

Research Article

Knowledge and Practices of Healthcare Providers Regarding Healthcare-Associated Infections in a Semi-Urban Health Center in Senegal, 2024

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Abstract

Given the scale of healthcare-associated infections worldwide, particularly in Senegal, and the key role played by healthcare personnel in preventing them, it is necessary to study the factors associated with healthcare providers' knowledge and practices regarding healthcare-associated infections (HAI). A descriptive and analytical cross-sectional study was carried out among nursing staff at Semi-Urban Health center (Keur Massar) in 2024. An exhaustive recruitment was carried out and data were collected using an anonymous self-administered questionnaire. Univariate, bivariate and multivariate analyses were performed using R 4.4.2 software. Qualitative variables were described by absolute and relative frequencies and quantitative variables by mean, standard deviation and extremes. The binary logistic regression method was used for the multivariate analysis. The adjusted Odds Ratios with their 95% confidence intervals were determined for each variable retained in the final model. A total of 90 people were surveyed. The average age of those surveyed was 35 ± 9.37 years, with extremes of 19 and 64 years. Women predominated, accounting for 74.4% of respondents. Only 22.2% of staff had a good knowledge of healthcare-associated infections. In all, 56.7% of those surveyed had good preventive practices with regard to healthcare-associated infections. Doctors (aOR = 19.30 [4.07 - 126]) and people with more than 10 years' professional experience (aOR = 5.88 [1.15-33.33]) were more likely to have good knowledge of HAIs. Paramedics (nurses, midwives) were more likely to have good HAI prevention practices (aOR= 5 [1.37- 20]). The knowledge and practices of healthcare providers in relation to HAIs were found to be inadequate. Professional experience of more than 10 years and the profession of doctor were positively associated with knowledge; the professions of nurse and midwife were associated with good HAI prevention practices. Ongoing training and the availability of the necessary guidelines can help to improve the knowledge and practices of healthcare personnel in the prevention of HAIs.

Keywords

Healthcare, Associated Infections, Knowledge, Practices, Senegal

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1. Introduction

An infection is said to be associated with care if it occurs during or after a patient's treatment (diagnostic, therapeutic, palliative, preventive or educational), and if it was neither present nor incubating at the start of the treatment. [1-6]. Healthcare-associated infection (HAI) includes nosocomial infection (NI), in the sense of "contracted in a healthcare establishment", and also covers care provided outside healthcare establishments. [2, 3]. HAIs concern not only patients, whether ill or not, but also healthcare professionals and visitors [2-4].

The four main sites of HAI, which account for 70% of all HAI, are, in order of importance, urinary tract infections, pulmonary infections, surgical site infections and catheter-related bacteremia. [7]. They are most often of bacterial origin, but viral, fungal or parasitic infections can also be found [8].

Healthcare-associated infections (HAIs) are a major public health problem worldwide [9, 10]. They represent the most common adverse event in healthcare provision, affecting the safety of both patients and healthcare staff. According to the WHO, every day, around 1.4 million people worldwide fall ill as a result of healthcare-associated infections, affecting several hundred million people every year. [1, 11]. Their prevalence is higher in developing countries [9]. In sub-Saharan Africa, available data show that the incidence of healthcare-associated infections ranges from 2% to 49%, with intensive care unit patients having the highest rate, at 21.2% to 35.6% [12]. In Senegal, a study conducted at Hôpital Aristide Le Dantec in 2019 found a prevalence rate of 8.8% [13].

HAIs have a significant impact on morbidity, mortality and quality of life [9]. They can lead to longer hospital stays, long-term disability, higher healthcare costs resulting in a considerable additional financial burden for patients, their families and healthcare systems in general, and above all avoidable deaths. [9, 14]. In fact, one out of every 10 patients affected succumbs to these infections [15].

The emergence of antimicrobial-resistant micro-organisms is another complication observed with HAIs. [8]. Above all, they pose a therapeutic problem due to the limited choice of antibiotic molecules available on the market, resulting in higher mortality [16].

