

# Exploring the Acceptance of COVID-19 Vaccine among Health Zone Nurse Supervisors Involved in the Active Monitoring of COVID-19 Vaccine Side Effects in Kinshasa, Democratic Republic of the Congo: A Health Belief Model-Based Survey

Muriel Nzazi Nsambu<sup>1</sup>, Levis Bolekola<sup>2</sup>, Marcellin Nimpa Mengouo<sup>3</sup>, Léon Kinuani Mbulu<sup>4</sup>, Joris Losimba Likwela<sup>5</sup>

<sup>1</sup>Kasai Oriental Provincial Office, World Health Organization, Mbuji-Mayi, Democratic Republic of the Congo

<sup>2</sup>Democratic Republic of the Congo Country Office, World Health Organization, Kinshasa, Democratic Republic of the Congo

<sup>3</sup>Burkina Faso Country Office, World Health Organization, Ouagadougou, Burkina Faso

<sup>4</sup>Operational Research Unit, National Expanded Program for Immunization, Ministry of Health, Kinshasa, Democratic Republic of the Congo

<sup>5</sup>Department of Public Health, Faculty of Medicine and Pharmacy, University of Kisangani, Kisangani, Democratic Republic of the Congo

Email: [nzazinsambum@who.int](mailto:nzazinsambum@who.int), [levisbolekola@gmail.com](mailto:levisbolekola@gmail.com), [nimpamengouom@who.int](mailto:nimpamengouom@who.int), [drkileon@gmail.com](mailto:drkileon@gmail.com), [joris.likwela@unikis.ac.cd](mailto:joris.likwela@unikis.ac.cd)

**How to cite this paper:** Nzazi Nsambu, M., Bolekola, L., Nimpa Mengouo, M., Kinuani Mbulu, L. and Losimba Likwela, J. (2025) Exploring the Acceptance of COVID-19 Vaccine among Health Zone Nurse Supervisors Involved in the Active Monitoring of COVID-19 Vaccine Side Effects in Kinshasa, Democratic Republic of the Congo: A Health Belief Model-Based Survey. *Journal of Biosciences and Medicines*, 13, 288-301. <https://doi.org/10.4236/jbm.2025.138023>

**Received:** July 16, 2025

**Accepted:** August 16, 2025

**Published:** August 19, 2025

---

## Abstract

**Background:** The COVID-19 pandemic has highlighted the importance of vaccination as a preventive tool. In the Democratic Republic of the Congo (DRC), uptake of vaccination remains low, particularly in a context of mistrust and misinformation. This study aims to assess the acceptability of the COVID-19 vaccine among nurse supervisors involved in adverse effects following immunization (AEFI) surveillance in Kinshasa. **Materials and Methods:** A cross-sectional study was conducted in October 2021 among 36 nurse supervisors (NS) from Kinshasa's 35 health zones (HZ), namely each NS assigned to monitor adverse events related to the COVID-19 vaccine in the HZ as well as the focal point for this activity at the provincial coordination level of the expanded programme on immunization. Data was collected using a questionnaire based on the Health Belief Model. Statistical analyses were performed with STATA/IC 16, using non-parametric tests to compare vaccinated and unvaccinated groups. **Results:** The vaccination rate was 80.6%. All participants aged 55 and

---



over were vaccinated. Perceived severity of COVID-19 was high, while perceived individual susceptibility was not significantly associated with vaccination. The main motivations for vaccination included perceived safety (24.1%), efficacy (17.2%) and WHO recommendations (17.2%). Preventive practices were not correlated with vaccination. **Conclusion:** Despite their key role in monitoring side effects, some nurse supervisors remain hesitant about the vaccine. The study revealed a high level of acceptability of the COVID-19 vaccine among nurse supervisors in Kinshasa, influenced by their perception of the severity of the disease and institutional recommendations. The active involvement of healthcare professionals in surveillance and communication mechanisms appears to be a strategic lever for boosting vaccine confidence.

## Keywords

Vaccine Acceptance, COVID-19, Health Belief Model, Healthcare Workers, Democratic Republic of the Congo

## 1. Introduction

The severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), a novel coronavirus belonging to the family Coronaviridae, termed coronavirus disease 19 or simply COVID-19, has rapidly spread throughout the world at an alarming pace and has been declared a pandemic by the World Health Organization (WHO) on March 11, 2020 [1]. Three years after, as of 10 March 2023, more than 676 million cases and over 6.88 million deaths have occurred globally since the start of the pandemic [2]. The DRC, like other African countries, is one of the least affected countries in the world with 95,944 confirmed cases of COVID-19 with 1464 deaths reported to WHO since the first COVID-19 case was reported on 10 March 2020 [2]-[4].

To date, there is no highly efficient treatment strategy for COVID-19, making preventive measures such as mask wearing, hand washing and social distancing the essential strategy for reducing disease transmission rates [5]-[12]. Vaccines are therefore key tools to effectively prevent spread of infections [13] [14].

