Cláudio Galuppo Diniz², Vânia Lúcia da Silva², Vanessa Cordeiro Dias², Alessandra Barbosa Ferreira Machado²

ABSTRACT

Introduction: The COVID pandemic enhanced the vaccination importance, however, sufficient coverage is hard to achieve, once the immunization rate varies upon vaccinal hesitation, involving several factors. **Objective:** To understand the reasons for adhering to or refusing vaccines, and to prevent new outbreaks/epidemics, of SARS-CoV-2 and other pathogens in Juiz de Fora, knowledge, perceptions, and attitudes toward vaccination were evaluated. **Methods:** The study is transversal, quantitative, and descriptive. The sample (n=655) was composed of Juiz de Fora's citizens who answered, anonymously, an online questionnaire provided by the Federal University of Juiz de Fora and the Basic Unities of Health. The perception about efficacy, importance, and safety of vaccines; the accurate knowledge and the ability to recognize fake news about the matter; the main sources to reach information and the determinants of vaccination adherence. A simple descriptive analysis was carried out. **Results:** The average age of the participants was 32 years old, with the majority being white, female, with a high educational and economic level. There was a high acceptance of the first dose against COVID-19 (98,93%), whereas 97,3% demonstrated an inclination to annual vaccination. The highest rate of incorrect knowledge about vaccination was among the participants with vaccinal refuse (71,43%). The main determinants of vaccinal posture were: information sources, being part of risk groups, comprehension of individual and collective protection, free vaccination, perception about the severity of SARS-CoV-2, and the belief that the collateral effects of the immunizers don't outweigh its benefits. **Conclusion:** Despite the high vaccine acceptance and perception and adequate knowledge about vaccines, vaccine hesitancy was associated with a low ability to detect fake news and lower health literacy in the studied sample. Therefore, public strategies should be considered to monitor anti-vaccine attitudes and further studies to understand the dynamic determinants of vaccination behavior according to the epidemiological context.

Keywords: Vaccination; COVID-19; Health knowledge.

¹ Universidade Federal de Juiz de Fora (UFJF), Juiz de Fora, Minas Gerais, Brazil.

² Departamento de Parasitologia, Microbiologia e Imunologia, Universidade Federal de Juiz de Fora (UFJF), Juiz de Fora, Minas Gerais, Brazil.

Responsible Editor:

Enio Roberto Pietra Pedroso
Faculdade de Medicina, Universidade Federal de Minas Gerais.
Belo Horizonte/MG, Brazil.

Corresponding Author:

Alessandra Barbosa Ferreira Machado
Departamento de Parasitologia,
Microbiologia e Imunologia,
Universidade Federal de Juiz de Fora (UFJF), Minas Gerais, Brazil.
E-mail: alessandra.machado@ufjf.br

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RESUMO

Introdução: A pandemia de COVID-19 evidenciou a importância da vacinação, porém é difícil alcançar cobertura suficiente, uma vez que a taxa de imunização varia conforme a hesitação vacinal, envolvendo diversos fatores. **Objetivo:** Compreender os motivos de adesão ou recusa às vacinas, com base no conhecimento, nas percepções e nas atitudes da população em relação à vacinação. **Métodos:** O estudo é transversal, quantitativo e descritivo e analisou 655 questionários respondidos anonimamente por cidadãos de Juiz de Fora. A percepção de eficácia, importância e segurança das vacinas; o conhecimento preciso e a capacidade de reconhecer notícias falsas sobre o assunto; as principais fontes de informação e os determinantes da adesão vacinal foram avaliados. **Resultados:** A idade média dos participantes foi 32 anos, sendo a maioria brancos, do gênero feminino, com alto nível educacional e econômico. Houve elevada aceitação da 1ª dose contra a COVID-19 (98,93%), sendo que 97,3% demonstraram inclinação à adesão anual. A maior taxa de conhecimento inadequado sobre vacinação foi entre os participantes com recusa vacinal (71,43%). Os principais determinantes da postura vacinal foram: fontes de informação, pertencimento a grupo de risco, compreensão sobre proteção individual e coletiva, vacinação gratuita, percepção da gravidade do SARS-CoV-2 e crença de que os efeitos colaterais dos imunizantes não suplantam seus benefícios. **Conclusão:** Apesar da elevada adesão e percepção vacinal, bem como conhecimento adequado sobre as vacinas, a hesitação vacinal foi associada à baixa capacidade de detecção de *fake news* e menor "alfabetização em saúde" na amostra estudada. Assim, deve-se considerar a realização de estratégias públicas que monitorem atitudes antivacinas e de estudos adicionais para compreender os determinantes dinâmicos da postura vacinal conforme o contexto epidemiológico.

Palavras-chave: Vacinação; COVID-19; Conhecimento em saúde.

INTRODUCTION

In 2020, the pandemic caused by the SARS-CoV-2 Coronavirus was declared responsible for varied clinical manifestations, from mild respiratory tract infections to acute respiratory failure and multisystem inflammatory syndrome, common causes of death. This epidemiological scenario highlighted the importance of vaccination to control the pandemic¹. However, infection control through vaccination proved to be difficult to achieve, since immunization rates vary depending on vaccine hesitancy, which, in turn, involves from regionality to socio-economic aspects and is influenced by the "anti-vaccine movements" that are strengthened by the spread of *fake news*^{2,3}.

