

Associated Factors with Acceptability of Vaccination Against COVID-19 Among Health Workers in Koumpentoum Health District (Senegal)

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Abstract: *Background:* Vaccination of health providers is one of the priorities in response to COVID-19. The objective of this study was to identify factors associated with the uptake of the second dose of Sinopharm by health workers in the Koumpentoum health district. *Methodology:* This was a cross-sectional, descriptive and analytical survey. A semi-structured closed questionnaire with items on socio-demographic characteristics, history and vaccination against COVID-19 was distributed to health workers. Multiple logistic regression was used to identify factors associated with taking the second Sinopharm dose. *Results:* In total, we had (168) respondents of whom (59.95%) were women. The mean age was (37.05 ± 9.76) years and the median (30) years. Almost all of them, (85.71%), were living with a partner. Unskilled workers represented (74.4%) of respondents. The average length of professional experience was (8.51 ± 5.81) years with median of (7) years. Incidence of co-morbidities was (8.93%), this of the COVID-19 (10.12%) and this of adverse events (16.67%). The second dose coverage of Sinopharm was (82.74%) and the statically and significantly associated factors were age > (35 years (ORa = 4.51 [1.71-11.91]; p = 0.0023), living with a partner (ORa = 4.11 [1.36-12.45]; p = 0.0123) and work experience > (5) years (ORa = 3.15 [1.09-9.08]; p = 0.0331). *Conclusion:* Factors related to vaccination of health workers against COVID-19 in Koumpentoum district are age, marital status and work experience. Training and vaccination of young health workers should be a prerequisite for the plan to revive and intensify vaccination against COVID-19.

Keywords: Vaccination, COVID-19, Health, Providers, Senegal

1. Introduction

Notified for the first time in Wuhan, China, the Severe Acute Respiratory Syndrome (SARS) virus disease caused by Corona virus 2 (Cov 2) spread rapidly around the world [1]. Dubbed COVID-19, it quickly became a pandemic that caused (609) million cases and (6.5) million deaths worldwide [2].

The race for vaccines by the global pharmaceutical industry quickly intensified. The global health emergency led to the

rapid development of vaccines against the disease, including mRNA vaccines [3]. The relaxation of vaccine licensing procedures has led to scepticism and mistrust among health care providers and the emergence of rumors that are harmful to COVID-19 vaccination, particularly through social networks [4]. The first vaccine against the disease, the Pfizer/BioNTech mRNA vaccine, was licensed by the World Health Organization (WHO) on (31th) December (2020). This was followed by several other vaccines: Astra Zeneca, Johnson and Johnson, Moderna, Sinopharm, Sinovacc, Covaccin, Covovax and Nuvaxovid [5].

Although several vaccines are currently available in Senegal, namely Sinopharm, Astra Zeneca, Johnson and Johnson, and Pfizer, vaccine coverage rates are still very low. The strategy to vaccinate (90%) of health workers and people vulnerable to the disease and (70%) of people over (18) years of age to achieve herd immunity is hampered by negative rumors and low support from health workers and the population [6].

Indeed, in July (2022), the vaccination coverage of health workers against COVID-19 in the health district of Koumpentoum according to administrative data was only (51%) [7]. Studies on the acceptability of vaccination against COVID-19 among health care providers are rare in Senegal. The objective of this study is to determine COVID-19 vaccination coverage among health workers in the Koumpentoum health district and identify associated factors in order to make recommendations for improvement.

2. Methodology

2.1. Framework of the Study

The health district of Koumpentoum covers the department of the same name.

Its population is estimated in (2022) to (176,666) inhabitants on a surface area of (7,652) km², i.e. a density of (23.08) inhabitants/Km².

In terms of health infrastructure and the provision of services and care, there are:

- 1) (22) health posts that provide only primary health care (PHC), the most distant of which is Loffé located (101) km from Koumpentoum.
- 2) (1) health centre located in Koumpentoum which offers reference care in addition to PHC [8].

In terms of human resources for health, there are (1,367) health workers distributed as follows

- 1) Within the framework of the provision of services and care by qualified providers: (72) qualified agents: (5) physicians, (2) pharmacists, (1) dental surgeon, (2) senior health technicians, (28) state midwives, (24) state nurses and (10) state nursing assistants.
- 2) Within the framework of the provision of services and care by unqualified providers: (60) unqualified agents: (30) community health agents and (30) matrons from the centre and health posts.

