Evaluation of COVID-19 Vaccination Acceptance in Guinea: Evidence from a Cross-Sectional Study of 1087 Students from 10 Public and Private Universities in Conakry in 2021

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Abstract: *Introduction:* Vaccination is currently the main prevention strategy advocated by governments around the world to stop the spread of this devastating COVID-19 disease pandemic. The objective of this study was to determine the level of acceptance of COVID-19 vaccination among students in the city of Conakry and to identify the factors that influence this acceptance. *Methods:* This was a cross-sectional study with an analytical purpose carried out among students of 10 universities in Conakry. Medians were used to summarize quantitative variables and proportions to summarize categorical variables. The adjusted Odd Ratio calculated in the multivariate logistic regression was used to identify factors associated with acceptance of vaccination. The associations observed in this study were not due to confounding by any of the other variables in the model. A p-value <0.05 was considered statistically significant. *Results:* A total of 1087 students were interviewed. They were predominantly female (55.66%) and young with a median age of 22 years (21 - 24). The proportion of students who accepted the COVID-19 vaccination was 74.5%; this leaves a refusal percentage of 25.5%. Letting nature take its course, fear of side effects, and the speed with which vaccines are put on the market were the main reasons given by students for refusing the COVID-19 vaccine, with respective percentages of 93.8%, 67.5% and 39.6%. Studying in a non-biomedical field (AOR: 2.101, CI 95%: [1.893 - 2.853]), believing that traditional plants are effective for the treatment of COVID-19 (AOR: 1.550, CI 95%: [1.076 - 2.223]), and having poor knowledge of COVID-19 vaccines (AOR: 2.029, CI 95%: [1.399 - 2.942]) were main factors associated with non-acceptance of COVID-19 vaccination. *Conclusion:* This study showed that the acceptance rate of COVID-19 vaccination was generally good among students in Conakry (74.5%). There is therefore no real problem of reluctance to be vaccinated against COVID-19 in this population group. The refusals (24.5%) to be vaccinated observed in this study are essentially linked to the poor access to information and the low level of knowledge about COVID-19 and anti COVID-19 vaccines. Strengthening information strategies for students, especially those in non-biomedical fields, could significantly reduce these refusals.

Keywords: COVID-19, Vaccination, Acceptance, Students, Conakry

1. Introduction

Severe Acute Respiratory Syndrome (SARS) was first reported in southern China in 2002 and the disease has spread to several countries in North America, South America, Europe and Asia [1]. Coronaviruses are a family of viruses that can cause diseases such as the common cold, severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome [2]. At end of December 2019, a new coronavirus was identified as the cause of a disease outbreak originating in China. The disease it causes is called coronavirus disease 2019 (COVID-19) [2]. Despite the Chinese government's efforts to contain it quickly, this COVID-19 epidemic spread very rapidly to several parts of China and to several other countries around the world, causing an outbreak of infectious pneumonia [3, 4]. With that, on 30 January 2020, the World Health Organization (WHO) announced that this health crisis caused by this new coronavirus was a public health emergency of international concern [3–6].

As of 31 December 2021, 285,685,469 cases of COVID-19 have been registered worldwide, of which 257,958,654 have been cured and 5,435,753 deaths [7]. The United States remains the most affected country, with 60,698,308 cases recorded, including 845,159 deaths [7]. In Africa, 7,189,628 cases of COVID-19 were recorded, including 155,892 deaths and 5,985,321 cured cases [8]. South Africa remains the most affected country in Africa, with 3,472,436 cases and 91,625 deaths [8]. In Guinea 32,671 positive cases were recorded, of which 29,922 were cured and 391 died in hospital [7].

Humanity has been seriously caught off guard by COVID-19, a pandemic that is shaking every continent and dramatically altering the lifestyles of the entire world population [9]. Its rapid spread has destabilized health systems and caused economic disruption around the world [10]. Initial prevention and control measures for this pandemic set by governments around the world, pending the availability of vaccine, included quarantine (self-isolation) of potentially exposed people, travel restrictions (international and domestic), physical distancing, wearing of masks, lockdowns, curfews, closure of schools and cult places, i.e. [10–12].