In this context, until July 2022, the municipality of Juiz de Fora, Minas Gerais - Brazil, gained prominence for having 87.4% of the population vaccinated against COVID-19 with 1st (81.2%), 2nd (51.1%), 3rd (15.4%) and 4th doses⁴. Contradictorily, concerning the National Vaccination Campaign against Influenza in 2021, the municipality had only 9% coverage, compared to the target of 90%⁵.

Aiming to understand the individual reasons related to vaccine adherence or refusal, to prevent new outbreaks/epidemics in the short and medium term of SARS-CoV-2 and other pathogens in Juiz de Fora, we evaluated the knowledge, perception, and population attitudes about vaccination. For this, the perception of the population

residing in the city about the effectiveness, importance, and safety of vaccines was evaluated, as well as adequate knowledge on the subject, the ability to recognize *fake news* and the sources most used to obtain information. Furthermore, the determinants involved in the population's adherence to vaccination were evaluated. Therefore, this analysis can contribute to creating social, epidemiological, educational, and political measures aimed at ensuring the maintenance or increase of vaccination coverage both for the National Immunization Program and against COVID-19 in the municipality.

METHODS

This is a cross-sectional study, with quantitative and descriptive characteristics, and was prepared based on the *Strengthening the Reporting of Observational Studies in Epidemiology* (STROBE) tool, which aims to assist in the systematic interpretation of cross-sectional studies, valuing the quality and relevance of the studies⁶.

The sample was made up of residents of Juiz de Fora, through the application of an *online* and anonymous questionnaire, using the Google Forms platform. Individuals who declared themselves to be residents of this municipality, over 18 years of age, and who voluntarily agreed to participate in the research from September to December 2021, by agreeing to the Free and Informed Consent Term (TCLE), were included. The exclusion criteria referred to individuals who interrupted filling out the questionnaire, who completed it more than once, who entered incomplete data or who didn't correspond to what was questioned. The initial sample space corresponded to 665 participants, however, 10 responses were excluded. The sample size was estimated using the USP-Bauru calculator, the minimum number for investigating the outcomes was 380 individuals, with a 5% margin of error and a 95% confidence interval, in an estimated population of 577,532 people (referring to Juiz de Fora, according to Instituto Brasileiro de Geografia e Estatística (IBGE), 2021)⁷.

Participants were recruited through social networks (WhatsApp, Twitter, and Instagram) and through Basic Health Units (BHUs) in Juiz de Fora, where pamphlets containing the *QR code* of the questionnaire were used. Individuals who wished to participate received the access link.

The ethical evaluation of research involving human beings was submitted to the Ethics and Research Committee of the Federal University of Juiz de Fora (UFJF) (number: 4,995,220). The reliability and privacy criteria were guaranteed following CONEP Resolution No. 466/2012. All individuals were informed about the objective, risks, and benefits of the research and the non-obligatory nature of participation, in addition to the anonymity of the study.

Data collection took place between November/2021 and March/2022, by completing a questionnaire developed by the authors, using the *Google Forms* link, consisting of 35 multiple choice questions, divided into 5 blocks, addressing:

- (a) perception of the importance, safety, and effectiveness of vaccination;
- (b) knowledge about vaccination, analyzing the recognition of *fake news*, and identification of the main source of information on health content;
- (c) posture regarding vaccination against SARS-CoV-2, assessing adherence, refusal and reasons;
- (d) beliefs and experiences about COVID-19;
- (e) socio-demographic information.

Regarding session b, participants could mark: yes, no or I don't know. One point was given if the marked answer was correct and zero points were assigned to incorrect answers and marked as "I don't know". The maximum score was 6 and those scoring above average (≥ 4) were categorized as having good knowledge about vaccination and those below average (≤ 3) as having inadequate knowledge.

As performed by Sturm et al. (2021)¹, firstly, participants were distinguished between those who received/intended to receive or not the vaccine against SARS-CoV-2. Simple descriptive analyses (absolute and relative) were performed for demographic characteristics, perceptions, knowledge, and attitudes about the vaccine against COVID-19.

RESULTS

PARTICIPANTS

The survey took place from November 10, 2021, to March 8, 2022, dates on which the moving average of confirmed cases was, respectively, 45 and 299 daily cases in the studied population⁸. During this period, the city was in the process of easing health measures and transitioning from school openings (November/2021) and later bars, and concert halls (January/2022). As of November 10, 2021, 444,853 doses of the first batch, 370,047 doses of the second batch, and 50,674 doses of the third batch had been administered⁹. As of March 8, 2022, 499,839 doses of the first batch, 445,688 doses of the second batch, and 234,088 booster doses had been administered¹⁰. In total, 665 participants answered the questionnaire, with a sample loss of 10 individuals.

