International Journal of Applied Science and Engineering Review

IJASER

ISSN: 2582-6271

Vol. 7, Issue. 2, March-April 2026, page no. 58-67

To cite this article: Baroani Bikenge J. Baron, Basandja Longembe Eugène, Panda Kitronza John and Losimba Likwela Joris (2026). HEALTHCARE PROVIDERS' KNOWLEDGE OF INDIVIDUAL PROTECTIVE MEASURES: A DESCRIPTIVE STUDY IN HEALTHCARE FACILITIES IN THE CITY OF KISANGANI, DRC, International Journal of Applied Science and Engineering Review (IJASER) 7 (2): 58-67 Article No. 259 Sub Id 388

HEALTHCARE PROVIDERS' KNOWLEDGE OF INDIVIDUAL PROTECTIVE MEASURES: A DESCRIPTIVE STUDY IN HEALTHCARE FACILITIES IN THE CITY OF KISANGANI, DRC

Baroani Bikenge J. Baron, Basandja Longembe Eugène, Panda Kitronza John and Losimba Likwela Joris

University of Kisangani, Faculty of Public Health
@Corresponding author: Baroani Bikenge J. Baron; baronjosephbikenge@gmail.com

DOI: https://doi.org/10.52267/IJASER.2026.7204

ABSTRACT

Introduction: This study was conducted to assess healthcare providers' knowledge of infection control measures in healthcare facilities in the city of Kisangani.

Materials and Methods: A descriptive cross-sectional study was conducted among 240 healthcare providers from 20 healthcare facilities in the city of Kisangani between August 15 and October 22, 2025. Data were presented as proportions for categorical variables and as mean ± SD for normally distributed quantitative variables.

Results: 67.5% of participants had completed on-the-job training on infection control measures. Knowledge of infection control measures was very high for all measures (≥80%); however, it was average for the critical moments of hand hygiene as defined by the WHO (around 60%). Knowledge of the components of the respiratory protocol, types of gloves, masks, and routes of transmission was high (≥70%), and the overall level of knowledge was rated as good for the majority (73.7%).

Conclusion: Overall, awareness of preventive measures is good, although gaps were observed in knowledge of the critical moments for hand hygiene as defined by the WHO. This may negatively impact compliance in healthcare settings. Capacity building is needed to improve the level of knowledge.

KEYWORDS: Knowledge, Preventive measures, Healthcare facilities, Kisangani

INTRODUCTION

The hospital environment is a setting where the high volume of interaction among patients, healthcare staff, and visitors facilitates the transmission of infections. It serves as a major reservoir of microbes,

ISSN: 2582-6271

Vol. 7, Issue.2, March-April 2026, page no. 58-67

including multidrug-resistant bacteria that can cause healthcare-associated infections. Environmental contamination in acute care facilities is a major route of germ transmission among patients, healthcare professionals, and visitors [1].

In 2022, the World Health Organization (WHO) highlighted the amplifying role of healthcare facilities in epidemiological situations due to the convergence of sick and vulnerable individuals [2].

The past decade has been marked by outbreaks such as Ebola, MERS-CoV, and the COVID-19 pandemic, demonstrating the rapid spread of pathogens in healthcare settings [3]. These events have revealed gaps in infection control programs, regardless of a country's income level. At the same time, less visible health emergencies, such as nosocomial infections (healthcare-associated infections) and antimicrobial resistance (AMR), continue to endanger patients [3].

The protective measures for healthcare workers defined by the French Society of Hospital Hygiene include standard precautions [4] and additional precautions such as contact, droplet, and airborne precautions. Standard precautions (SP) are the first line of defense against the transmission of any microorganism. They must be followed when caring for any patient and their environment. Additional hygiene precautions apply in well-defined infectious situations to prevent the transmission of microorganisms, particularly those posing an epidemic risk but also those responsible for serious or difficult-to-treat infections [5].

In the absence of an effective medical treatment or vaccine, adherence to preventive measures and social distancing guidelines is the only way to control the spread of a virus. Systematic adherence to preventive measures and social distancing guidelines has evolved over time. The perceived effectiveness of the measures was associated (positively) with adherence only during epidemic waves, while the level of depression was associated (negatively) with adherence only during the first epidemic wave [6].