Factors favoring HAIs include host-related factors (immunodepression, extreme age, etc.), environmental factors (handling, contaminated equipment and environment, lack of asepsis, etc.) and factors related to the care procedure itself (invasive procedures and devices, immunosuppressive treatment, inadequate organization of care, etc.) [17].

A large proportion of HAIs could be prevented by effective infection prevention and control measure [10]. Prevention relies mainly on nursing staff. However, there is little data on the implications of their knowledge and practices for the occurrence of HAIs. It is in this context that we felt it

appropriate to study the factors associated with the knowledge and practices of healthcare providers at the Keur Massar Health Center regarding healthcare-associated infections.

This study will contribute to a better understanding of the obstacles to infection control, and to the identification of solutions adapted to local realities. In sub-Saharan Africa, and particularly in Senegal, these challenges are accentuated by limited human resources for health and infrastructure, insufficient access to preventive equipment, and disparities in the training of health personnel. These obstacles hamper the effectiveness of preventive measures, making this research relevant to improving practices and strengthening patient care.

2. Methodology

2.1. Study Framework

The study took place at the Keur Massar Health Center which is semi urban Health Center in the department of Keur Massar in the Dakar region of Senegal. The center covers nine health posts and four health huts in four communes of the department: Malika, Keur Massar Nord, Keur Massar Sud and Jaxaay [18]. The population of the department of Keur Massar is estimated at 759,849. [19]. The Keur Massar Health Center includes a medical service, a pediatric service, a maternity ward and an operating room. The center also offers medical and surgical care services.

2.2. Type and Period of Study

This was a descriptive and analytical cross-sectional study conducted among nursing staff at the Keur Massar Health Center during 2024.

2.3. Study Population

The study population consisted of all healthcare providers at the Keur Massar health center (medical and paramedical staff).

Inclusion criteria

All healthcare providers working at the Keur Massar health center during the survey period (medical and paramedical staff) were included.

Non-inclusion criteria

Providers who refused to participate in the study and those unavailable or absent from the facility during the survey period were not included.

2.4. Recruitment

An exhaustive recruitment process was carried out and all

providers meeting the inclusion criteria were interviewed.

2.5. Data Collection

Collection tool

An anonymous questionnaire was developed based on a literature review on the assessment of healthcare providers' knowledge and practices regarding healthcare-associated infections [20-23]. The questionnaire focused in particular on: (i) respondents' socio-professional data, (ii) general knowledge of healthcare-associated infections, (iii) standard precautions to prevent HAIs, (iv) hand hygiene practice, (v) personal protective equipment, (vi) use and disposal of sharps, (vii) treatment of reusable materials and instruments, and (viii) housekeeping and waste disposal.

Collection technique

The questionnaire was administered to service providers during face-to-face interviews from March 19 to April 12, 2024.

Operational definition of variables

Definition of IAS

The definition of healthcare-associated infections was considered correct if the person chose the most precise and complete answer, i.e.: "any infection occurring during or following the management (diagnostic, therapeutic or preventive) of a patient and if it was neither present nor incubating at the start of the management, all within a period ≥ 48 hours or $>$ the incubation period".

Examples of IAS

For the examples of healthcare-associated infections, the answer was considered correct if the respondent chose the following three (3) answers out of five (5): Urinary tract infection caused by *Escherichia coli*, Catheter-related infection caused by *Staphylococcus epidermidis* and Pneumonia caused by *Pseudomonas aeruginosa*.

Risk factors for healthcare-associated infections

To the question concerning the main risk factors contributing to healthcare-associated infections, the answer was considered correct if the respondent chose the following four (4) propositions: Invasive procedures, Length of hospital stay, Immunocompromised patients and Extreme age.

Transmission modes

As for the modes of transmission of HAIs, the answer was considered correct if the respondent chose the following three (3) propositions: handling, Septic material and Lack of asepsis.