The current priority strategy advocated by almost all countries to control this pandemic and reduce its burden is vaccination of a large proportion of the population [10, 11]. As of 18 February 2021, there were at least seven different vaccines for COVID-19 available to countries for priority vaccination of vulnerable populations. At the same time, more than 200 candidate vaccines are under development, with more than 60 in clinical development [13]. The goal is to protect populations in all countries. Access to one or more effective vaccines would be a valuable resource in reducing the burden of COVID-19 [10, 11]. However, speculation about the origin of the epidemic, the efficacy and side effects of the COVID-19 vaccines could lead to reluctance to accept these vaccines in the population [11]. On that note, a survey conducted in the US in 2020 showed high hesitation. Forty percent (40%) of Americans surveyed said they would not get it if it were available now. Only 37% said they would be comfortable being among the first to get the vaccine [11]. Fear of vaccines has increased considerably, due to misinformation circulating in social media creating a lot of mistrust and suspicion around vaccines against COVID-19 [14]. Studies in other countries have identified many factors that influence acceptance of the COVID-19 vaccine. These include perceived risk of disease, perceived safety and efficacy of vaccines, general attitudes towards vaccination [15]. Worldwide, as of 31 December 2021, China is the country that has vaccinated the most candidates, with 3,293,526,192 people, followed by India with 1,860,524,339 people [16].

Africa will need 1.5 billion doses to vaccinate 60% of its population and achieve herd immunity [12]. In Guinea on 31 December 2021, there were 2,026,767 people vaccinated with the first dose, i.e. 15.43% of the population [17].

Knowledge of the level of acceptance of vaccination and the factors that would explain the reluctance within certain populations could better guide the development and implementation of effective population-based vaccination strategies against COVID-19. However, as far as we know, no study has yet been conducted in Guinea on the acceptance of COVID-19 vaccination among students. Hence the interest of the present study, the objective of which was to determine the level of acceptability of the COVID-19 vaccine, as well as to identify the factors associated with the non-acceptance of the COVID-19 vaccination among students in public and private universities in the city of Conakry.

2. Methods

2.1. Design and Setting of Study

This was a cross-sectional study with an analytical focus carried out in Guinean universities and higher education institutes in December 2021.

This study was carried out among students of public and private universities and institutes in the city of Conakry. The city of Conakry has 38 universities/institutes of higher education, of which seven are public, i.e. 18%, and 31 private, i.e. 82%. [18]. These universities and institutes are spread over the five communes of the city of Conakry. They are twenty-five in the commune of Ratoma; three in the commune of Dixinn; two in the commune of Matam; seven in the commune of Matoto and one in the commune of Kaloum.

The city of Conakry remains the region most affected by the COVID-19 pandemic in Guinea, accounting for more than 90% of the total 2,026,767 cases recorded by 31 December 2021 in Guinea [19].

The response to the COVID-19 pandemic is coordinated by the Ministry of Health with the support of the National Health Security Agency. The Ministry of Health benefits

from technical and financial assistance from several development partners, notably the World Health Organization, CDC, European Union, German Cooperation, etc. At the decentralized level, the coordination of the response is ensured by the Regional Health Inspectorates and the Prefectural Health Directorates with the technical support of the Regional Epidemic Alert and Response Teams and the Prefectural Epidemic Alert and Response Teams. By 31 December 2021, the country had ten (10) COVID-19 vaccination centers in Conakry. The COVID-19 vaccines used are Astra Zeneca, Sino pharm, Sputnik V, Pfizer, Sinovac and Johnson and Johnson.

2.2. Study Population

This study covered students normally enrolled in ten universities and institutes in Conakry. We specifically included students who were present during data collection and who agreed to participate in the study. Students who completed the questionnaire incorrectly or who completed less than 50% of the questions on the questionnaire were excluded from the study.