In developing countries, adherence to preventive measures is generally insufficient to control the transmission of infections in healthcare settings. A systematic review of the literature on factors influencing hand hygiene compliance revealed that compliance rates are often below 50%, particularly among physicians [7]. Although the availability of sinks is important, having plenty of them does not guarantee satisfactory compliance; motivation and evaluation play a more crucial role [7].

Several studies have demonstrated the positive impact of systematically implementing Standard Precautions (SP) or practices included in these precautions, particularly hand hygiene. In France, the Study Group on Healthcare Workers' Risk of Exposure to Infectious Agents (GHWREIA) demonstrated a 25%

ISSN: 2582-6271

Vol. 7, Issue.2, March-April 2026, page no. 58-67

reduction over 10 years in blood exposure incidents (BEIs) among 1,506 nurses in medical and intensive care units, thanks to improved application of SP [8].

It should be noted that accidents preventable through the use of standard precautions still account for more than one-third of the needlestick injuries reported in the national needlestick injury surveillance system in France [9]. Similarly, another study found that gloves reduced the amount of blood transmitted during a needlestick injury involving an inoculated volume [7,9].

In the Democratic Republic of the Congo (DRC), a study conducted at the ILEBO General Hospital in Kasai Province found that, despite healthcare providers' good understanding of COVID-19 and the preventive measures enacted to curb the spread of the disease, handwashing facilities were lacking, and mask-wearing and social distancing were not being observed [10].

A study on hand hygiene compliance in hospitals in Lubumbashi concluded that both private and public health facilities lacked adequate handwashing equipment and that hand hygiene compliance in these facilities differed statistically [11].

A previous study conducted in Tshopo Province on hand hygiene compliance in general referral hospitals in Kisangani revealed gaps in knowledge regarding several aspects of hand hygiene practice in healthcare settings and a low overall rate of awareness of the WHO's hand hygiene guidelines (36%) [12].

Despite evidence regarding the level of infection risk in healthcare facilities, the justified importance of these measures, WHO recommendations in the area of patient safety, and their contribution to improving the quality of care, these measures often remain poorly understood and poorly adhered to.

The objective of this study was to assess healthcare providers' knowledge of infection control measures in healthcare settings in the city of Kisangani.

MATERIALS AND METHODS

This is a descriptive cross-sectional study conducted at twenty healthcare facilities in the health zones of Kisangani, the capital of Tshopo Province, during the period from August 15 to October 22, 2025.

The sample size was calculated using the Schwartz formula as follows: $n = Z^2 * pq / d^2$. Considering a 95% confidence level (Z95 = 1.96); a lower overall hand hygiene compliance rate of 19% observed in a study conducted in Japan [13]; a 5% margin of error; and an anticipated non-response rate of 5%, our sample size was 248 subjects.

ISSN: 2582-6271

Vol. 7, Issue.2, March-April 2026, page no. 58-67

Only healthcare facilities providing secondary-level care with a capacity of no more than 50 inpatient beds were included in the list. At each healthcare facility, 10 to 15 healthcare providers were selected, representing all professional categories present at the time of the study. The total number of participants included in the study was 240.

At each healthcare facility, 10 to 15 healthcare providers were selected, including all professional categories present at the time of the study. The total number of subjects included in the study was 240.

Variables of interest

Knowledge was assessed based on the following criteria:

- Knowledge of 4 infection control measures (4 points);
- Knowledge of 5 WHO guidelines for hand hygiene (5 points);
- Knowledge of respiratory protection protocols (4 points);
- Knowledge of types of gloves (3 points);
- Knowledge of types of masks in healthcare settings (2 points) and
- Knowledge of routes of transmission in healthcare settings (3 points).

An overall score of 15 or higher, corresponding to the upper quartile (Q3), was considered "good knowledge."

Data Collection

Data were collected through structured interviews and direct observation using a survey questionnaire and an observation guide, both integrated into a smartphone via the Kobo Collect tools.