DEMOGRAPHIC DESCRIPTIVE

The average age of the participants was 32 years old (SD: 13.2), the majority being white (72.52%), female (65.19%), with a high educational level (79.39% declared to be studying higher education or have already completed postgraduate studies) and economic (70.84% have a family income greater than 3 minimum wages) (Table 1).

Table 1. Demographic profile of the evaluated population.

Parameters analyzed	
Age	
18 to 28 years old	338 (50.98%)
29 to 38 years old	118 (17.80%)
39 to 48 years old	97 (14.63%)
49 to 58 years old	72 (10.86%)
59 to 69 years old	38 (5.73%)
Minimum	18
Average	32.9
Maximum	69
Standard deviation	13.2
Gender:	
Feminine	427 (65.19%)
Masculine	226 (34.5%)
Nonbinary	2 (0.31%)
Education	
Not literate	0 (0%)
Incomplete primary education	2 (0.31%)
Complete primary education	0 (0%)
Complete high school	46 (7.02%)
Incomplete high school	6 (0.92%)
Complete higher education	81 (12.37%)
Incomplete higher education	246 (37.56%)
Postgraduate	274 (41.83%)
Race/Ethnicity	
Yellow	9 (1.37%)
Indigenous	0 (0%)
White	475 (72.52%)
Black	38 (5.80%)
Brown (mixed)	121 (18.47%)
I don't know how to answer	5 (0.76%)
Rather not answer	7 (1.07%)
Approximate monthly household income:	
Up to 1 minimum wage	31 (4.73%)
From 1 to 3 minimum wages	160 (24.43%)
From 3 to 6 minimum wages	162 (24.73%)
From 6 to 9 minimum wages	97 (14.81%)
From 9 to 12 minimum wages	82 (12.52%)
From 12 to 15 minimum wages	40 (6.11%)
More than 15 minimum wages	83 (12.67%)

PERCEPTIONS ABOUT VACCINES

When asked about the safety, importance, and effectiveness of vaccines, 95.57% disagreed that they cause more side effects than benefits, 99.38% agreed that they are important to control and/or eradicate infectious diseases and 98.01% agreed that they are effective to prevent infectious diseases (Table 2).

KNOWLEDGE ABOUT VACCINES

Knowledge was evaluated by three true and false statements, formulated according to the material "16 myths and truths about vaccines" from the Brazilian Society of Immunizations¹¹. The statement with the highest number of wrong answers (2.90%) was "Vaccination protects the person as well as others around". In addition, the largest number of those who didn't know how to respond focused on the assertion: "Vaccines can cause infertility" (21.98%).

Only 3.66% (n=24) of the participants had below-average assertiveness in relation to the statements, being categorized as having inadequate knowledge about vaccination. Of these, 45.83% declared schooling compatible with graduate school, 20.85% and 33.3% with complete and incomplete higher education, respectively. In addition, 20.83% (n=5) of these didn't have the intention of being vaccinated against COVID-19, corresponding to 71.43% of those who adopted this attitude.

When asked about updating the vaccination card, 39 (5.95%) stated that it is out of date, while 25 (3.81%) couldn't answer. As for the Brazilian Society of Immunizations, about 25% declared ignorance and, of those who were not vaccinated/intended to be vaccinated against COVID-19, 71.42% (n=5) were unaware of it. Regarding the sources used to obtain information, the main ones were health services (n=417), television (n=380), and college (n=312).

The detailed characteristics of the knowledge area can be seen in Table 3 and Graph 1.

ATTITUDE TOWARDS VACCINATION AGAINST COVID-19

Regarding the vaccine against COVID-19, only 1.07% didn't intend to be vaccinated and 98.93% reported having taken the 1st dose. Of these, 86.11% took the 2nd, 8.95% took the 3rd, 0% didn't intend to take the 2nd, and 2.47% didn't intend to take the 3rd. Most applied doses were from Pfizer[®] (42.74%) and AstraZeneca[®] (36.88%). 97.3% agreed with the possibility of adhering to the annual vaccination against COVID-19.

As for individuals who intended or chose to be vaccinated, most agreed (98.6%) that they were vaccinated because it is a form of individual and collective protection. In addition, the majority fully agreed that they were vaccinated because they considered COVID-19 to be serious (87.65%). As for the motivation for being part of the risk group, 49.07% totally disagreed, while 20.06% totally agreed. The majority also strongly disagreed that social life (43.20%) and the media (33.17%) were influences for getting vaccinated.

Some questions had more discrepant answers: only 38.42% completely agreed that political conceptions affected the act of vaccinating and only 35.95% completely agreed that free of charge also impacts the decision.