Due to the low penetration rate of masks and the limitations of treatment options worldwide, more hopes were pinned on the development of a COVID-19 vaccine [15]. Since, an immense global interest has risen around the development and distribution of safe and effective SARS-CoV-2 (COVID-19) vaccines [16]. As of April 8, 2022, has evaluated that the following vaccines against COVID-19 have met the necessary criteria for safety and efficacy: i) AstraZeneca/Oxford vaccine, ii) Johnson and Johnson, iii) Moderna, iv) Pfizer/BioNTech, v) Sinopharm, vi) Sinovac, vii) COVAXIN, viii) Covovax, ix) Nuvaxovid and x) Cansino [17].

Although published safety and efficacy trials reported high efficacy rates of approved Covid 19 vaccines in conjunction with limited side effects and a low rate of adverse reactions, the rapid pace of vaccine development and the uncertainty

of potential long-term adverse effects raised some level of hesitation against Covid 19 vaccines in the global community [15] [18]-[20].

Yet, despite the existing data on the safety and effectiveness of the vaccines, skepticism regarding their use exists worldwide [21]. Conspiracy theories about COVID-19 being a hoax or a bioweapon designed in a Chinese laboratory began to circulate on social media almost immediately after the first reports of the virus [14] [22]. Bertin *et al.* found that the more participants believed in COVID-19 conspiracy theories, the less likely they were to support vaccination [23].

The Democratic Republic of the Congo (DRC) has started the COVID-19 vaccination at mid-April 2021 following a delay due to announcement, a few days before, of suspension of vaccination campaign with AstraZeneca by several European countries, suspected of having caused rare but serious blood complications [24] [25]. This campaign began in context of limited official communication as well as confusion and mistrust in the general population following the unclear announcement of the first case of COVID-19 in DRC on March 10, 2020 and the statements of opinion leaders in the media who insinuated that the announcement of the disease's arrival was solely a tactic for gaining access to funds for the fight against the coronavirus [26].

As a result the start of this vaccination against COVID-19 was marked by slow and poor support from the targeted populations, so that by April 2, 2023, only 15,574,105 vaccine doses have been administered [3].

To support the DRC COVID-19 vaccination campaign, the WHO country office implemented an active surveillance of COVID-19 adverse effects following immunization (AEFI) as part of the deployment of phase II Covid vaccination. This surveillance was undertaken by nurse supervisors (NSs) of each of the 35 health zones of the city of Kinshasa.

However, utility of vaccine campaigns to control COVID-19 is not merely dependent on vaccine efficacy and safety. Vaccine acceptance among the public and healthcare workers appears to have a decisive role in the successful control of the pandemic [28]. Vaccine hesitancy is a common phenomenon globally, with variability in the cited reasons behind vaccine refusal [28]-[31]. The most common reasons include perceived risks vs. benefits, certain religious beliefs and lack of knowledge and awareness [28] [32]-[34].

For the COVID-19 vaccine, AEFI have been reported, including fake news that has been described as infodemia [35] [36]. This infodemia has not spared health professionals.

Attitude and utilization of vaccination by healthcare professionals (HCP) is a major factor that is consistently associated with patient acceptance and vaccination, adherence to vaccination schedules, and reduced vaccine hesitancy. Maintaining confidence in vaccination depends on the interaction between patients and providers [27].

Recent studies from Cameroon have further highlighted the persistent challenge of vaccine hesitancy among healthcare professionals in Africa, with ac-

ceptance rates ranging from 39% to 45% despite increased awareness and institutional efforts to promote vaccination [37].

Prior the first phase of vaccination against COVID-19, in May 2020, the DRC's National Vaccination Program conducted a survey to assess HCP's acceptability of vaccination, that have shown that Only 27.7% of HCPs said that they would accept a COVID-19 vaccine if it was available [27]. Ditekemena *et al.* have investigated the level of willingness for COVID-19 vaccination in general population in the Democratic Republic of Congo which concluded that there was a low overall willingness for vaccination among citizens in the DRC [5].

Little is known about hesitancy to receive the COVID-19 vaccines among HCPs since the vaccination have begun. This study was performed to evaluation vaccine intake and intention to take vaccine COVID-19 among NSs committed to COVID-19 AEFI surveillance in the 35 health zones (HZ) of the city of Kinshasa using health belief model (HBM).

## 2. Materials and Methods

### 2.1. Study Design and Participants

This was a cross-sectional study conducted in October 2021 targeting NSs involved in Covid-19 AEFI surveillance in the 35 health zones of the city of Kinshasa as well as the AEFI surveillance focal point of the extended programme on immunization (EPI) at the provincial level. This represents all those eligible for the study, which sought to focus on healthcare providers who were most knowledgeable about the adverse effects of the COVID-19 vaccine. HZ Chief Medical Officers, who are theoretically better informed about the adverse effects of the COVID-19 vaccine, were not included because they were too busy during this period of intensified response to COVID-19.

### 2.2. Data Collection

The study of 36 NSs in Kinshasa aimed to assess their acceptability of the COVID-19 vaccine through the prism of the HBM, a theoretical framework widely used to understand health behaviors [13]. This model explores individual perceptions of disease threat, perceived benefits of action, perceived barriers, signals to action and self-confidence. Each nurse supervisor completed a questionnaire based on the Health Belief model, adapted from Al-Metwali *et al.*, 2021 (Figure 1). The adapted questionnaire was submitted to two local WHO experts and one expert from the EPI. The agreed format was submitted to the interviewees.