Data Analysis

The collected data were organized into an Excel database and then exported to SPSS 13 for analysis.
The descriptive statistics used included proportions for categorical variables and the mean ± SD for normally distributed quantitative variables.

Ethical Considerations

The research protocol was submitted for approval to the Ethics Committee of the University of Kisangani. Participation in the study was voluntary and required verbal consent from each participant. Anonymity was ensured from data collection through to publication.

International Journal of Applied Science and Engineering Review

IJASER

ISSN: 2582-6271

Vol. 7, Issue.2, March-April 2026, page no. 58-67

RESULTS

Table 1. Sample description

Variables N=240	Terms and conditions	Frequency	Percentage
Age (Mean ± SD) years	38.1 ± 11.2		
Sex	Male	107	44.6
	Female	133	55.4
Professional category	Doctor	29	12.1
	Nurse	101	42.1
	Midwife	20	8.3
	Lab Technician	35	14.6
	Cleaning Technician	43	17.9
	Other	12	5.0
Qualification	Doctor	29	12.1
	Licensed	114	47.5
	Graduate	37	15
	Diploma	36	15
	Other	24	10
Seniority (Average ± SD) years	9.8 ± 8.7		

The average age of the respondents was 38.1 ± 11.2 years; nurses, those with a bachelor's degree, and those affiliated with a network of contracted healthcare facilities were predominant. The average length of service was 9.8 ± 8.7 years.

Table 2. Training and Knowledge of Infection Control Measures and Critical Moments for Hand Hygiene

Variables N=240	Terms and Conditions	Frequency	Percentage
Has completed training on infection control measures in healthcare settings	Yes	162	67.5
	No	78	32.5
Protective measures in healthcare settings	Hand Hygiene	240	100.0
	Wearing a mask	238	99.2
	Cough or sneeze into your elbow	208	86.7
	Disposable tissue	214	89.2

International Journal of Applied Science and Engineering Review

IJASER

ISSN: 2582-6271

Vol. 7, Issue.2, March-April 2026, page no. 58-67

	Social distancing	226	94.2
Key moments for hand hygiene	Before patient contact	163	68.0
	Before any action is taken	155	64.6
	After patient contact	165	68.8
	After exposure to blood	163	68.0
	After contact with the patient's environment	153	63.8

Table 2 shows that nearly two-thirds of participants had completed on-the-job training on infection control measures. Knowledge of infection control measures was very high for all measures; however, it was average for the critical moments for hand hygiene as defined by the WHO.

Table 3. Knowledge of respiratory protocols, types of gloves, types of masks, and routes of contamination in healthcare settings

Variables N=240	**Terms and Conditions**	**Frequency**	**Percentage**
Components of the respiratory protocol	Cough into your elbow	179	74.6
	Disposable towels	169	70.4
	Throw it in the trash	173	72.1
	Hand hygien	181	75.4
Types of gloves	sterile	196	81.7
	Non-sterile	128	53.3
	Housekeeping	158	65.8
Types of masks	Surgical	201	83.8
	Respirator	184	76.7
Routes of transmission in healthcare settings	Contact	230	95.8
	Droplets	203	84.6
	Aerial	215	89.6
Overall level of awareness of preventive measures	Good	163	73.7
	Weak	77	26.3

Table 3 shows that the level of knowledge regarding the components of respiratory protocol, types of gloves, masks, and routes of contamination was high; the overall level of knowledge was rated as good for the majority.

International Journal of Applied Science and Engineering Review

IJASER

ISSN: 2582-6271

Vol. 7, Issue.2, March-April 2026, page no. 58-67

DISCUSSION

This study found that 67.5% of participants had completed on-the-job training on infection control measures. Knowledge of infection control measures was very high for all measures (≥80%); however, it was average for the critical moments of hand hygiene as defined by the WHO (around 60%) (Table 2). Knowledge of the components of the respiratory protocol, types of gloves, masks, and routes of transmission was high (≥70%); overall knowledge was rated as good for the majority (73.7%) (Table 3). The proportion of trained healthcare providers and the level of knowledge regarding preventive measures observed in our study are higher than those reported in some other studies.