2.3. Sampling and Data Collection

The sample size was calculated using the SCHWARTZ formula: $n=Z\alpha^2PQ/e^2$, where $Z\alpha=$ the odds associated with the confidence limit, P= expected prevalence, Q = 1-P and e = the margin of error. The expected acceptance rate of the COVID-19 vaccination is not known. It was therefore estimated at 50%. We used 50% as the expected prevalence, 3% as the margin of error and the Z-value with a 95% confidence limit is equal to 1.96. After numerical application, we obtained a minimum size of 1067. Taking 5% as the misfill rate, we obtained a minimum size of 1120 students to interview. After excluding incorrectly filled out forms, we obtained a total of 1087 students included in the study.

These students were interviewed in ten (10) universities and institutes of higher education. The composition of these ten universities and institutes took into account the current natural distribution of universities and institutes in the city of Conakry according to their legal status (public or private). Thus, we selected the two (2) largest public universities in Conakry, or even in the Republic of Guinea (Gamal Abdel Nasser University of Conakry and General Lansana Conté University of Sonfonia). Subsequently, we randomly selected eight (8) universities and institutes. These were the Catholic University of West Africa, the Kofi Annan University of Guinea, the Mercure University of Guinea, the Mahatma Ghandi University, the Nongo University of Conakry, the International University of Conakry, the Source University and the Graduate Institute of Guinea. A random number generator was used to make this selection. The number of students surveyed per university and institute was proportional to the size of the student body of each university and institute in the overall student body of the ten (10) universities and institutes selected for the survey. All faculties of the ten selected universities/institutes were

included in the study. Two classes per faculty were randomly selected. The students in the classes were selected by random draw in the classrooms at break time.

Data were collected using a pre-tested questionnaire from universities that were not on the list of universities selected for the study. This allowed the research team to adapt the questionnaire to make it easier to understand and complete. The administration of the questionnaire was done in an electronic version designed on Kobocollect v1.14.0. Students were interviewed during breaks or after class. An interview lasted between 10 and 15 minutes. A team of five interviewers was trained to fill in the questionnaire at the Chair of Public Health of the Gamal Nasser University of Conakry before going into the field.

2.4. Study Variables Definition

The variable of interest or dependent variable in this study was the acceptance of the COVID-19 vaccination. This was the ratio of the number of students willing to receive the COVID-19 vaccine injections to the total number of students surveyed. Students who answered "yes" to the following question were considered to be willing to receive COVID-19 vaccination: "Will you be willing to receive the doses of COVID-19 vaccine currently offered by the Guinean government? This question did not take into account the anti COVID-19 vaccination status of respondents. This is because someone can be vaccinated against their will. Following this question, we asked about vaccination status.

2.5. Explanatory or Independent Variables

The independent variables in this study included socio-demographic characteristics (age, gender, ethnicity, religion, occupation, marital status), field of study (biomedical and non-biomedical), number of years of study, and COVID-19 history. Within these explanatory variables, we also controlled for respondents' opinions on the following questions: (i) is COVID-19 related to climate? and (ii) is COVID-19 treated with traditional plants?

We also took into account the level of knowledge of the respondents about vaccines against COVID-19. Here, students who cited at least three names of COVID-19 vaccines used in Guinea were considered to have good knowledge of COVID-19 vaccines; the others were classified as having poor knowledge of COVID-19 vaccines.

2.6. Data Analysis

The collected data were exported to Excel for cleaning and then exported to IBM SPSS Statistics 25 for analysis.

At the descriptive stage, continuous quantitative variables were summarized as medians with their interquartile ranges. Categorical variables were summarized as proportions with their 95% confidence intervals.

At the analytical or etiological stage, we performed bivariate and multivariate analyses to look for associations between the acceptance of the COVID-19 vaccination and the explanatory variables. The crude odd ratio with its 95% confidence interval

was calculated in the bivariate analysis. Covariates for the multivariate logistic regression were selected if the p-value was less than or equal to 0.20 in bivariate. A model selection procedure following the "stepwise top-down" strategy by controlling and checking for confounding factors at each step was used in the multivariate regression. The relevant pairwise interactions of the variables retained in this model were tested. We adjusted simultaneously for several variables in the models. Finally, the adjusted odd ratio was calculated to investigate the association between vaccination acceptance and the different covariates. The associations observed in this study were not due to confounding by any of the other variables in the model. A p-value <0.05 was considered statistically significant.