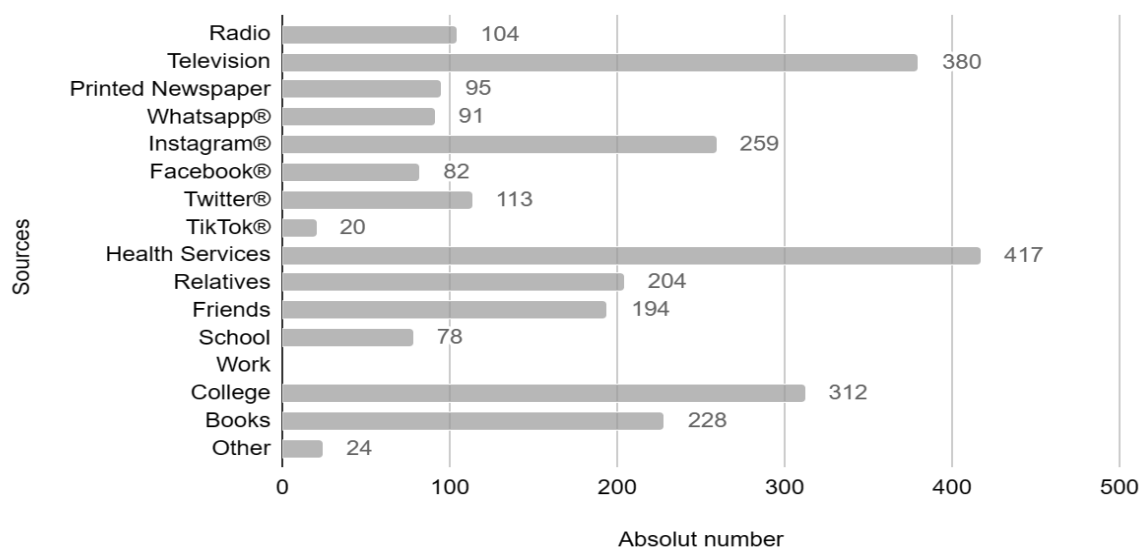
As for the participants who denied interest in taking or having taken the vaccine, 85.71% agreed that they adopted this stance because they didn't believe that the vaccine is a form of protection against COVID-19, while the majority

Table 2. Perceptions of the evaluated population regarding the safety, importance, and effectiveness of vaccines in general.

Perceptions	Do you think that vaccines, in general, cause more side effects than benefits?	Do you think that vaccines, in general, are important to control and/or eradicate infectious diseases?	Do you think that vaccines, in general, work to prevent infectious diseases?
I totally disagree	584 (89.16%)	0 (0%)	3 (0.45%)
I partially disagree	42 (6.41%)	0 (0%)	2 (0.30%)
Neither agree nor disagree	14 (2.13%)	4 (0.61%)	8 (1.22%)
I partially agree	9 (1.37%)	24 (3.66%)	65 (9.92%)
I totally agree	6 (0.91%)	627 (95.72%)	577 (88.09%)
Total	655 (100%)	655 (100%)	655 (100%)

Table 3. Knowledge of the population about vaccination in general.

Knowledge	Yes	No	I don't know how to answer
Vaccination protects the person as well as others around.	627 (95.72%)	19 (2.90%)	9 (1.37%)
Vaccines are capable of altering human DNA.	9 (1.37%)	579 (88.39%)	67 (10.22%)
Some vaccines must be taken before traveling to specific destinations.	640 (97.70%)	1 (0.15%)	14 (2.13%)
Vaccines can cause side effects	619 (94.50%)	14 (2.13%)	22 (3.35%)
Vaccines can cause infertility	7 (1.06%)	504 (76.94%)	144 (21.98%)
The coronavirus vaccine increases the risk of getting sick from COVID-19.	5 (0.76%)	633 (96.64%)	17 (2.59%)
Is your vaccination card up to date?	591 (90.22%)	39 (5.95%)	25 (3.81%)
Do you know about the National Immunization Program?	502 (76.64%)	153 (23.35%)	0 (0%)



Graph 1. Main sources of Knowledge about the health area.

fully agreed that they didn't get vaccinated (57.14%) for not being a risk group. Social life, the media, and political conceptions didn't significantly affect the participants regarding vaccine non-adherence, since, respectively, 85.71%, 71.42%, and 85.71% totally disagreed about the influence of these parameters in their vaccine posture. In addition, 57.14% agreed that they took this action because they don't consider COVID-19 to be serious, and 71.42% because they believe that the side effects will affect their well-being and productivity.

Detailed characteristics about posture can be seen in Table 4 and Graph 2.

BELIEFS AND EXPERIENCES ABOUT COVID-19

As for beliefs and experiences about COVID-19, 87.18% agreed that the possibility of being infected and dying from COVID-19 worried them and 96.64% agreed that they were afraid of infecting a family member or friend and 53.58% agreed they were afraid to leave home due to COVID-19. When asked if they had already had COVID-19 confirmed by any test, 83.36% denied the infection and, in relation to those who affirmed, 69.36% had some symptoms and 44.72% of the participants performed RT-qPCR for diagnostic confirmation (Table 5 and Graph 3).

DISCUSSION

Despite the global efforts to develop effective and safe immunizers, population adherence is a challenge to extended vaccine coverage¹³.