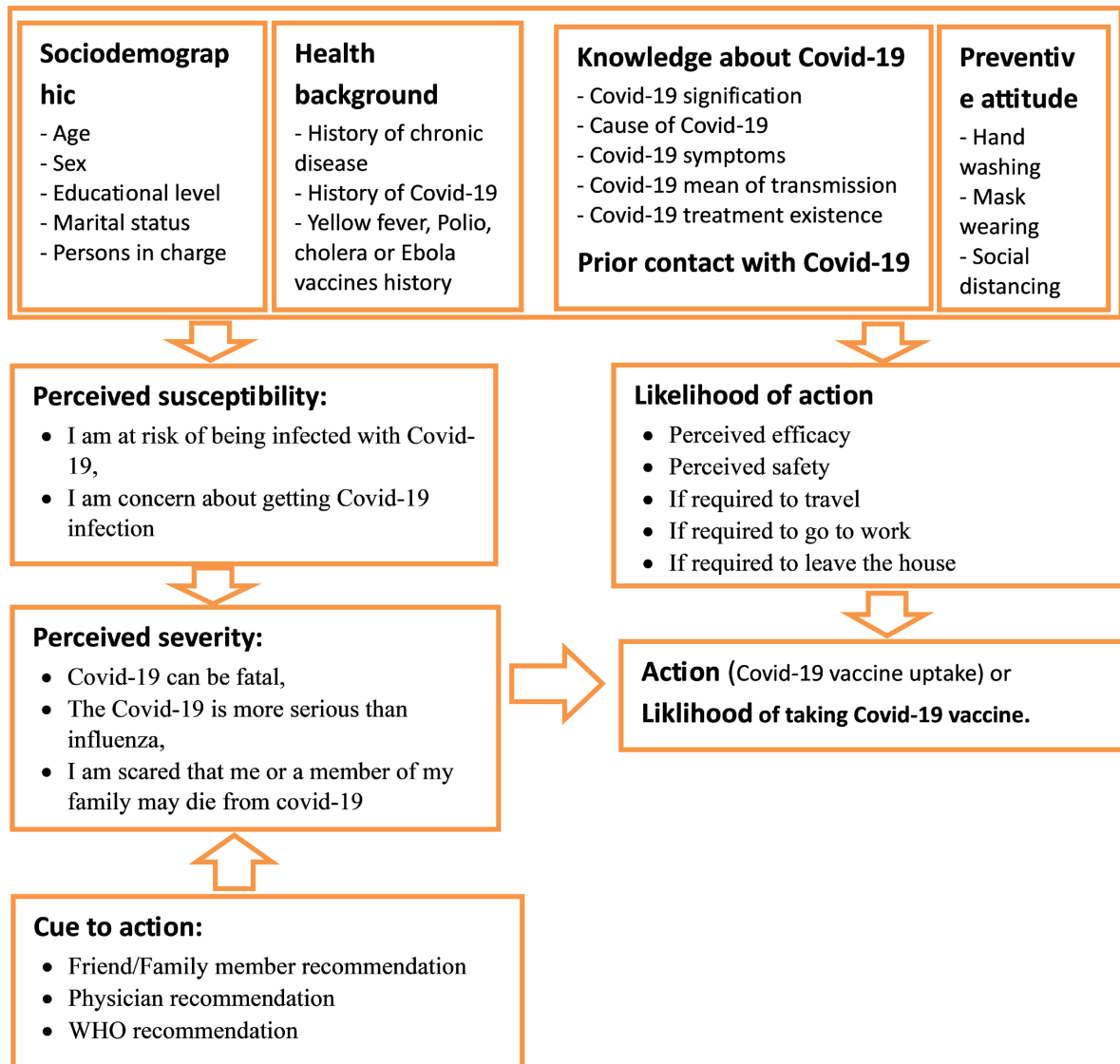
### 2.3. Data Analysis

The descriptive statistics concerning sociodemographic characteristics, health background, knowledge about Covid-19, perceived susceptibility, perceived severity and the cue to action were computed using proportion. The exact 95% confidence intervals (CI) of Clopper-Pearson were calculated for sociodemographic characteristics, health background, knowledge about Covid-19, perceived suscep-

tibility and perceived severity.

The use of preventive measures was assessed using an arbitrary quantitative Likert scale containing five possible responses: 1 (don't know), 2 (rarely), 3 (medium), 4 (frequently), and 5 (At any time). The median and interquartile range for the Likert scale data were calculated and compared between vaccinated and not vaccinated groups using Wilcoxon and Mann-Whitney test.

All statistical analyses were performed using STATA/IC 16 for Windows (StataCorp LP).



**Figure 1.** Conceptual framework for the hypothesized predictors of COVID-19 vaccine uptake (adapted from Al Metwali *et al.* [13]).

### 3. Results

Of the 36 participants, 80.6% were vaccinated. **Table 1** shows the characteristics of the surveys according to whether they had already been vaccinated or not.

**Table 1.** Sociodemographic characteristics and health background of participants by COVID-19 vaccines uptake (N = 36).