3. Results

3.1. Socio-demographic Characteristics of Interviewees

A total of 1,087 students in the city of Conakry were interviewed about their acceptance of the COVID-19 vaccination. The median age of the students interviewed was 22 years (21-24). Students in the 20-24 age group were the most numerous, with a frequency of 69.1%. The female gender was more represented (55.7%) and the majority of the students interviewed were single. Students studying in the non-medical field made up 70.8% of the sample compared to 29.2% of students studying in the biomedical field. The majority of the ethnic groups were Malinke, Sousou and Peulh, with 29.6%, 25.9% and 19.4% respectively. The most represented religion was Muslim, with a frequency of 77.6% (Table 1). Students with a history of COVID-19, i.e. having already had COVID-19 disease, represented 10.67% of the sample. Students who stated that COVID-19 was climate related, that traditional platforms treat COVID-19 represented 20.42% and 73.89% of our sample respectively. With regard to knowledge of different COVID-19 vaccines used in Guinea, only 24.75% of the students could name at least three vaccines (Table 1).

Table 1. *Sociodemographic characteristics of 1087 students from ten (10) universities in the city of Conakry questioned about anti-COVID-19 vaccination in 2021.*

Variables	Number	Percentage (%)
Sex		
Female	605	55.66
Male	482	44.34
Median age (IQR)	22 (21 - 24)	
Age range		
< 20 years	106	9.75
20 - 24 years old	751	69.09
≥ 25 years old	230	21.16
Number of years of study		
12 years	656	60.35
34 years old	258	23.74
≥ 5 years	173	15.92
Fields of study		
Non-biomedical	770	70.84
Biomedical	317	29.16
Marital status		
Not married	1068	98.25
Married	19	1.75

Variables	Number	Percentage (%)
Ethnic group		
Fulani	211	19.41
Soussou	281	25.85
Malinke	322	29.62
Forest	211	19.41
foreigners	62	5.70
Religion		
Muslim	844	77.64
Christian	225	20.70
Animism	8	0.74
Without religion	10	0.92
History of COVID-19 (former COVID-19 patient)		
Yes	116	10.67
No	971	89.33
Having someone with COVID-19 in your entourage		
Yes	507	46.64
Nope	580	53.36
Is COVID-19 climate-related?		
Yes	222	20.42
No	865	79.58
Is COVID-19 treated with traditional plants?		
Yes	814	74.89
No	273	25.11
Having cited at least three anti-COVID-19 vaccines used in Guinea?		
No	818	75.25
Yes	269	24.75

3.2. Acceptance of COVID-19 Vaccination

At the time of data collection, 74.5% of students in the city of Conakry were willing to receive the COVID-19 vaccine doses recommended by the Guinean government. They were then asked about their COVID-19 vaccination status. The study revealed that 46.9% of the students had already been vaccinated against COVID-19. Of these, 65.8% had received one dose compared to 34.2% who had received two doses (Table 2). In 96.6% of the cases, the students vaccinated had done so voluntarily, as opposed to 3.4% who had been vaccinated as a result of a work requirement, travel, etc.

Table 2. *Acceptance of vaccination and anti COVID-19 vaccination status of the 1087 students from ten (10) universities in the city of Conakry interviewed in 2021.*

Variables	Number	Percentage (%)	95% CI
Accepts the anti-COVID-19 vaccination			
Yes	810	74.5	(72.18 – 77.00)
No	277	25.5	(22.82 – 27.87)
Already vaccinated (*n=810*)			
Yes	380	46.9	(43.50 – 50.40)
Nope	430	53.1	(49.60 – 56.40)
Number of vaccine doses received (n= *380*)			
Dose	250	65.8	(61.10 – 70.30)
Two doses	130	34.2	(30.00 – 38.40)

3.3. Reasons for Refusing the COVID-19 Vaccine

In this study, we also explored the reasons for refusing the COVID-19 vaccine among students who were reluctant to be vaccinated. Thus, letting nature take its course, adverse side effects of the COVID-19 vaccine, rapid development of the COVID-19 vaccine by whites, unsafe COVID-19 vaccine, COVID-19 vaccine can lead to death were the main reasons for students' reluctance to take the COVID-19 vaccine with

proportions of 93.8%, 67.5%, 39.6%, 25.6 and 18.7% respectively (Figure 1).