Regarding the data collected, it is worth highlighting that the sociodemographic descriptive study of the participants includes a portion that is not representative of the Brazilian population. According to IBGE data in 2022, the highest prevalence of the population self-declares as mixed-race, female, with a median age of 35 years, complete secondary education, and nominal income per capita with an average of BRL 1,625.00 monthly¹⁴. In contrast, the data found in the research refers, in large proportion, to a white, female, young population (average age of 32 years), with high education (undergraduate/postgraduate) and economic power. Therefore, as the studied group has particular characteristics, the results are relevant although not representative of the Brazilian population.

Regarding collected data, the studied population has shown a perception above 95% about the security, importance, and effectiveness of vaccines in general. Research conducted before the availability of COVID-19 vaccines analyzed that the most significant predictors for vaccine adherence are high perception of the benefits gained from vaccination, vaccine effectiveness, and low concern about side effects^{13,14}.

Another aspect that influences the vaccination rate is the knowledge about the theme, as was demonstrated by one study, in which more than 90% of the participants reported

that they would only receive the vaccine against coronavirus if they received accurate information¹⁴. The inadequate information acquisition about immunization has been associated to lower levels of schooling and income¹⁵, just as not validated sources about health subjects¹⁶. This study's findings differ from this tendency regarding education and economic situation, once all participants classified as having inadequate knowledge about vaccination had declared elevated educational level and the majority had owned high economic pattern (mensal income above 9 minimal salary - 45,83%). This divergence can be explained by distinct information sources, traditional sources were predominant in this present research, while social media were prevalent in the referenced article. The database also can clarify the difference found since the excess of information available by social media promotes the dissemination of content without scientific validation, a phenomenon called "Infodemic" by WHO¹⁷⁻¹⁹.

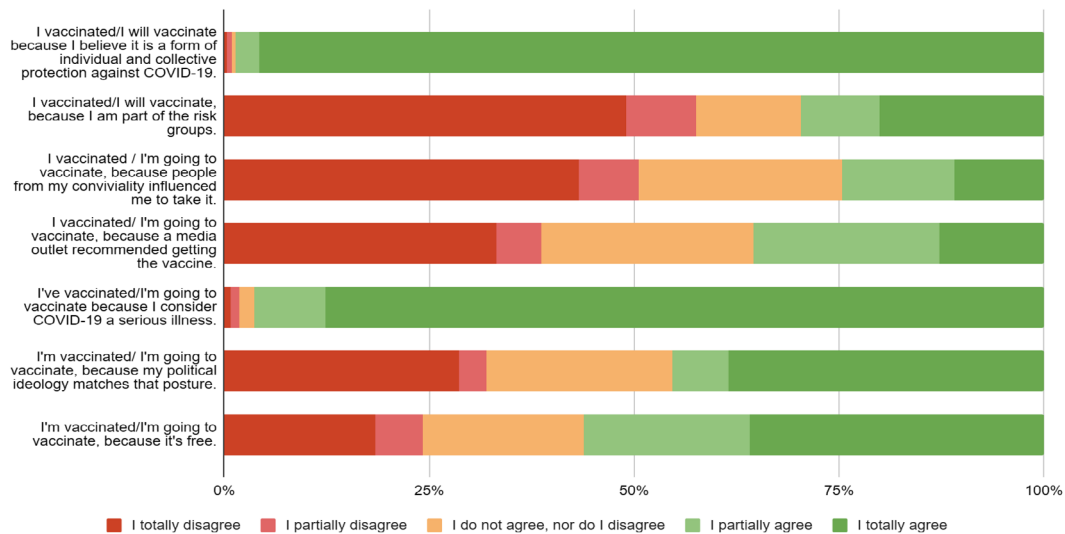
Beyond that, with the COVID-19 pandemic, the individual capacity to comprehend health-related content, guiding decision-making based on reliable information, became known as "Health literacy"¹⁹. This potential of comprehension could be the justification for the discrepancies found in this study: despite 79,39% owning high scholarship level, 3,66% of the total obtained an inadequate level of vaccination information, showing that the high educational pattern does not mean having a better capacity of discern knowledge properly.

By contrast, other authors showed that higher adherence to vaccination against COVID-19 was associated with higher levels of immunizers' knowledge. The same evidence can be seen in this study, once 96% of the participants' total obtained adequate knowledge about vaccination and, at least, adhered to the first COVID-19 vaccine dose. However, Gupta, Watanabe, and Laurent analyzed that the lower the "Health Literacy" and the ability to detect fake news in the sample studied, the greater the association with vaccine hesitancy²⁰, which also could be corroborated by the data found, that 71.43% of those who refused immunizers against SARS-CoV-2 were classified as having inadequate knowledge about vaccines. In addition, from these, all marked the assertions that corresponded to fake news ("Vaccines can cause infertility", "Vaccines are capable of altering human DNA" and "The coronavirus vaccine increases the risk of getting sick from COVID-19") as true. Also, 60% of them considered as wrong the affirmation "Vaccination protects the person as well as others around" demonstrating difficulty in understanding that vaccinating is a collective act^{20,21}.

