

Research Article

COVID-19: Characteristics, Vaccination Status, and Perceptions of Healthcare Workers in Mali's University Hospitals in 2023

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Abstract

Introduction: Coronavirus disease (COVID-19) is an infectious disease caused by the SARS-CoV-2 virus. Mali has been conducting vaccination campaigns since March 2020. There is insufficient data on COVID-19 vaccination among healthcare workers in university hospitals (UCHs). The objectives of this study were to describe the characteristics of UCH healthcare workers, determine their vaccination status, and assess their perceptions of COVID-19 vaccination. **Methods:** We conducted a cross-sectional study from January 1 to June 30, 2023. We interviewed randomly selected consenting healthcare workers from the staff list of each UCH using questionnaires. We analyzed the data with Epi-info 7 software and calculated frequencies, proportions, means, and confidence intervals. **Results:** A total of 277 agents were interviewed; the average age was 33 (SD = +8.67); the male-to female ratio was 1.02. Approximately 41% (107/277) were aged 18-29; 66% were married. The agents interviewed were mainly doctors (41%) and health technicians (21.66%). The proportion of health workers vaccinated against COVID-19 was 49% (135/277), of whom approximately 61% (83/135) had received two or more doses. Approximately 78% (216/277) of the healthcare workers interviewed had a positive opinion of COVID-19 vaccination; 83% (230/277) believed in the effectiveness of the COVID-19 vaccine; fear of side effects (53.5%) and lack of confidence in vaccines (18%) were the main reasons for not getting vaccinated. **Conclusion:** The workers interviewed were mainly young doctors and health technicians aged 18 to 29 with a higher education level and working in a healthcare unit. More than half of these healthcare workers had not yet been vaccinated against COVID-19, mainly because of the risk of side effects. Most of them had a positive perception of COVID-19 vaccination.

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Keywords

COVID-19 Vaccination, Healthcare Workers, Characteristics, Perception, Mali

1. Introduction

Coronavirus disease or COVID-19 has appeared since December 2019 in Wuhan, China. It is an infectious disease caused by a virus called SARS-CoV-2 [1]. Declared a public health emergency of international concern by the World Health Organization WHO on 30 January 2020 [2] then a pandemic on 11 March 2020 [3].

As of 14 October 2022, there were 620,301,709 confirmed cases of COVID-19 worldwide, including 6,540,487 deaths, giving a case-fatality rate of 1.05% [4]. During the same period in Africa, 12,072,363 confirmed cases of COVID-19 were reported, with 255,822 deaths, representing a case-fatality rate of 2.11% [5]. In Mali, the first confirmed cases of COVID-19 were recorded on 25 March 2020. [6]. As of 5 October 2022, Mali had recorded a total of 32,686 confirmed cases of COVID-19, including 742 deaths, representing a case-fatality rate of 2.27% [7].

Following the increase in the number of confirmed cases and deaths from COVID-19 worldwide, strategies were developed and put in place to respond. These strategies include vaccination, which is the most effective public health intervention, as well as barrier and environmental measures [8]. Several types of vaccine have been developed and made available to the public, leading to a reduction in the spread of the disease and in the number of serious cases of COVID-19 [9]. In some people, administration of these vaccines caused mild to moderate adverse side effects such as fever, fatigue, headaches, muscle aches, chills, diarrhea and redness at the injection sites [10]. In some cases, vaccinated individuals have experienced more serious reactions, leading to death. These post-immunization reactions in certain subjects vaccinated against COVID-19 are thought to have led to reluctance or mistrust of the vaccines used [11].

In Mali, following the implementation of vaccination campaigns against COVID-19 and awareness-raising activities [12], the rate of COVID-19 vaccination coverage in the general population was still very low, at 22.66% on 6 October 2022 [13]. However, we do not have sufficient data on COVID-19 vaccination among healthcare workers, particularly those working in university hospital centers (UCH). The objectives of this study were to describe the characteristics of UHC health workers, determine their vaccination status and their perception of COVID-19 vaccination.

2. Materials and Methods

2.1. Scope of the Study

The study was carried out in the main university hospital centers in Bamako and Kati: National Center for Odontostomatology (CNOS), Kati Hospital, Mali Hospital, African Institute of Tropical Ophthalmology (IOTA), Mother and Child Hospital le Luxembourg, Hospital Point G and Hospital Gabriel Touré [14]. These university hospitals were considered to be reference facilities for the management of COVID-19 patients. It was for this reason that we chose them to carry out this study.