In Morocco, one study found that only 28.7% of healthcare workers had received training on preventive measures, and personal protective equipment was rarely mentioned in several high-risk situations [14].

In Burkina Faso, a lack of awareness regarding standard precautions for preventing healthcare-associated infections was also observed, underscoring the need to train healthcare workers to reduce morbidity and mortality associated with healthcare-associated infections [15].

The results of a study conducted during the COVID-19 pandemic revealed a high level of overall awareness; all respondents reported being aware of the existence of COVID-19 as well as the preventive measures implemented to curb the spread of the disease [10].

This high level of awareness during the COVID-19 pandemic can be attributed to a high level of overall knowledge about the disease (99.17%) and its perception within the community as a very serious (86.78%) and highly contagious (97.52%) disease [16].

The high overall level of knowledge found in our study can be attributed, on the one hand, to the high proportion of healthcare providers who reported having already received on-the-job training on infection control measures, and, on the other hand, to the COVID-19 pandemic period, which was marked by large-scale awareness campaigns across multiple channels.

In Benin, the overall hand hygiene compliance rate was lower (31.7%), as was adherence to the five critical moments of hand hygiene as defined by the WHO. This situation was linked to insufficient knowledge of the various aspects of infection control measures [17].

Similar results to ours were also observed in Likasi, DRC, with varying levels of knowledge regarding hand hygiene practices in healthcare settings (washing with soap and water and using hand sanitizer) and the various barrier measures [18].

ISSN: 2582-6271

Vol. 7, Issue.2, March-April 2026, page no. 58-67

Understanding standard precautions and their effectiveness leads to mastery of their application and should enable healthcare staff to care for patients with confidence, regardless of the diagnosed infectious agent [4]. It constitutes the primary focus of intervention to improve adherence to barrier measures.

In healthcare settings, the concepts of protection and hygiene remain of paramount importance even today; the correct and effective implementation of infection control measures by healthcare staff makes care safer for both patients and hospital staff.

Basic training alone is not sufficient to improve healthcare providers' knowledge of infection control measures; on-the-job training and ongoing awareness campaigns are necessary to highlight the realities of infection spread in healthcare settings when infection control measures are neglected.

Responsible institutional policies are needed to improve healthcare providers' knowledge of infection control measures and to increase compliance. These policies must include capacity-building through on-the-job training, refresher courses, and supervisory visits.

STUDY LIMITATIONS

Intrinsic preventive measures were not addressed in this study, specifically cleaning of floors, surfaces, and objects; ventilation and air circulation; capacity limits; and air quality. Therefore, a secondary study is planned to investigate the factors associated with awareness of preventive measures in healthcare facilities in the city of Kisangani. Finally, the exclusion of the Lubunga district due to accessibility issues may limit the generalizability of the data to the entire city of Kisangani.

CONCLUSION

Overall, awareness of preventive measures is good, although gaps have been observed in knowledge of the critical moments for hand hygiene as defined by the WHO. This may negatively impact compliance in healthcare settings. Capacity building is needed to improve the level of knowledge.

REFERENCES

1. Annabelle Richer-Fortin. Contamination of the hospital environment by carbapenem-resistant genes. 27th Annual Public Health Conference. Institute National of Public Health Québec, 2024.
2. Warren, B. G., Barrett, A., Graves, A., King, C., Turner, N. A., Anderson, D. J. An Enhanced Strategy for Daily Disinfection in Acute Care Hospital Rooms: A Randomized Clinical Trial. *JAMA network open*, 2022 ;*5*(11), e2242131.
3. World Health Organization. Global Report on Infection Prevention and Control: executive summary. 2022; Geneva