Variables	Overall N = 36	Vaccination uptake	
		Yes, n (%)	[CI 95%]
Age			
<55 years	31	24 (77.4)	[58.9 - 90.4]
≥55 years	5	5 (100)	[47.8 - 100]
Gender			
Male	21	17 (81.0)	[58.1 - 95.6]
Female	15	12 (80.0)	[52.0 - 95.7]
Partnership			
Single	7	6 (85.7)	[42.1 - 99.6]
Married/Partnered	29	23 (79.3)	[60.3 - 92.0]
History of chronic disease			
Yes	5	4 (80.0)	[28.4 - 99.5]
No	31	25 (80.7)	[62.5 - 92.5]
History of Covid-19			
Yes	3	2 (66.7)	[9.4 - 91.2]
No	33	27 (81.8)	[64.5 - 93.0]
History of flu			
Yes	20	16 (80.00)	[56.3 - 94.3]
No	16	13 (81.3)	[54.4 - 96.0]
Yellow fever, Polio, cholera or Ebola vaccines history			
0	7	6 (85.7)	[42.1 - 99.6]
≥1	29	23 (79.3)	[60.3 - 92.0]

In terms of socio-demographic characteristics, vaccinated and unvaccinated people had almost the same profile. Most of the nurse supervisors had already taken their vaccine. All nurses aged 55 and over had received the vaccine. Of the 3 respondents who had previously contracted Covid-19, 2 had received the vaccine.

**Table 2** shows participants' knowledge of whether they have received the COVID-19 vaccine or not.

**Table 2.** Knowledge of participants by COVID-19 vaccines uptake (N = 36).

Variables	Overall N = 36	Vaccination uptake	
		Yes, n (%)	[CI95%]
COVID-19 signification			
Correct	20	17 (85.0)	[62.1 - 96.8]
Incorrect/Unknown	16	12 (75.0)	[47.6 - 92.7]
Cause of COVID-19			
Correct	34	27 (79.4)	[62.0 - 91.3]
Incorrect/Unknown	2	2 (100)	[15.8 - 100]*

**Continued**

Knowledge about COVID-19 symptoms			
Sufficient (At least, fever and cough)	34	27 (79.4)	[62.0 - 91.3]
Insufficient	2	2 (100)	[15.8 - 100]*
Knowledge about COVID-19 mean of transmission			
Sufficient (At least, by air and by contact)	13	10 (76.9)	[46.2 - 95.0]
Insufficient	23	19 (82.6)	[61.2 - 95.0]
knowledge about the existence of a treatment for Covid-19			
Yes	14	10 (78.6)	[49.2 - 95.3]
No	22	19 (81.8)	[59.7 - 94.8]

\*one-sided, 97.5% confidence interval.

Almost all the respondents knew the viral origin and the main symptoms of the disease. Neither knowledge of the meaning of the term COVID-19, nor of the mode of transmission, nor of the treatment recommended by the Multisectoral Committee on Covid-19, seemed to be related to taking the vaccine.

Respondents' attitudes to preventive measures against COVID-19 are shown in **Table 3** below, according to whether they have already been vaccinated or not.

**Table 3.** Preventive attitudes against COVID-19.

Items	Overall	Vaccination uptake		P-val <sup>§</sup>
	N = 36	Yes, N = 29	No, N = 7	
Hand washing, Median (Interquartile range)*	2 (1 - 2)	2 (1 - 2)	2 (1 - 2)	0.12
Mask wearing, Median (Interquartile range)*	2 (1 - 2)	1 (1 - 2)	2 (2 - 3)	0.88
Social distancing, Median (Interquartile range)*	2 (1 - 5)	2 (1 - 6)	2 (2 - 3)	0.63
Cough/sneeze into elbow crease or disposable tissue, Median (Interquartile range)*	2 (1 - 4)	2 (1 - 4)	2 (2 - 3)	0.99
Composite score <sup>¥</sup>	11 (8 - 11)	11 (8 - 12)	11 (9 - 11)	0.88

\*The scale of response of preventive practices questions was assessed by a Likert scale ranging from 1 = don't know, 2 = rarely, 3 = medium, 4 = frequently, and 5 = At any time; <sup>¥</sup>The composite The composite score was the sum of the scores obtained for each prevention practice, <sup>§</sup> Wilcoxon and Mann-Whitney test.

COVID-19 prevention practices did not appear to influence vaccine uptake.

**Table 4** shows the perceived sensitivity of the Covid-19 vaccine and the perceived seriousness of the Covid-19 vaccine.

**Table 4.** Perceived susceptibility to COVID-19 vaccine and perceived severity of COVID-19 vaccine.

Variables	Overall	Vaccination uptake	
	N = 36	Yes, n (%)	[CI 95%]
<b>Perceived susceptibility</b>			
I am at risk of being infected with COVID-19			
Yes	26	21 (80.8)	[60.0 - 93.4]
No	10	8 (80.0)	[44.4 - 97.5]

**Continued**

I am concern about getting COVID-19 infection			
Yes	30	25 (83.3)	[65.3 - 94.4]
No	6	4 (66.7)	[22.3 - 95.7]
<b>Perceived severity</b>			
COVID-19 can be fatal			
Yes	34	28 (82.4)	[65.5 - 93.2]
No	2	1 (50.0)	[1.3 - 98.7]
The COVID-19 is more serious than influenza			
Yes	32	27 (84.4)	[67.2 - 94.7]
No	4	2 (50.0)	[6.8 - 93.2]
I am scared that me or a member of my family may die from COVID-19			
Yes	33	28 (84.8)	[68.1 - 94.9]
No	3	1 (33.3)	[0.8 - 90.6]

**Table 4** shows that most respondents had a perception of the severity of covid-19. Although nearly one-third of respondents had a lower perception of susceptibility to covid-19, this did not appear to significantly influence vaccine uptake.