2.2. Type and Period of Study

We conducted a cross-sectional study that took place from January 1 to December 31, 2023 Study population.

It was made up of doctors, pharmacists, medical assistants, biologists, midwives, health technicians, lab technicians, matrons and orderlies.

2.2.1. Inclusion Criteria

- 1) be a healthcare worker at one of the university hospital centers involved in the study
- 2) Be present at the time of the visit of the interviewers
- 3) Agree to take part in the study.

2.2.2. Non-inclusion Criteria

Healthcare workers who are unavailable to participate in the study Sampling.

2.2.3. Sampling Techniques

The list of staff at each university hospital constituted our sampling frame. Participants were selected at random using the simple random sampling technique. The list was numbered from 1 to X. Using Excel's random function, we generated numbers at random between 1 and X. The numbers generated were chosen without repetition until we reached the planned sample size for each university hospital.

2.2.4. Minimum Sample Size

Our minimum sample size was calculated using Open Epi software using the following formula: $n = [DEFF * Np (1-p)] / [(d^2 / Z^2 (1-\alpha) / 2 * (N-1) + p * (1-p))]$. The size of the population (N) of health workers practicing in the university hospitals was 1714 [15]. The hypothetical % frequency of outcome factors

in a population is estimated at 31%, with reference to a study carried out at the Tengadogo University Hospital (Burkina Faso) [16]. The desired precision was 5% (d) and the test for the reduced deviation of the centered reduced normal distribution for a risk α of 0.05 is $Z_{1-\alpha/2} = 1.96$. After calculation, the minimum sample size was 276, distributed between the university hospitals in proportion to the size of their staff. The response rate was 99% (277/280).

2.3. Data Collection

Data was collected using a questionnaire designed and pre-tested in a reference health center (CSR  ) and corrected. The questionnaire was administered face-to-face.

3. Variables

The variables were summarized into socio-demographic variables (age in years, sex, marital status, COVID-19 antecedent, COVID-19 family antecedent, qualification, level of education, service, residence, assessment of vaccination, assessment of COVID-19 vaccination, belief in vaccination) and clinical variables (vaccination status, number of doses, availability of vaccination card, doses recorded on card, side effects of vaccine, type of side effect, description of side effect, reasons for accepting vaccination, reasons for refusing vaccination, availability of vaccine, conditions of access to vaccines, storage, qualifications of vaccinators, financial expenses incurred during a vaccination session, estimated vaccination time, assessment of time taken, place of vaccination, assessment of place of vaccination).

3.1. Data Entry and Analysis

The data were entered and analyzed using Epi Info version 7.2.0.1 and SPSS version 2022. Inconsistent data were first checked and corrected. Duplicates were searched for and deleted. We calculated the proportions for the qualitative variables and the means $\pm$ standard deviations based on the normality of the distribution.

3.2. Ethical Considerations

The authorizations of the health authorities, in particular the Directors General of the university hospitals involved in the study, were obtained. The free and informed written consent of the health workers surveyed was requested and obtained before they were interviewed. The confidentiality of the data collected and the anonymity of the participants were ensured.

4. Results

4.1. Characteristics of UHC Healthcare Workers

A total of 277 healthcare workers completed the questionnaires. The average age of the staff interviewed was 33 years (SD= +8.67) and the sex ratio M/F was 1.02.

The 18-29 age group accounted for approximately 41%. Of the health workers interviewed, 51% were male; 66% were married (Table 1).

Table 1. Distribution of university hospital health workers by age, gender, and marital status, Mali, 2023.

Characteristics	n (%)	CI 95%
Age (years)		
18-29	107 (40,5)	[34,55-46,72]
30-39	96 (36,4)	[30,55-42,48]
40-49	43 (16,3)	[12,05-21,31]
50-59	17 (6,44)	[3,80-10,11]
60 et plus	1 (0,38)	[0,01-2,09]
Gender		
Male	140 (50,54)	[44,4 -56,58]
Female	137 (49,46)	[43,42-55,51]
Marital status		
Single	91 (32,85)	[27,3 -38,73]
Married	183 (66,06)	[60,16-71,62]
Divorced	2 (0,72)	[0,09 - 2,58]

Characteristics	n (%)	CI 95%
Widowed	1 (0,36)	[0,01 - 1,99]

The health workers interviewed were mainly doctors (41%), health technicians (21.66%), biologists (6%), midwives (5%), medical assistants (5%), laboratory technicians (4%), pharmacists (2%) and matrons (2%); 72% had a higher level of education; 91% worked in a health unit and 22% lived in Commune 3 of Bamako (Table 2).