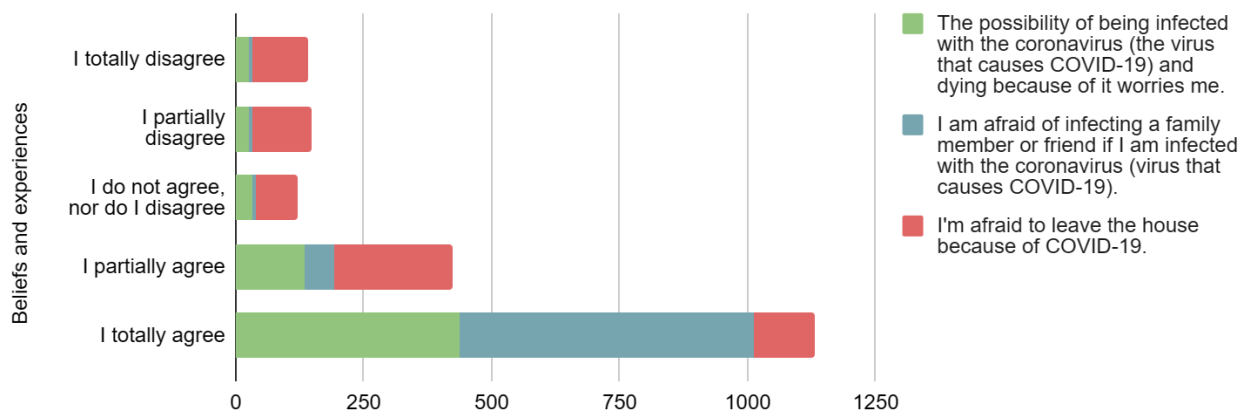
Despite Brazil presenting a higher rate of global immunization, nowadays it faces difficulties in vaccinating the population against SARS-CoV-2¹⁵. The factors attributed to these difficulties vary regionally and are determined as the pandemic progresses. The source of information interference, the social and political influence, the belonging to a risk

Table 4. Attitude of the population evaluated in relation to vaccination against COVID-19.

Attitude	
	Have you taken the 1st dose of the vaccine available against COVID-19?
Yes	648 (98.93%)
No	7 (1.07%)
Total	655 (100%)
Regarding participants who didn't take the 1st dose	If you haven't had the COVID-19 vaccine, do you plan to take it?
Yes	0 (0%)
No	7 (100%)
Total	7 (100%)
Regarding participants who have already taken the 1st dose	If you've already taken the first dose of the COVID-19 vaccine, do you plan to take the booster doses?
I have already taken the 2 nd dose and the 3 rd dose	5 (8.9%)
I have already taken the 2 nd dose and I intend to take the 3 rd dose	540 (83%)
I have already taken the 2 nd dose, but I don't intend to take the 3 rd dose	13 (2%)
The vaccine I took does not have a booster dose	26 (4%)
I haven't taken it yet and I don't intend to take the 2 nd and 3 rd doses	0 (0%)
I haven't taken the 2 nd and 3 rd doses yet and I intend to take only the 2 nd dose	3 (0.004%)
I haven't taken the 2 nd and 3 rd doses yet and I intend to take the 2 nd and 3 rd doses	8 (1.2%)
Total	648 (100%)
Regarding participants who have already taken the 1st dose	If you've had any vaccine against COVID-19, what was it?
Astrazeneca®	239 (36.8%)
Coronavac®	81 (12.5%)
Janssen®	9 (1.3%)
Pfizer®	277(42.7%)
Astrazeneca® and Coronavac®	0 (0%)
Astrazeneca® and Pfizer®	15(2.3%)
Astrazeneca® and Janssen®	0 (0%)
Pfizer® and Coronavac®	27(4.1%)
Pfizer® and Janssen®	0 (0%)
Coronavac® and Janssen®	0 (0%)
Total	648 (100%)
Regarding participants who have already taken the 1st dose	If vaccination against COVID-19 were carried out annually, similar to what is done with the influenza vaccine (H1N1/flu), would you take it?
Yes	631(97.3%)
No	17 (2.62%)
Total	648 (100%)



Graph 2. Reasons that led the population to vaccination against COVID-19.



Graph 3. Beliefs and Experiences of Juiz de Fora's population with COVID-19.

group, the comprehension of individual and collective protection, the perception of coronavirus severity, and the belief that the immunizer's collateral effects outweigh its benefits, impact on the vaccinal posture of Juiz de Fora habitants.

A crucial obstacle in ensuring vaccination coverage capable of restraining the current pandemic is vaccine hesitancy, which has been linked to specific determinants: fear of side effects; recommendations from health institutions; social, political, and cultural views, and knowledge about immunizers²². Beyond these, studies have detached the crescent role of confidence lack in vaccine safety during the pandemic period, which is prompted by anti-vaccine content^{22,23}. It has been shown that when people search for information, mainly on social media, vaccine refusal is a prevalent topic. Therefore, it is questionable if the high

vaccine acceptance of this present study is related to the main information sources used by the participants, which included, especially, health services (n=417), television (n=380), college (n=312); sources that have traditionally been able to generate a positive impact, beyond providing scientifically based content²².