ISSN: 2582-6271

Vol. 7, Issue.2, March-April 2026, page no. 58-67

4. Aumeran, C., Jacomet, C. Preventing the risk of infection in healthcare settings through barrier measures. Sages-femmes, 202;19(5), 15-18.
5. French Society of Hospital Hygiene. Update on standard precautions. Healthcare facilities, medical-social facilities, outpatient care. June 2017. https://sf2h.net/wp-content/uploads/2017/06/HY_XXV_PS_versionSF2H.pdf
6. Metzger, C., Yai, J., Ramdriamampianina, S., Nassany, O., Vernay, M. Factors associated with adherence to preventive measures and social distancing guidelines in France. Public Health, 2024;36(HS1), 57-57.
7. Krikorian R, Lozach-Perlant A, Ferrier-Rembert A, Hoerner P, Sonntag P, Garin D et al. Standardization of needlestick injury and evaluation of a novel virus-inhibiting protective glove. J Hosp Infect; 2007; 66:339–345.
8. 8. Abiteboul D, Lamontagne F, Lolom I, Tarantola A, Descamps JM, Bouvet E. Incidence of blood-exposure incidents among nursing staff in metropolitan France, 1999–2000: results of a multicenter survey in 32 hospitals. BEH No. 51/2002;255. Mast ST, Woolwine JD, Gerberding JL. Efficacy of gloves in reducing blood volumes transferred during simulated needlestick injury. *J Infect Dis.*; 1993 ;168(6) :1589-1592.
9. Mast ST, Woolwine JD, Gerberding JL. Efficacy of gloves in reducing blood volumes transferred during simulated needlestick injury. *J Infect Dis.*; 1993 ;168(6) :1589-1592.
10. Belesi B. M. Assessment of compliance with preventive measures and measures to limit the spread of COVID-19 at the HGR/Ilebo. Journal of Health Sciences, 2022;1(1), 31-33.
11. Musangu, M. S., Umba, F. M., Umba, E. K., Bope, M. H. B., Bora, G. K., Kalwaba, S. K., Nyembo, C. M. Hand hygiene compliance in hospitals: a requirement for patient safety in healthcare facilities in Lubumbashi, Democratic Republic of the Congo. Revue de l'Infirmier Congolais, 2020;4(2), 36-42.
12. Basandja LE et Panda LK. Observance de l'hygiene des mains dans les hôpitaux généraux des références de la Ville de Kisangani en RDC. *Pan African Medical Journal*. 2020; 35:57.
13. Sakihama T, Honda H, Saint S, Fowler KE, Kamiya T, Sato Y et al. Improving healthcare worker hand hygiene adherence before patient contact: A multimodal intervention of hand hygiene practice in Three Japanese tertiary care centers. J Hosp Med. 2016, Mar;11(3):199-205.
14. Benboubker, M., El Marnissi, B., Nhili, A., El Rhazi, K. Knowledge, attitudes, and practices regarding standard precautions among healthcare workers at the Hassan II University Hospital Center in Fez (Morocco). 1995; EMHJ; 23(1).
15. Dahourou, D.L., Moussa, M., Ter Tiero Elias, D.A.H., Kabore, I., CISSE, K., Coulibaly A. & Ouedraogo S. Knowledge and practices of healthcare providers in Burkina Faso regarding standard precautions for the prevention of healthcare-associated infections in 2023. Burkinabè Journal of Public Health, 2025;1(1), 28-39.

ISSN: 2582-6271

Vol. 7, Issue.2, March-April 2026, page no. 58-67

16. 16. Coulibaly, M. B. Knowledge, perceptions, and practices of healthcare workers during the COVID-19 pandemic in the Gbeke region, Côte d'Ivoire. Malian Journal of Infectious Diseases and Microbiology, 2022;17(1), 6–16.
17. Bello, C., Degbey, C. C., & Lamine, B. M. (2024). Adherence to standard precautions in hospital hygiene in pediatric wards in Benin. Beninese Journal of Infectious Diseases, 3(2), 24-30.
18. Ilunga, J. K., Kabundji, S. M., Ilunga, W. N., Ilunga, C. K., Ngoy, M. I., Mukanya, G. K., Okobela, S. W., Saleh, A. A., & Kaswala, C. N. Observance des mesures barrières contre la maladie à coronavirus 2019 par le personnel soignant des centres de santé de référence Milumba et Kikula de Likasi. *Revue De l'Infirmier Congolais*, 2022; *6*(1), 17–20.