Table 2. Distribution of university hospital health workers by qualification, level of education, department, and residence, Mali, 2023.

Characteristics	n (%)	CI 95%
Qualification		
Doctors	114 (41,16)	[35,30 - 47,20]
Pharmacist	6 (2,17)	[0,80 - 4,65]
Medical assistant	14 (5,05)	[2,79 - 8,33]
Biologists	17 (6,14)	[3,62 - 9,64]
Midwives	15 (5,42)	[3,06 - 8,77]
Health technicians	60 (21,66)	[16,96 - 26,98]
Laboratory technicians	10 (3,61)	[1,74 - 6,54]
Matrons	3 (1,08)	[0,22 - 3,13]
Others	28 (10,11)	[6,82 - 14,28]
Level of Education		
Higher	200 (72,20)	[66,53 - 77,40]

Characteristics	n (%)	CI 95%
Secondary	65 (23,47)	[16,60 - 28,91]
Primary	12 (4,33)	[2,26 - 7,45]
Service		
Care unit	255 (91,05)	[0,42 - 2,02]
Administration	22 (7,94)	[1,78 - 27,80]
Residence		
Municipality 1	24 (8,66)	[5,63 - 12,62]
Municipality 2	29 (10,47)	[7,12 - 14,69]
Municipality 3	61 [22,02]	[17,28 - 27,37]
Municipality 4	38 (13,72)	[9,89 - 18,34]
Municipality 5	29 (10,47)	[7,12 - 14,69]
Municipality 6	47 (16,97)	[12,74 - 21,92]
Kati	31 (11,19)	[7,73 - 15,51]
Others	18 (6,50)	[3,90 - 10,08]

4.2. Vaccination Status and Number of Doses of COVID-19 Vaccine Received

The proportion of health workers vaccinated against COVID-19 in Mali's university teaching hospitals was 49% (135/277). About 61% of vaccinated workers had received more than 2 doses of COVID-19 vaccine (Table 3).

Table 3. Distribution of university hospital healthcare workers by vaccination status and number of COVID-19 vaccine doses received in Mali, 2023.

University hospital healthcare workers	Frequence	Proportion (%)	CI 95%
Vaccination status (n= 277)			
Not vaccinated	142	51,26	[45,21-57,29]
Vaccinated	135	48,74	[42,71-54,79]
Number of doses received (n= 135)			
1 dose	52	38,52	[30,76- 47,93]
2 doses	73	54,07	[46,03 - 63,52]
3 or more doses	10	7,41	[2,63 - 11,51]

4.3. Perception of University Hospital Healthcare Workers Regarding COVID-19 Vaccination

Approximately 84% (232/277) of the health workers interviewed stated that they had not undergone COVID-19. They had no personal history of COVID-19; 84.5% (234/277) said they had no family history of COVID-19; 78% (216/277)

thought that vaccination against COVID-19 was a good strategy for responding to the COVID-19 pandemic; 83% (230/277) believed in the effectiveness of the COVID-19 vaccine. According to the UHC staff interviewed, fear of side effects (53.5%) and lack of confidence in the available vaccines (18%) were the main reasons for not vaccinating (Table 4).

Table 4. Perception of university hospital health workers on COVID-19 vaccination, Mali, 2023.

Characteristics	n (%)	CI 95%
Personal history of COVID-19		
Yes	45 (16,25)	[12,10 - 21,13]
No	232 (83,75)	[78,87 - 87,90]
Family history of COVID-19		
Yes	43 (15,52)	[11,47 - 20,33]
No	234 (84,48)	[79,67 - 88,53]
Appreciation of vaccination (COVID-19)		
Good	216 (77,98)	[72,63 - 82,72]
Poor	23 (8,30)	[5,34 - 12,20]
Don't know	38 (13,72)	[9,89% - 18,34]
Belief in vaccination		
Yes	230 (83,03)	[78,08 - 87,26]
No	47 (16,97)	[12,74 - 21,92]
Reason for not vaccinating (n=142)		
Does not believe in the disease	5 (3,52)	[1,15 - 8,03]
Do not trust the vaccine	25 (17,61)	[11,73 - 24,88]
Fear of side effects	76 (53,52)	[44,97 - 61,93]
Vaccine not available	9 (6,34)	[2,92 - 11,69]
Other	27 (19,01)	[12,92 - 26,45]

5. Discussion

A total of 277 health workers completed the questionnaires. The average age of the health workers interviewed was 33 years (SD= +8.67); the sex ratio M/F was 1.02. According to Hamdi El Kefi, in his study on the acceptability of COVID-19 vaccination at the Tunisian general hospital, the average age was 40, ranging from 20 to 60 years [17]; Abdoulaye O et al found a mean age of 32.58±12 years [18]. The latter result is approximately the same as in our study. In our study, we did not find much difference in the gender of the agents interviewed. Males

accounted for 51%. Hamdi El Kefi and Abdoulaye O found a gender predominance in favor of women, which was 55.3% respectively [17] and approximately 60% [18, 19].