3.4. Incentives for Accepting COVID-19 Vaccination

When asked what would motivate them to take the COVID-19 vaccine doses, the vaccine-averse students mentioned the following main incentives: (i) if COVID-19 vaccines were rigorously tested (66.5%), (ii) if I see that many people have been vaccinated without side effects (58.8%), (iii) if my government does not require me to vaccinate (33.5%), (iv) if vaccination was linked to getting a job (20.2%) (Figure 2).
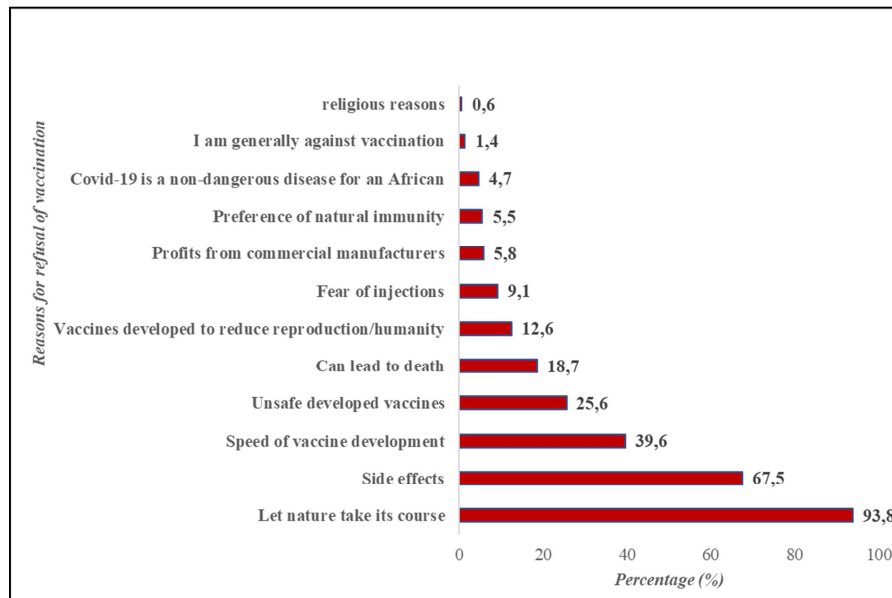

Figure 1. Reasons for refusing the COVID-19 vaccination given by 708 students from ten (10) universities in the city of Conakry interviewed in 2021.
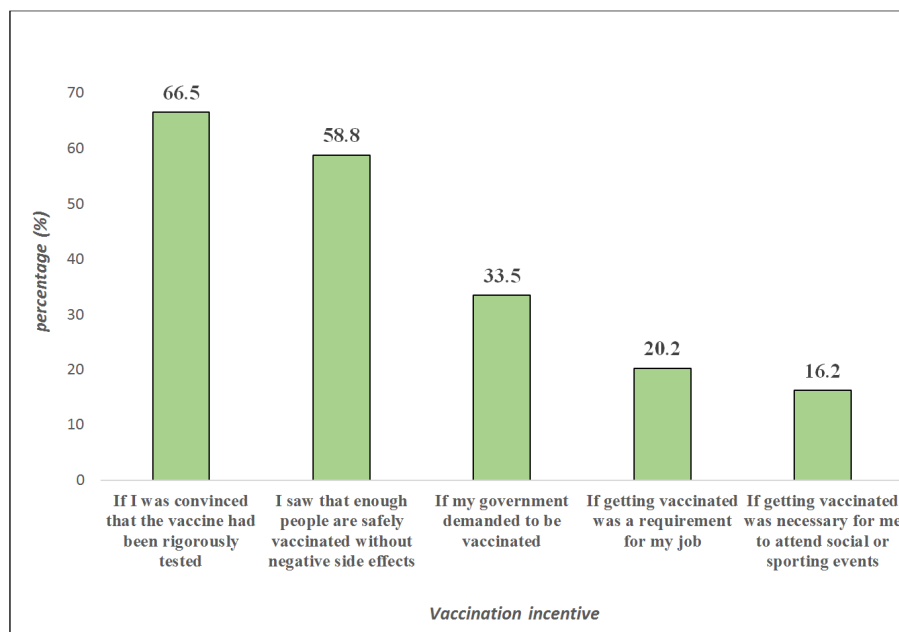

Figure 2. Incentives for acceptance of COVID-19 vaccination mentioned by 708 students from ten (10) universities in the city of Conakry interviewed in 2021.