Political ideology is another factor of vaccine influence, and the politicization of immunizers is an important obstacle to adherence¹⁵. One study showed that people who feel close to radical parties or who do not identify with any party are more likely to refuse vaccination²⁴. Despite this, having this present study in view, less than half of the participants (n=45,37%) agreed in some way that they vaccinated/would vaccinate because they had a political ideology consistent with this posture.

Table 5. Beliefs and Experiences of the evaluated population in relation to COVID-19.

Beliefs and experiences with COVID-19	
	Have you ever had COVID-19 confirmed by any diagnostic test?
Yes	91 (13.89%)
No	546 (83.36%)
I don't know	18 (2.75%)
	If you had COVID-19 confirmed by any diagnostic test, which one was performed?
RT-PCR	56 (8.54%)
Antigen test	15 (2.29%)
Serological test	9 (1.37%)
RT-PCR, Serological test	5 (0.76%)
RT-PCR, Antigen test	7 (1.07%)
RT-PCR, Antigen test, Serological test	2 (0.31%)
Antigen test, Serological test	1 (0.15%)
Other	4 (0.61%)
I don't know	23 (3.51%)
I didn't have COVID-19	532 (81.22%)
Total	655
	If you had COVID-19 confirmed by any diagnostic test, have you had any symptoms?
I didn't have COVID-19	531 (81.07%)
Yes	86 (13.13%)
No	38 (5.80%)
Total	655

In another sight, other study had showed that the confidence in government and the encouragement of family and friends were determinants for greater vaccine acceptance, while religious reasons were associated with lower adherence¹³. In this present study, these factors were summarized as “social influence” and 85.71% of those who adhered to vaccination totally disagreed about the impact of this parameter on their vaccination posture. This discrepancy can be explained by the cultural differences between the countries analyzed.

Regarding belonging to a risk group, more than half of the participants who denied having an interest in taking/ having taken the vaccine, fully agreed that they did not get vaccinated/would vaccinate (57.14%) for not being part of the risk groups, while only 20% of the participants who adhered to the vaccine totally agreed that they adopted this posture for being part of this group. A global survey to characterize the aspects that influence the acceptance of the vaccine showed that individuals over 65 years old are more likely to be vaccinated²⁵ since there is a higher number of fatal cases associated with this age group²⁶, which may

justify the data found since the average age of the sample studied was 32 years. In addition, one study demonstrated that having chronic diseases reduces vaccine hesitancy since these diseases are less prevalent among young people¹².

Another well-established factor in vaccine against COVID-19 acceptance is the understanding that the immunizers reduce the probability of being infected and, if infected, reduce complications¹⁴. This parameter was corroborated by the data analyzed that most participants agree (98.62%) and adhered to vaccination because it is a form of individual and collective protection. Parallel to this, a study focusing on vaccination against Influenza suggests that the recognition of this protection, as well as the safety of vaccines, can be associated with the fact of having the vaccine card updated²⁷, a trend that was also noted in the present research, since only 5.95% of the participants claimed that the card is outdated.

In this context, it has been shown that the individual identification of COVID-19 as a severe disease results in a higher intention to get vaccinated^{14,28}. This pattern was found in the present study since the majority totally agreed

(87.85%) that the severity of COVID-19 was one of the determinants of getting vaccinated. Although the severity of an infection is also one of the reasons for vaccination posture in anti-vaccine groups, 42.85% of participants fully agreed that they do not intend and have not been vaccinated because they do not consider COVID-19 as severe. This behaviour can be explained by studies that indicate that there is a dissemination not based on scientific evidence, that COVID-19 is a common flu¹⁷.

Another reason for vaccine acceptance is its gratuity since the majority (56.17%) of the participants adhering to the vaccine agreed that this is one of the reasons for such a posture. In 2020, one survey showed that the majority of the population was willing to pay for the vaccine, but their income was a limiting factor for access, concluding that immunizers should be freely provided^{14,16}.

In addition, it has been proven that the fear of the adverse effects of vaccination is linked to vaccine refusal globally, especially if there is a lack of incentive²⁹ and consistent with these findings, in this study, 71.42% of those who did not opt for vaccination against COVID-19 agreed that they adopted this posture because they believed that the side effects of the vaccine would have an impact on their quality of life.

Despite the obstacles to vaccine acceptance, the adherence to the first dose was 98.93% and the percentage of rejection of the second dose was null, while the third was 2.47%. However, during the period that the questionnaire was applied, there were no booster doses for Jansen's immunizer, and the 26 participants who received this type of vaccine were not included in the calculations of rejection rates of the additional doses. The literature points out that the adverse effects experienced after the first dose, opinions that subsequent vaccination is unnecessary, uncertainties regarding long-term safety, and the false sense that the infection is eradicated due to the reduction in the number of cases and deaths are determining factors for the acceptance of the booster^{30,31}. In Brazil, in the pre-pandemic period, the decrease in national vaccine coverage was also justified by access barriers from shortages of immunizers and restrictions on commercial hours - factors that may be associated with the data found³². Interestingly, adherence to the COVID-19 vaccine in the city was higher than the estimated nationally, corresponding to 85.63%³³, while the intention to take the booster doses was also higher than that found in an American study, of 61.8%³⁴. Considering this high rate found, it can be discussed whether there was an underrepresentation of the non-vaccinating sample (7 participants). This limitation could be associated with the low dissemination to non-academic areas and the difficulty of documenting anti-vaccine ideologies.