In our study, the proportion of healthcare workers vaccinated against COVID-19 in Mali's university hospitals was 49% (135/277). According to Hamdi El Kefi, 58% of the healthcare workers interviewed had been vaccinated against COVID-19 [17]; Abdoulaye O et al found that 42% of the agents interviewed were vaccinated [20]; 95% of healthcare professionals vaccinated against COVID-19 according to Moussa et al [19]. A study carried out among students at the Faculty of Medicine and Odontostomatology in Mali reported that 38.84% of students had been vaccinated [21].

We found that around 41% of the agents interviewed were in the 18-29 age bracket. According to the study carried out by Abdoulaye O in four health facilities in Niger, young people under the age of 30 accounted for 53% [18]. The 30-39 and 40-49 age groups were in the majority in the study carried out in Senegal by Moussa DS, accounting for 46% and 34% respectively [19].

According to our results, doctors and health technicians represented respectively 41% and 22% of the agents interviewed while Abdoulaye O found that paramedics and students represented respectively about 48% and 43% [18]. In the study carried out in Senegal, the doctors concerned accounted for 14% [19].

We found that 72% of the agents surveyed had a higher level of education; 91% worked in a health care unit and 22% lived in Commune 3 of Bamako. According to the study carried out by Moussa DS in Senegal on the acceptability of COVID-19 vaccination, 79% of participants had a higher level of education [19]. These results do not differ sufficiently from those obtained in our study.

In our study, around 84% of the healthcare workers interviewed had no history of COVID-19 disease, and 79% felt that vaccination against COVID-19 was a good strategy for responding to the COVID-19 pandemic. According to the study carried out in Tunisia on the acceptability of COVID-19 vaccination, 85% had a good perception of COVID-19 vaccination [17]. The benefits of vaccination against COVID-19 were also recognized by healthcare personnel, according to a study by Gnagoran Kouakou Daniel N'GUESSAN and Denis Komenan DAGOU on healthcare personnel's beliefs about vaccination against Covid-19 [22].

Our study found that fear of side effects was the main reason for non-vaccination for the health workers interviewed in the university hospitals (53.52%). Fear of side effects was also cited in other studies as a major reason why healthcare professionals did not vaccinate. Similarly, according to Gnagoran Kouakou Daniel N'GUESSAN and Denis Komenan DAGOU, some healthcare professionals had cited fears about the vaccine's side effects or efficacy as major reasons for accepting vaccines against COVID [22].

6. Conclusion

The health workers interviewed were mainly young doctors and health technicians aged between 18 and 29, with a higher level of education and working in a health care unit. More than half of these health workers had not yet been vaccinated against COVID-19, mainly because of the fear of side effects, although they generally had a good perception of COVID-19 vaccination. Good communication would help reassure health workers about COVID-19 vaccination.

Abbreviations

CI	Confidence Interval
COVID-19	Coronavirus disease 2019
F	Female
FMOS	Faculty of Medicine and Odontostomatology
ICER	International Center for Excellence in Research
M	Male
NOSC	National Odontostomatology Center
SARS-CoV-2	Severe Acute Respiratory Syndrome for Coronavirus
SD	Standard Deviation
UHC	University Hospital Center
WAOI	West African Ophthalmological Institute
WHO	World health organization

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Author Contributions

HK, OS, HS, BT developed the protocol, collected, analyzed and interpreted the data, and contributed to the drafting of manuscripts. CAC, NT, YIC, AS and DB contributed to the analysis and interpretation of data and the revision of several drafts. DB, OS, CAC, NT made substantial contributions to the drafting of manuscripts.

Current State of Knowledge

Several types of vaccine have been developed and made available to the public. Studies have been carried out on the COVID-19 disease, but we do not have sufficient data on the perception and anti-COVID-19 vaccination coverage of health workers working in health care structures, particularly university hospitals.

Conflicts of Interest

We declare that we have no conflicts of interest.

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