Among vaccinated individuals, the likelihood of getting vaccine was: “Perceived safety” (7, *i.e.* 24.1%), “Perceived efficacy” (5, *i.e.* 17.2%) and the cue to get vaccine was: “Who recommendation” (5, *i.e.* 17.2%), “Unique dose” (4, *i.e.* 13.8%), “Physician recommendation” (1, *i.e.* 3.5%), “Friend or Family member recommendation” (1, *i.e.* 3.5%) and “do not have an opinion” (6, *i.e.* 20.7%). While among not vaccinated individuals, the likelihood of wish having vaccine was: “If required to leave the house” (2, *i.e.* 28.6%) and the cue to wish having vaccine was: “friend or family member recommendation” (3, *i.e.* 42.9%), “WHO recommendation” (1, *i.e.* 14.3%).

#### 4. Discussion

Findings from this study reveal a relatively high acceptability of the COVID-19 vaccine (80.6%) among nurse supervisors involved in AEFI surveillance in Kinshasa. This rate is significantly higher than that observed in the general population in the Democratic Republic of Congo (DRC), where previous surveys have reported acceptability rates ranging from 27.7% to 50.8% [38] [39]. This difference may be explained by the participants’ level of professional involvement in the vaccination process, their direct exposure to pharmacovigilance data, and their privileged access to scientific information. These findings are in accordance with those obtained in Thailand, which revealed a high rate of physician willingness to take the COVID-19 vaccine, particularly among staff members, in 2021; however, a significant proportion of them would not yet suggest vaccination to their families or patients [40].

A recent literature review showed a wide variation in vaccine hesitancy among

healthcare professionals, including primary healthcare center (PHC) workers (50%), medical students (45%), nurses (21%), and dentists (18%). Hesitancy toward booster doses was also found in HCWs who had taken primary doses (2.8% to 26%) [41]. Despite varying rates of HCW hesitancy after the vaccine's release, this hesitancy is expected to negatively affect efforts to achieve widespread vaccination. To address these concerns, policymakers must raise awareness among healthcare professionals, as they are the easiest to reach and are the primary source of information for patients. Understanding the drivers of acceptance of the COVID-19 vaccine among healthcare professionals, particularly through the Health Belief Model, therefore provides an opportunity to guide these types of actions [42].

The HBM postulates that perceptions of disease severity and susceptibility influence the likelihood of adopting health behavior [43]. In this study, the majority of NSs perceived COVID-19 as a serious disease, and a significant proportion felt at risk. Yet these perceptions showed no statistically significant relationship with vaccination. On the other hand, the fact that the perception of individual susceptibility to infection, although present, showed no significant association with vaccination could reflect a form of trivialization of risk among healthcare professionals, as observed in other African contexts [44].

Furthermore, this may be explained by the fact that other elements of the model, such as cues to action (WHO recommendations, professional requirements, influence of relatives), played a more decisive role. Indeed, among those vaccinated, the main motivations were the perceived safety of the vaccine (24.1%), its efficacy (17.2%) and official recommendations (WHO, doctors). These results confirm the importance of reliable sources of information and institutional communication in vaccine promotion [16] [21].

A study carried out in Senegal reported an acceptability rate of 65% among healthcare professionals, with the influence of medical recommendations as a determinant, as we found in our survey, but also other determinants such as confidence in the vaccine's efficacy and perception of the seriousness of the disease, which we did not find in our study [39]. In Côte d'Ivoire, similar results were observed, although mistrust of health authorities and rumors were major disincentives [40]. These factors underline the importance of institutional recommendations (WHO, doctors) as levers for action, which was also confirmed in our study, where these recommendations were cited as triggers for vaccination.

Most participants had a good knowledge of COVID-19, including its viral origin and symptoms. However, this knowledge did not translate into a significant difference in vaccine acceptance. This finding is in line with the evidence noted in a literature review by Yaqub *et al.* (2014), who emphasize that knowledge alone is not sufficient to predict vaccination behavior [34].

It is also notable that preventive practices (hand washing, wearing a mask, social distancing) were not significantly associated with vaccination. This suggests that vaccination is perceived as a distinct measure, perhaps more institutional than

behavioral, and that adherence to one measure does not necessarily guarantee adherence to another. It could also indicate that NSs, as health professionals, apply preventive measures independently of their vaccination status, out of professional duty or respect for health protocols. This finding is in line with observations made in other African countries, where vaccination is often perceived through the prism of trust in the authorities rather than as a simple extension of barrier gestures [39].

The study also highlights the persistence of a certain vaccine hesitancy, even among healthcare professionals. This hesitancy is fueled by infodemia, defined as an overabundance of information, some of it false, which complicates decision-making [36]. Conspiracy theories, rumors of sterility or serious side effects have circulated massively in the DRC, affecting public and caregiver confidence [26].