3.5. Factors Associated with Non-acceptance of the COVID-19 Vaccine

Our study found that socio-demographic characteristics, knowledge of the COVID-19 vaccine and perceptions of COVID-19 disease were factors influencing acceptance of the COVID-19 vaccine among students in the city of Conakry. Thus, female students were 1.4 times (AOR: 1.422; CI: [1.062 - 1.905]) more likely to refuse the COVID-19 vaccination compared to others. In terms of age, young students (under 20 years) were found to be 1.6 times (AOR: 1.602; CI: [1.396 - 2.605]) more likely to be vaccine-refractory than others. Also students from non-medical

university fields of study were 2.1 times (AOR: 2.101; CI: [1.893 - 2.853]) more likely to refuse vaccination. In this study, it was also noted that students who believed in the efficacy of traditional herbs in treating COVID-19 disease were 1.5 times (AOR: 1.550; CI: [1.076 - 2.233]) more likely

to refuse the COVID-19 vaccination. Finally, students who had poor knowledge about COVID-19 vaccines, i.e. who could not name at least three COVID-19 vaccines used in Guinea, were 2 times (AOR: 1.602; CI: [1.399 - 2.942]) more likely to refuse to take COVID-19 vaccine doses (Table 3).

Table 3. *Factors associated with the not acceptance of the COVID-19 vaccination of the 1087 students from ten (10) universities in the city of Conakry in 2021.*

Variables	Yes n (%)	No n (%)	AOR	95% CI	p-value
Sex					
Female	431 (71.2)	174 (2 8.8)	1,422	(1.062 – 1.905)	0.018
Man	379 (78.6)	103 (21.4)	1		
Age range					
< 20 years	76 (71.7)	30 (28.3)	1,102	(0.896 – 1.605)	0.177
20 - 24 years old	558 (74.3)	193 (25.7)	1,201	(0.907 – 1.908)	0.316
≥ 25 years old	173 (75.1)	57 (24.8)	1		
Number of years of study					
12 years	488 (74.4)	168 (25.6)	1,081	(0.810 – 1.892)	0.078
34 years old	184 (71.3)	74 (28.7)	1.007	(0.982 – 4.988)	0.082
≥ 5 years	138 (79.8)	35 (20.2)	1		
Field of studies					
Non-biomedical	532 (69.1)	238 (30.9)	2,101	(1.893 – 2.853)	0.017
Biomedical	243 (76.8)	74 (23.3)	1		
Is COVID-19 climate-related?					
Yes	162 (74.5)	60 (27.0)	1,657	(0.938 – 1.983)	0.071
No	723 (75.5)	248 (24.5)	1		
Is COVID-19 treated with traditional plants?					
Yes	587 (72.1)	227 (27.9)	1,550	(1.076 – 2.233)	0.019
No	223 (81.7)	50 (18.3)	1		
Having cited at least three anti-COVID-19 vaccines used in Guinea?					
No	586 (71.6)	232 (28.4)	2,029	(1.399 – 2.942)	< 0.001
Yes	224 (83.3)	45 (16.7)	1		

4. Discussion

Vaccinating a large proportion of the population remains one of the most effective preventive strategies to stop the spread of the COVID-19 pandemic, which has claimed lives and destabilized health systems and economies in every corner of the world since it began in China in 2019 [10]. Obtaining better COVID-19 vaccination coverage requires better adherence of the population to this vaccination. The objective of this study was to determine the level of acceptance of the COVID-19 vaccination among students in Conakry and to identify the factors that influence this acceptance. Thus, we conducted a cross-sectional study in 2021 among students from 10 universities in the city of Conakry.