In the context of prevention and promotion activities in the community:

- 1) (262) community health actors: (72) matrons and (72) community health agents from the centre and health posts and (118) home-based care providers;
- 2) (973) community prevention and promotion actors: (666) multi-purpose community relays and (307) badienou gox, etymologically paternal aunts of the zones, raising awareness solely on reproductive health.

2.2. Type and Period of Study

We conducted a descriptive and analytical study that explored the knowledge, attitudes and practices [9] and

acceptability of COVID-19 vaccination by health workers in the Koumpentoum health district.

The survey took place from (1st) to (15th) October (2022).

2.3. Population Study

The study population was the (1,367) health workers in the district.

2.4. Inclusion and Non-Inclusion Criteria

All health workers in the Koumpentoum health district who agreed to participate in the study were included.

Health workers who were absent during the collection period or who refused to participate in the study were not included.

2.5. Sampling

The target of the study was the (1,307) health workers in the district.

We calculated the sample size according to Schwartz's formula [9]:

$$N = Z^2 \times p \times (1 - p) \times d/i^2$$

Where:

p = estimated desired full vaccination coverage of (90%);

q = (1) - p = (10%);

i = margin of error set at (0.05);

d = (1.5) is the design effect;

N = (1.962) × (0.90) × (0.10) × (1.5)/ (0.05)² = (207), add (10%) non-respondents and the final size N = (228).

A proportional allocation of the number of participants per benefit point was made.

Then, the anonymous questionnaire was distributed to the providers present at the points of service who had agreed to participate in the study.

2.6. Variables Definitions

The dependent variable was the acceptability of the vaccination against 19 which is defined as the actual intake of the second dose of Sinopharm.

The independent variables will be related to the following items:

- 1) Socio-professional characteristics: sex, age, marital status, socio-professional category, seniority;
- 2) Vaccination against COVID-19: vaccination status, type of vaccine received, number of doses received, reasons for vaccination, desire for vaccination, existence of side effects and preferences.

2.7. Data Collection

Administrative data on COVID-19 vaccination were collected from the focal point in charge of the expanded program on immunization and the head nurses.

An anonymous questionnaire including socio-occupational characteristics, vaccination and determinants of acceptability of the COVID-19 vaccination was administered to health workers.

2.8. Data Analysis

The Epi-Info software version (7) was used to create the input mask and to obtain the database. The R software version (4.05) was used for the analysis.

In descriptive analysis, quantitative variables were described using extremes means and standard deviations, while qualitative variables were described using frequencies with confidence intervals (95% CI).

Pearson's chi2 statistical tests and Fisher's test under the conditions of applicability had verified the existence of a statistically significant relationship in the bivariate analysis.

In the multivariate analysis, we used multiple logistic regression and included all independent variables with a $p < (0.25)$ found in the bivariate analysis and those for which the literature review had revealed a link with the independent variable. The top-down stepwise method allowed us to retain the variables associated with the acceptability of the COVID-19 vaccination at a threshold of $p < (5\%)$. In a second step, these variables were removed one by one with a comparison of the nested models by the Aikake information criterion (AIC) [10]. The process was continued until no improvement was found by the maximum likelihood test. The Hosmer-Lemeshow test [11] was used to verify the adequacy of the final model. The strength of the associations between the acceptability of COVID-19 vaccination and the independent variables was assessed in bivariate analysis with the OR and in multivariate analysis with the adjusted OR, surrounded by their 95% CIs.

2.9. Ethical Considerations

The study protocol was submitted to the health authorities.

With an information letter read in French, the survey was explained to all participants.

Free consent was collected and documented on a form with the signature of the agent consenting to the survey. The data was collected anonymously, stored and used exclusively for research purposes.

2.10. Study Limitation

The main limitation of our study was that the survey was conducted by district health workers, which could lead to a desirability bias. However, investigators were deployed outside their area of responsibility to reduce its effects.

3. Results

3.1. Distribution of Health Workers by Socio-Occupational Characteristics and Medical History

To sum up, we had (168) respondents of whom (55.95%) were women. The mean age was (37.05 ± 9.77) years and the median was (35) years. Almost all of them (85.71%) were living with a partner. Unskilled workers represented (74.4%). The average length of work experience was (8.51 ± 5.81) years with a median of (7) years. The incidence of co-morbidities was (8.93%), COVID-19 was (10.12%) and adverse events were (16.67%).

The coverage of the first dose of Sinopharm was (91.67%) that of the second dose (82.74%).

The main reasons for non-vaccination were fear of side effects (31.03%), negative rumors (27.59%) and doubts about the efficacy of the vaccine (24.14%).

Table 1. Distribution of health workers by socio-occupational characteristics and medical history.