It is worrying to note that some SIs were not vaccinated, despite their role in monitoring AEFI. This highlights the need for more training, psychological support and targeted communication with healthcare professionals.

Findings from this study are outlined in a broader context of structural challenges to health security in Africa, where dependence on imported vaccines and weak health communication systems were highlighted during the pandemic [39]. The experience of the nurse supervisors in Kinshasa shows that the active involvement of healthcare professionals in surveillance and communication systems can boost vaccine confidence and is a promising avenue for future vaccination campaigns on the continent.

This study had some limitations. The sample of 36 participants, although representative of Kinshasa's NS, remains limited for generalization to the whole country. In addition, the study is based on self-reports, which are subject to social desirability bias. Finally, the absence of multivariate analysis limits the identification of independent factors associated with vaccination.

## 5. Conclusion

Despite their key role in monitoring side effects, some nurse supervisors remain hesitant about the vaccine. The study revealed a high level of acceptability of the COVID-19 vaccine among nurse supervisors in Kinshasa, influenced by their perception of the severity of the disease and institutional recommendations. The active involvement of healthcare professionals in surveillance and communication mechanisms appears to be a strategic lever for boosting vaccine confidence. These results suggest the need for greater involvement of healthcare professionals in vaccination campaigns, particularly in terms of targeted communication strategies.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

## References

- [1] Parasher, A. (2020) COVID-19: Current Understanding of Its Pathophysiology, Clinical Presentation and Treatment. *Postgraduate Medical Journal*, **97**, 312-320. <https://doi.org/10.1136/postgradmedj-2020-138577>

- [2] Johns Hopkins (2022) University COVID-19 Dashboard Johns Hopkins University (JHU). <https://coronavirus.jhu.edu/map.html>
- [3] World Health Organization (2023) Democratic Republic of the Congo: WHO Coronavirus Disease (COVID-19) Dashboard with Vaccination Data. WHO Coronavirus (COVID-19) Dashboard with Vaccination Data. <https://covid19.who.int/region/afro/country/cd>
- [4] Michel-Kabamba, N., Ngatu, N., Leon-Kabamba, N., Katumbo-Mukemo, A., Mukuku, O., Ngoyi-Mukonkole, J., *et al.* (2020) Occupational COVID-19 Prevention among Congolese Healthcare Workers: Knowledge, Practices, PPE Compliance, and Safety Imperatives. *Tropical Medicine and Infectious Disease*, **6**, Article No. 6. <https://doi.org/10.3390/tropicalmed6010006>
- [5] Ditekemena, J.D., Nkamba, D.M., Mutwadi, A., Mavoko, H.M., Siewe Fodjo, J.N., Luhata, C., *et al.* (2021) COVID-19 Vaccine Acceptance in the Democratic Republic of Congo: A Cross-Sectional Survey. *Vaccines*, **9**, Article No. 153. <https://doi.org/10.3390/vaccines9020153>
- [6] Noh, J.Y., Seong, H., Yoon, J.G., Song, J.Y., Cheong, H.J. and Kim, W.J. (2020) Social Distancing against COVID-19: Implication for the Control of Influenza. *Journal of Korean Medical Science*, **35**, e182. <https://doi.org/10.3346/jkms.2020.35.e182>
- [7] Jang, W.M., Jang, D.H. and Lee, J.Y. (2020) Social Distancing and Transmission-Reducing Practices during the 2019 Coronavirus Disease and 2015 Middle East Respiratory Syndrome Coronavirus Outbreaks in Korea. *Journal of Korean Medical Science*, **35**, e220. <https://doi.org/10.3346/jkms.2020.35.e220>
- [8] Wang, Q. and Yu, C. (2020) The Role of Masks and Respirator Protection against SARS-CoV-2. *Infection Control & Hospital Epidemiology*, **41**, 746-747. <https://doi.org/10.1017/ice.2020.83>
- [9] Wang, M., Cheng, Y., Ye, L., Zhou, M., Chen, J. and Feng, Z. (2020) The COVID-19 Outbreak: The Issue of Face Masks. *Infection Control & Hospital Epidemiology*, **41**, 974-975. <https://doi.org/10.1017/ice.2020.129>
- [10] Offeddu, V., Yung, C.F., Low, M.S.F. and Tam, C.C. (2017) Effectiveness of Masks and Respirators against Respiratory Infections in Healthcare Workers: A Systematic Review and Meta-analysis. *Clinical Infectious Diseases*, **65**, 1934-1942. <https://doi.org/10.1093/cid/cix681>
- [11] Manikandan, N. (2020) Are Social Distancing, Hand Washing and Wearing Masks Appropriate Measures to Mitigate Transmission of Covid-19? *Vacunas*, **21**, 136-137. <https://doi.org/10.1016/j.vacun.2020.09.001>
- [12] Tobaiqy, M., Qashqary, M., Al-Dahery, S., Mujallad, A., Hershman, A.A., Kamal, M.A., *et al.* (2020) Therapeutic Management of Patients with COVID-19: A Systematic Review. *Infection Prevention in Practice*, **2**, Article ID: 100061. <https://doi.org/10.1016/j.infpip.2020.100061>
- [13] Al-Metwali, B.Z., Al-Jumaili, A.A., Al-Alag, Z.A. and Sorofman, B. (2021) Exploring the Acceptance of Covid-19 Vaccine among Healthcare Workers and General Population Using Health Belief Model. *Journal of Evaluation in Clinical Practice*, **27**, 1112-1122. <https://doi.org/10.1111/jep.13581>
- [14] Akther, T. and Nur, T. (2022) A Model of Factors Influencing COVID-19 Vaccine Acceptance: A Synthesis of the Theory of Reasoned Action, Conspiracy Theory Belief, Awareness, Perceived Usefulness, and Perceived Ease of Use. *PLOS ONE*, **17**, e0261869. <https://doi.org/10.1371/journal.pone.0261869>
- [15] Xing, K., Tu, X.-Y., Liu, M., Liang, Z.-U., Chen, J.-N., Li, J.-J., *et al.* (2021) Efficacy and Safety of COVID-19 Vaccines: A Systematic Review. *Chinese Journal of Contem-*