This study showed that the proportion of students in Conakry who accepted the COVID-19 vaccination was 74.5% in 2021. A study conducted by Ditekemena et al. in the Democratic Republic of Congo in February 2021 showed that 55.90% of participants intended to accept the COVID-19 vaccine [20]. A study by Sallam et al. in Jordan in 2021 showed a low intention to vaccinate against COVID-19, with an acceptance rate of 34.9%. [21]. Other studies have reported significant proportions of participants accepting COVID-19 vaccination. These include the Barello et al. study, which showed an acceptance rate of 86.10% [22], and Graupensperger et al. which showed a 91.64% intention to be

vaccinated in the US in 2021 [23].

The variation in the proportions of acceptance of COVID-19 vaccination could be attributed to differences in socio-demographic backgrounds and study settings. For example, media use, culture and study recency could have a strong influence on willingness to be vaccinated against COVID-19 [24].

A few participants in our study (24.5%) expressed their refusal to receive the COVID-19 vaccine. Of these participants, 93.8% said they wanted to let nature take its course, 67.5% were concerned about the side effects of the vaccine, 39.6% were concerned about the accelerated trials used to market the vaccine, 25.6% said the COVID-19 vaccine was unsafe, and 18.7% of participants said the COVID-19 vaccine can cause death. Similar factors have been reported in previous studies [25]. The top three reasons for refusing to be vaccinated reported by these studies were: worrying about the side effects of the vaccine (51.14%), not having a clear understanding of its effects due to the recent introduction of the vaccine (42.41%) and observing the effect of vaccination on others (34.54%) [26]. Concerns about the safety and efficacy of the vaccine, as well as fears about potential side effects, were the most critical determinants of vaccine refusal [27]. Alqudeimat et al. found that participants who thought vaccines posed health risks were less willing to accept vaccination [28]. Another study conducted in Saudi Arabia in 2021 by Almaghaslah et al. found that vaccine efficacy and safety were among the most critical factors

contributing to vaccine reluctance [29]. Also Mubarak et al. showed in a study in Saudi Arabia in 2022 that 62.3% of the students in their study believed in the effectiveness of the COVID-19 [30]. On that note, it is important to remember that although many people were concerned about the possibility of unknown long-term side effects, the Center for Disease Control and Prevention (CDC) in the US confirmed that long-term side effects were unlikely [31]. The spread of misinformation via social media platforms has intensified doubts about the vaccine among the general public and, in turn, decreased acceptance of COVID-19 vaccination [32].

I will vaccinate when I am confident that the COVID-19 vaccine has been rigorously tested (66.5%); I expect many people to be vaccinated without side effects (58.8%); I will vaccinate if the government requires vaccination (33.5%) were the main factors that would make people reluctant to get vaccinated against COVID-19 [24, 33]. Current and future immunization campaigns would benefit from taking these elements into account for full success. This will help to increase the number of students being vaccinated.

This study showed that gender, field of study, reliance on the traditional plant for the treatment of COVID-19 and knowledge of COVID-19 vaccines are factors associated with acceptance of COVID-19 vaccination by students in the city of Conakry. Thus, students studying in non-biomedical fields were 2.101 times more likely to refuse COVID-19 vaccination than other students in biomedical fields. In Ethiopia in 2021, results obtained by Birhan Taye et al. reported that non-medical field of study was also a significant risk factor for non-acceptance of COVID-19 vaccination (AOR: 2.25, 95% CI: 1.43, 3.54) [34]. The reason for this result would be that health science students are more familiar with the signs and symptoms of COVID-19; they will easily understand the long-term costs of the pandemic. In addition, they are close to health facilities and have high exposure to different populations due to the nature of their education [35]. This shows the need to strengthen information and education strategies for students from other fields of study. This will be done through the facilitation of training modules on COVID-19 and conference debates for them. It is also important, because of their emergence and re-emergence, to introduce lessons on the prevention of some diseases with epidemic potential into the training curriculum of students in non-biomedical fields.