Variables	Absolutes frequencies (n = 782)	Relatives frequencies (%)
<i>Gender</i>		
Male	74	44.05
Female	94	55.95
<i>Age</i>		
Mean	37.05	9.77
Median	35	
<i>Age group</i>		
≤ 30 years	118	70.24
> 30 years	50	27.59
<i>Marital status</i>		
In couple	144	85.71
No in couple	24	14.29
<i>Professional status</i>		
Qualified	43	25.6
Non qualified	125	74.4
<i>Professionnal experience</i>		
Mean	8.51	5.81
Median	07	
<i>Professionnal experience</i>		
> 5 years	75	44.64
≤ 5 years	93	55.36
<i>Vaccination coverage</i>		
1 st dose	154	91.67
2 nd dose	139	82.74
3 rd dose	65	38.69
<i>Side effects</i>		
Yes	28	16.67

Variables	Absolutes frequencies (n = 782)	Relatives frequencies (%)
No	140	83.33
<i>Reason of second dose uptake</i>		
To set a good example	65	46.76
To protect my family	63	45.32
For my personal protection	9	6.48
Medical recommendation	2	1.44
<i>Reason of non-vaccination</i>		
Doubts about effectiveness	7	24.14
Distrust	5	17.24
Because of harmful rumours	8	27.59
Fear of side effects	9	31.03
<i>Do you suffer from a chronic disease?</i>		
Yes	15	8.93
No	153	91.07
<i>Have you ever been ill with COVID-19?</i>		
Yes	17	10.12
No	151	89.98

3.2. Bi Variate Analysis

In bi variate analysis, factors statically and significantly associated with the uptake of second dose of Sinopharm were age >(30) years (OR = 4.5 [1.97-10.49]; p = 0.001), living with a couple (OR = 3.72 [1.43-9.63]; p = 0.005), and experience > (5) years (OR = 2.44 [1.01-5.88]; p = 0.021).

Table 2. Factors associated with taking the second dose of Sinopharm in bi variate analysis.

Variables	P value	OR	IC _{95%}
Gender male	0.254	1.62	0.7-3.77
Age group > 30 years	0.001	4.5	[1.97-10.49]
Life in a couple	0.005	3.72	[1.43-9.63]
Professional status qualified	0.263	1.39	[0.52-3.68]
Professional experience > 5 years	0.021	2.44	[1.01-5.88]
Side effects	0.095	3.1	[0.69-13.89]
Chronic disease	0.498	0.818	[0.21-3.1]
COVID-19	0.592	0.97	[0.26-3.62]

3.3. Multi Variate Analysis

In multi variate analysis, factors statically and significantly associated with the uptake of second dose of Sinopharm were age > (30) years (OR = 4.51 [1.71-11.91]; p = 0.0023), living with a couple (OR = 4.11 [1.36-12.45]; p = 0.0123), and experience > (5) years (OR = 3.15 [1.09-9.08]; p = 0.0331).

Table 3. Factors associated with taking the second dose of Sinopharm in multivariate analysis.

Variables	ORa	P value	IC _{95%}
Gender male	1.84	0.22	[0.69-4.91]
Age group > 30 years	4.51	0.0023	[1.71-11.91]
Life in a couple	4.11	0.0123	[1.36-12.45]
Professional status qualified	0.58	0.391	[0.16-2.01]
Professional experience > 5 years	3.15	0.0331	[1.09-9.08]
Side effects	1.79	0.477	[0.35-8.98]
Chronic disease	2.15	0.271	[0.21-21.33]
COVID-19	0.73	0.711	[0.13-3.86]

4. Discussion

In our study, the response rate was (73.68%). Although quite high, it was lower than that observed in Sangalkam by Diedhiou B. B. *et al.* with (82.05%) [12]. This illustrates the importance given by the agents to vaccination against COVID-19.

Unqualified agents represented (74.4%). The problem of qualified human resources in the field of health arises in

developing countries and particularly in Sub-Saharan Africa, especially in regions located far from national capitals [13].

The frequency of co-morbidities was (8.93%). The latter is significantly lower than that of the general population. Indeed, according to the STEPS survey (2015), the prevalence of hypertension in Senegal was (29.8%) in the adult population [14]. A greater knowledge of the means of prevention of chronic diseases involving more preventive measures could explain this finding.

The frequency of COVID-19 of (10.12%) is lower than that

observed by Diedhiou B. B. *et al.* in Sangalkam at the beginning of the pandemic with (25.8%) [12] and by Mejdane R. *et al.* in Oran (Algeria) with (22.8%) [15]. A lower population density in Koumpentoum (23.08 inhabitants/Km²), a better current knowledge of the disease and the availability of means of prevention could explain this lower prevalence observed in our sample.