Recent studies have shown that individuals with adherence to vaccination against influenza tend to follow

the same posture against the coronavirus^{12,35,36} and, in the present study, when asked about adherence to the possibility of annual vaccination against COVID-19, as it is done with influenza, 97.38% claimed that they would take the vaccine. However, it is questionable whether this will be achieved, once in comparison with the National Influenza Vaccination Campaign in 2021, Juiz de Fora presented only 9% of vaccination coverage, while the goal was 90%⁵. From another view, the COVID-19 pandemic, compared to Influenza, presents a higher basic number of reproduction (R0), indicating that the infection is more contagious, has a longer incubation period, and higher transmission in pre-symptomatic phases. Consequently, it predominantly affects the economically active population, resulting in high hospitalization rates of older patients and higher mortality²⁶. Hence, these epidemiological differences justify the higher demand for annual immunization.

Knowledge about the National Immunization Program was an aspect analyzed in this research since disinformation about vaccine-preventable infections has been a risk to achieving adequate vaccination rates²⁷, favoring not only the progression of the COVID-19 pandemic but also the increase in previously controlled infections. The data showed that 25% of the participants were unaware of the National Immunization Program, which reinforces the need to strengthen educational campaigns that disseminate the services offered by the Unified Health System.

Lastly, research demonstrates that the intention to get vaccinated also varies with the experiences lived during the pandemic³⁷. In this study, 87.18% of the individuals agreed that the possibility of being infected with SARS-CoV-2 and dying from it worried them, whereas 87.94% totally agreed about the fear of infecting a family member or friend. However, when asked if they have a fear of leaving home, the data were more diverse, with 34.35% of the participants disagreeing and only 18.17% totally agreeing. Similar results were found in another study, in which the fear of being infected varies according the age, social isolation, economic situation, the level of knowledge about COVID-19, having a person or family member infected with the virus in their social environment, and having previous health problems^{37,38}. Another point associated with fear of infection was the possibility of testing positive³⁸ and, in this study, 87.18% of those who totally agreed that the possibility of dying from the infection worried them reported not having been infected. However, this aspect opens space to discuss whether the data correspond, in fact, to reality, since there is underreporting in Brazil³⁸.

Furthermore, it is worth highlighting that the studied groups were composed of high-income individuals with a high level of education, which is a more homogeneous group than the Brazilian population in general. People with higher income and education may have more access to information

and generate a different perception of vaccination compared to other social groups.

CONCLUSION

This present study has allowed us to understand the factors that influence the vaccination stance of the studied population regarding COVID-19 vaccination, aiming to provide data that can be used in health education projects. Although the population sampled in this work is not representative of the majority of the Brazilian population, it is a key population that can be a reference for other subpopulations in terms of forming opinions.

The results of this work suggest that the determining factors in relation to vaccination posture are related to sources of health information, belonging to a risk group, understanding of individual and collective protection, free distribution of vaccines, perception of the severity of SARS-CoV-2 and the belief that the side effects of the vaccines developed do not outweigh their benefits. Furthermore, the study indicates that the social and political environment can influence vaccination adherence or refusal.

Considering that, to implement a mass vaccination campaign with effective vaccination coverage, it is necessary to understand the vaccination posture of a target population, longitudinal research must be carried out covering a larger and more representative portion of the Brazilian population since perception and knowledge can change over time. Finally, it is important to propose effective strategies to encourage vaccine acceptance and promote evidence-based health education. This requires a comprehensive consideration of the health status, scientific knowledge, and socioeconomic context of subpopulations, as well as an analysis of the impact of fake news on expanding vaccine coverage.

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AUTHORS' CONTRIBUTION:

We describe contributions to the papers using the taxonomy (CRediT) provided below: *Conceptualization, Investigation, Methodology, Visualization & Writing – review & editing*: Gabriela Carneiro Neves, Thaís Costa de Almeida, Thamires Siqueira Rocha, Maria Eduarda Ferreira Naves, Isabelle de Fátima Fernandes. *Project administration, Supervision & Writing – original draft*: Gabriela Carneiro

Neves, Thaís Costa de Almeida, Alessandra Barbosa Ferreira Machado, Cláudio Galuppo Diniz, Aripuanã Sakurada Aranha Watanabe, Vânia Lúcia da Silva, Vanessa Cordeiro Dias. *Validation & Software*: Alessandra Barbosa Ferreira Machado, Vanessa Cordeiro Dias. *Resources & Funding acquisition*: Alessandra Barbosa Ferreira Machado, Vanessa Cordeiro Dias. *Data curation & Formal Analysis*: Alessandra Barbosa Ferreira Machado, Yasmin Neves Vieira Sabino, Vanessa Cordeiro Dias.

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