The study also found that students who believed that traditional herbs are effective in treating COVID-19 were 1.55 times more likely to refuse COVID-19 vaccination compared to those who did not hold this belief. Also, this study showed that students with low knowledge of COVID-19 vaccines, i.e. who named less than three COVID-19 vaccines, were 2.029 times more likely to refuse COVID-19 vaccination than others. Sahile et al. in Ethiopia in 2021 showed in their study that refusal to be vaccinated was associated with lack of knowledge about the COVID-19 vaccine (AOR: 2.187, 95% CI: 1.391-3.438, P < 0.001) [36]. The results of our study could be explained firstly by the fact that knowledge is the starting point of any practice and a

motivator to make good decisions. In addition, well-informed people can understand the seriousness of the disease and the need to eliminate the virus using all available opportunities such as vaccines [37]. It is important to note that since the advent of COVID-19, many Guineans have never really believed in its existence, arguing that it was just a hobby of the richest, a political will to muzzle the political opposition, thus rejecting all indications and recommendations coming from the country's authorities. To this must be added a rather timid awareness-raising campaign.

This study only gives the status of acceptance of COVID-19 vaccination by students in Conakry at the time of data collection in December 2021. The acceptance rate of COVID-19 vaccination could change in the present day. In addition, this study did not include universities in the interior of the country. However, because of the large sample of students interviewed (over 1,000) and the fact that Conakry is home to over 80% of Guinean students from all regions of the country, this study may be representative of the Guinean student population. It constitutes evidence that national health authorities could use to readjust information and communication strategies in order to significantly reduce the reluctance to vaccinate against COVID-19 among Guinean students. This should be accompanied by improving student access to COVID-19 vaccination (e.g. by setting up mobile vaccination points in the Universities).

5. Conclusions and Recommendations

This study showed that the acceptance rate of COVID-19 vaccination was generally good among students in the city of Conakry (74.5%). There is therefore no real problem of reluctance to be vaccinated against COVID-19 in this population group. The refusals to vaccinate that were observed in this study are essentially linked to poor access to information on COVID-19 (students in non-biomedical fields) and to the low level of knowledge about COVID-19 vaccines. The vaccination campaigns currently underway in the country should be reinforced by targeted information strategies, especially among students in non-biomedical fields. This could significantly reduce the rate of refusal of COVID-19 vaccination, which was 24.5% in this study. Another survey of the general population, not only in Conakry, but also in the interior of the country, would be useful for an overall understanding of the acceptance of COVID-19 vaccination in Guinea.

Data Availability

The data used to analyze the results of this study contains individual and anonymous information from students at 10 universities in the city of Conakry. Authorisation to carry out the study and to disseminate its results was obtained from the university authorities. Anyone interested in obtaining these data for scientific purposes may request them from the authors of this work at the following address: nnleno81@gmail.com.

Abbreviations

AOR, Adjusted Odd Ratio; COVID-19, Coronavirus disease 2019; CDC, Centers for Disease Control and Prevention; IQR, interquartile range, CI, Confidence Interval; SARS, Severe Acute Respiratory Syndrome; WHO, Word Health Organization.

Declarations

Authors' Contributions

Authors	Contributions
Niouma Nestor Leno	Study design, data analysis, drafting of the first manuscript, finalization of the submitted manuscript
Abdoulaye TOURE	Review of the study design, review of the manuscript
Kadio Jean-Jacques Olivier Kadio	Supervision of data collection, data processing and analysis, review of the first manuscript
Sinan Serge Armel Kouame	Data collection and cleaning, literature review, writing the introduction
Alexandre Delamou	Review of the study design, review of the manuscript
Alioune Camara	Review and validation of study design, review and validation of manuscript

Conflicts of Interest

The authors stated that there were no competing interests.

Ethical Considerations

The study carries no risk of adverse effects as it is non-interventional. Nevertheless, before the launch of this study, its protocol was presented for validation before a scientific jury of the Chair of Public Health of the Faculty of Health Sciences and Technology of the Gamal Abdel Nasser University of Conakry. This protocol was registered at the Gamal Abdel Nasser University of Conakry under the number 540/B at the deanship of the Faculty of Health Sciences and Techniques of the Gamal Abdel Nasser University of Conakry. Oral informed consent was obtained from each participant prior to the administration of the questionnaire. Authorisation to carry out the survey was obtained from the heads of the universities and the various faculties. In order to maintain confidentiality, the data collected was anonymous and accessible only to the researchers.

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