In our sample, the frequency of occurrence of adverse events was (16.67%) clearly lower than that observed by Diedhiou B. B. *et al.* in Sangalkam with (30.3%) [12] and Saed B. Q. *et al.* in the United Arab Emirates with (75.6%) dominated by minor reactions [16]. Underreporting of minor adverse events may explain this situation.

The acceptability of COVID-19 vaccination which corresponded to the coverage of the second dose of Sinopharm was (82.74%). Similar frequencies were observed by Zaiton H. *et al.* with (74.4%) in Israel [17], by Yima D *et al.* with (74.5%) in Ethiopia [18] and by Diedhiou B. B. *et al.* in Senegal with (73.5%) [12]. Significantly lower results were found by Ziade N. *et al.* in Arab countries with (59%) [19] and by Mejdane R. *et al.* in Oran (Algeria) with (13.8%) [15]. This performance noted in our sample could be explained by the fact that in Senegal, vaccination of health care providers is one of the priorities on the fight against COVID-19 and this since the advent of the first doses of vaccine against the disease [6].

In our study, the gender of the health workers was not associated with the acceptability of the COVID-19 vaccination, contrary to the findings of Larhlid M. *et al.* in Morocco who noted a link between the male gender of the health workers and the acceptability of the vaccination [20].

In our sample, professional status was not associated with acceptability of COVID 19 vaccination, unlike the series of Zaitoon H *et al.* [17] and Yima D *et al.* [18] where doctors and nurses were more likely to be vaccinated than the rest of the health workers. Indeed, doctors and nurses constituting the frontline staff are therefore more exposed to COVID-19 than the rest of the health workers.

The presence of co-morbidities and a history of COVID-19 were not predictive to taking the second dose of Sinopharm. In contrast, Larhlid M. *et al.* [20] noted that the presence of chronic diseases and perceived risk of contracting the disease were associated with better acceptability of COVID-19 vaccination.

The main reasons for taking the second dose of Sinopharm were to set a good example (46.76%) and the perception of protecting one's family (45.32%). Similar results were found by Diedhiou B. B. *et al.* [12] in Sangalkam and Ziade N. *et al.* [19]. Overall, this illustrates the confidence of the agents in the health care system and the leadership of the health hierarchy.

Factors statically and significantly associated with the uptake of the second dose of Sinopharm were age > (30) years (ORa = 4.51 [1.71-11.91]; p = 0.0023), living with a partner (ORa = 4.11 [1.36-12.45]; p = 0.0123) and experience > (5) years (ORa = 3.15 [1.09-9.08]; p = 0.0331).

The notion of living in a couple was associated with taking the second dose of Sinopharm (ORa = 4.11 [1.36-12.45]; p = 0.0123). Similarly, health workers older than (35) years were

more likely to take the second dose of Sinopharm (ORa = 4.51 [1.71-11.91]; p = 0.0023). A similar association was noted by Zaiton *et al.* in Israel [17] (OR: 1.075; 95% CI: 1.04-1.11, p < 0.001) and by Monym L *et al.* in Morocco [20]. Work experience > (5) years was also predictive of taking the second dose of Sinopharm. This relationship between job tenure and acceptability of COVID-19 vaccination was also found by Larhlid M *et al.* in Morocco [20]. These findings could be explained by a greater confidence of health care workers that increases with professional experience, particularly through the experience of the routine expanded program of vaccination.

In our study, there was no relationship between the presence of side effects and the acceptability of COVID-19 vaccination. The main reasons for non-vaccination were fear of side effects (31.03%), negative rumors (27.59%) and doubts about the efficacy of the vaccine (24.14%). Similar findings were made by Diedhiou B. B. *et al.* [12] in Sangalkam and by Yima D. *et al.* in Ethiopia [18]. The persistence of health workers' distrust of calf vaccines, particularly against COVID-19, is a barrier to achieving the vaccination coverage objectives. The training of young health providers on the expanded program on immunization and on health communication is imperative.

5. Conclusion

Vaccination of health care providers is one of the priorities in the response to COVID-19. The objective of this study was to identify factors associated with the uptake of the second dose of Sinopharm by health workers in the Koumpentoum health district. Factors statistically significant associated with taking the second dose of Sinopharm were age, marital status, and work experience. In the context of reviving and intensifying vaccination against COVID-19, sensitization and vaccination of young providers should be a prerequisite.

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