- porary Pediatrics*, **23**, 221-228.
- [16] Forman, R., Shah, S., Jeurissen, P., Jit, M. and Mossialos, E. (2021) COVID-19 Vaccine Challenges: What Have We Learned So Far and What Remains to Be Done? *Health Policy*, **125**, 553-567. <https://doi.org/10.1016/j.healthpol.2021.03.013>
- [17] World Health Organization (2022) COVID-19 Advice for the Public: Getting Vaccinated. <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/covid-19-vaccines/advice>
- [18] Doroftei, B., Ciobica, A., Ilie, O., Maftai, R. and Ilea, C. (2021) Mini-Review Discussing the Reliability and Efficiency of COVID-19 Vaccines. *Diagnostics*, **11**, Article No. 579. <https://doi.org/10.3390/diagnostics11040579>
- [19] Anand, P. and Stahel, V.P. (2021) The Safety of Covid-19 mRNA Vaccines: A Review. *Patient Safety in Surgery*, **15**, Article No. 20. <https://doi.org/10.1186/s13037-021-00291-9>
- [20] Menni, C., Klaser, K., May, A., Polidori, L., Capdevila, J., Louca, P., *et al.* (2021) Vaccine Side-Effects and SARS-CoV-2 Infection after Vaccination in Users of the COVID Symptom Study App in the UK: A Prospective Observational Study. *The Lancet Infectious Diseases*, **21**, 939-949. [https://doi.org/10.1016/s1473-3099\(21\)00224-3](https://doi.org/10.1016/s1473-3099(21)00224-3)
- [21] Lazarus, J.V., Ratzan, S.C., Palayew, A., Gostin, L.O., Larson, H.J., Rabin, K., *et al.* (2020) A Global Survey of Potential Acceptance of a COVID-19 Vaccine. *Nature Medicine*, **27**, 225-228. <https://doi.org/10.1038/s41591-020-1124-9>
- [22] Douglas, K.M. (2021) COVID-19 Conspiracy Theories. *Group Processes & Intergroup Relations*, **24**, 270-275. <https://doi.org/10.1177/1368430220982068>
- [23] Bertin, P., Nera, K. and Delouvé, S. (2020) Conspiracy Beliefs, Rejection of Vaccination, and Support for Hydroxychloroquine: A Conceptual Replication-Extension in the COVID-19 Pandemic Context. *Frontiers in Psychology*, **11**, Article ID: 565128. <https://doi.org/10.3389/fpsyg.2020.565128>
- [24] UNICEF, Democratic Republic of the Congo (2021) Vaccination against COVID-19 Has Begun in the Democratic Republic of Congo. Statement from the United Nations System in the DRC. <https://www.unicef.org/drcongo/communiqués-de-presse/la-vaccination-contre-la-covid-19-commence-en-rdc>
- [25] Dotan, A. and Shoenfeld, Y. (2021) Perspectives on Vaccine Induced Thrombotic Thrombocytopenia. *Journal of Autoimmunity*, **121**, Article ID: 102663. <https://doi.org/10.1016/j.jaut.2021.102663>
- [26] Kasambule, A. (2020) Controversial Communication around COVID-19 in DRC. Pulitzer Center. <https://pulitzercenter.org/stories/controversial-communication-around-covid-19-drc>
- [27] Kabamba Nzaji, M., Kabamba Ngombe, L., Ngoie Mwamba, G., Banza Ndala, D.B., Mbidi Miema, J., Luhata Lungoyo, C., *et al.* (2020) Acceptability of Vaccination against COVID-19 among Healthcare Workers in the Democratic Republic of the Congo. *Pragmatic and Observational Research*, **11**, 103-109. <https://doi.org/10.2147/por.s271096>
- [28] Sallam, M. (2021) COVID-19 Vaccine Hesitancy Worldwide: A Concise Systematic Review of Vaccine Acceptance Rates. *Vaccines*, **9**, Article No. 160. <https://doi.org/10.3390/vaccines9020160>
- [29] Lane, S., MacDonald, N.E., Marti, M. and Dumolard, L. (2018) Vaccine Hesitancy

- around the Globe: Analysis of Three Years of WHO/UNICEF Joint Reporting Form Data-2015-2017. *Vaccine*, **36**, 3861-3867. <https://doi.org/10.1016/j.vaccine.2018.03.063>
- [30] Wagner, A.L., Masters, N.B., Domek, G.J., Mathew, J.L., Sun, X., Asturias, E.J., *et al.* (2019) Comparisons of Vaccine Hesitancy across Five Low- and Middle-Income Countries. *Vaccines*, **7**, Article No. 155. <https://doi.org/10.3390/vaccines7040155>
- [31] The Lancet Child & Adolescent Health (2019) Vaccine Hesitancy: A Generation at Risk. *The Lancet Child & Adolescent Health*, **3**, Article No. 281. [https://doi.org/10.1016/s2352-4642\(19\)30092-6](https://doi.org/10.1016/s2352-4642(19)30092-6)
- [32] Karafillakis, E. and Larson, H.J. (2017) The Benefit of the Doubt or Doubts over Benefits? A Systematic Literature Review of Perceived Risks of Vaccines in European Populations. *Vaccine*, **35**, 4840-4850. <https://doi.org/10.1016/j.vaccine.2017.07.061>
- [33] Pelčić, G., Karačić, S., Mikirtichan, G.L., Kubar, O.I., Leavitt, F.J., Cheng-tek Tai, M., *et al.* (2016) Religious Exception for Vaccination or Religious Excuses for Avoiding Vaccination. *Croatian Medical Journal*, **57**, 516-521. <https://doi.org/10.3325/cmj.2016.57.516>
- [34] Yaqub, O., Castle-Clarke, S., Sevdalis, N. and Chataway, J. (2014) Attitudes to Vaccination: A Critical Review. *Social Science & Medicine*, **112**, 1-11. <https://doi.org/10.1016/j.socscimed.2014.04.018>
- [35] Castaldi, S., Maffeo, M., Riviuccio, B.A., Zignani, M., Manzi, G., Nicolussi, F., *et al.* (2020) Monitoring Emergency Calls and Social Networks for COVID-19 Surveillance. To Learn for the Future: The Outbreak Experience of the Lombardia Region in Italy. *Acta Biomedica*, **91**, 29-33.
- [36] Secosan, I., Virga, D., Crainiceanu, Z.P., Bratu, L.M. and Bratu, T. (2020) Infodemia: Another Enemy for Romanian Frontline Healthcare Workers to Fight during the COVID-19 Outbreak. *Medicina*, **56**, Article No. 679. <https://doi.org/10.3390/medicina56120679>
- [37] Cheuyem, F.Z.L., Amani, A., Nkodo, I.C.A., Boukeng, L.B.K., Edzamba, M.F., Nouko, A., *et al.* (2025) COVID-19 Vaccine Acceptance and Hesitancy in Cameroon: A Systematic Review and Meta-Analysis. *BMC Public Health*, **25**, Article No. 1035. <https://doi.org/10.1186/s12889-025-22195-4>
- [38] Mpoyi, T. and Kabamba, M. (2023) Acceptabilité du vaccin contre l'infection à COVID-19 dans la population en RD. Congo. *Revue d'Épidémiologie et de Santé Publique*, **71**, Article ID: 101791. <https://doi.org/10.1016/j.respe.2023.101791>
- [39] Happi, C.T. and Nkengasong, J.N. (2022) Two Years of COVID-19 in Africa: Lessons for the World. *Nature*, **601**, 22-25. <https://doi.org/10.1038/d41586-021-03821-8>.
- [40] Sirikalyanpaiboon, M., Ousirimanechai, K., Phannajit, J., Pitisuttithum, P., Jantarabenjakul, W., Chaiteerakij, R., *et al.* (2021) COVID-19 Vaccine Acceptance, Hesitancy, and Determinants among Physicians in a University-Based Teaching Hospital in Thailand. *BMC Infectious Diseases*, **21**, Article No. 1174. <https://doi.org/10.1186/s12879-021-06863-5>
- [41] Aldakhlan, H.A., Khan, A.S. and Alabdulbaqi, D. (2024) Hesitancy over the COVID-19 Vaccine among Various Healthcare Workers: An International Narrative Review. *Cureus*, **16**, e53059. <https://doi.org/10.7759/cureus.53059>
- [42] Jones, C.L., Jensen, J.D., Scherr, C.L., Brown, N.R., Christy, K. and Weaver, J. (2014) The Health Belief Model as an Explanatory Framework in Communication Research: Exploring Parallel, Serial, and Moderated Mediation. *Health Communication*, **30**, 566-576. <https://doi.org/10.1080/10410236.2013.873363>
- [43] Champion, V.L. and Skinner, C.S. (2008) The Health Belief Model. In: Glanz, K.,

Rimer, B.K. and Viswanath, K., Eds., *Health Behavior and Health Education: Theory, Research, and Practice*, 4th Edition, Jossey-Bass, 45-65.

- [44] Yue, J., Liu, Y., Zhao, M., Bi, X., Li, G. and Liang, W. (2023) The R&D Landscape for Infectious Disease Vaccines. *Nature Reviews Drug Discovery*, **22**, 867-868.  
<https://doi.org/10.1038/d41573-023-00119-4>