Persons exposed to IAS

To accept that the respondent knew all the categories of people potentially exposed to healthcare-associated infections, he had to choose the following five (5) answers: Patients, Visitors/carers, Nursing staff, Hygiene and maintenance staff and administrative staff.

Standard precaution

Concerning the eight (8) standard precautions recommended by the WHO to prevent the transmission of

healthcare-associated infections, the answer was considered correct if the person chose the following eight (8) answers among the 12 propositions: Wash hands, Wear gloves, Wear protective goggles or masks, Wear gowns, Prevent injuries from sharp objects, Treat instruments and equipment correctly, Handle, transport and treat used/dirty linen correctly and Follow correct procedures for environmental cleanliness and waste disposal.

Components of personal protective equipment

We considered that respondents were familiar with PPE components if they selected the following items: Gloves, Masks (surgical, FFP), Goggles, Gown, Overblouse or gown cap, Operating theatre scrubs, Face shield, Caps and Shoe covers.

Indications for hand hygiene

To the question about when providers should perform hand hygiene, the answer was considered correct if they chose the following 5 propositions: Before any contact with a patient, Before a clean or aseptic procedure, After any risk of exposure to a biological fluid, After any contact with a patient, and After contact with the patient's environment.

Simple hand-washing steps

For the steps involved in simple hand washing, the following combination was considered the correct answer: A - C - B - D - E - G - F, (A) Wet your hands with lukewarm water, (C) Apply soap, (B) Rub your hands together for at least 20 seconds, (D) Wash all surfaces of your hands, including your fingernails, thumbs and between your fingers, (E) Rinse your hands under running water, (G) Dry your hands thoroughly, (F) If possible, turn off the tap with a paper towel or towel.

Surgical hand-washing steps

For the steps involved in surgical handwashing, the following combination was considered the correct answer: C - A - B - F - E - H - D - G, (C) Wet your hands, (A) Apply soap, (B) Rub your hands together for 60 seconds, (F) Wash all surfaces of your hands (including nails, thumbs, between your fingers), your wrists and forearms, (E) Rinse your hands and arms under running water, starting with your fingertips, (H) Repeat the wash three times, (D) Dry yourself carefully from your hands to your elbows, (G) Keep your hands always above your elbows.

Isolation indications

The respondent knew the situations in which a patient had to be isolated (septic isolation/protective isolation) if he gave the following two (2) answers: Patient carrying a potentially contagious infection and Subject abnormally susceptible to infections.

Disposal of sharp objects

With regard to the choice of container for the disposal of sharp objects, the answer was correct if the respondent chose the proposal: «In a safety box».

Antibiotic prophylaxis

The provider knew the appropriate time to initiate antibiotic prophylaxis if he chose to do so before the potentially contaminating invasive procedure.

Knowledge score

To assess the level of IAS knowledge, a total knowledge score was established. A score of one (1) point was awarded to those who gave the correct answer to the knowledge questions, and a score of zero (0) to those who gave the wrong answer. Providers with a total score $\geq 60\%$ were considered to have good knowledge. On the other hand, those with a score $< 60\%$ were considered to have poor knowledge.

Practice score

To assess the level of HAI preventive practices, a total practices score was established. A score of one (1) point was awarded to those who gave the right answer to the practice questions, and a score of zero (0) to those who gave the wrong answer. Providers with a total score $\geq 60\%$ were considered to have good practices. On the other hand, those with a score $< 60\%$ were considered to have poor practices.

2.6. Data Analysis

Data were analyzed using R 4.4.2 software. Quantitative variables were described by mean, median, mode and standard deviation. For qualitative variables, absolute and relative frequencies were calculated. In the analytical part, bivariate and multivariate analyses were performed, with cross-tabulations between variables to address the concerns formulated in the objectives. The dependent variables were IAS knowledge and practice. Chi-square or Fisher tests were used, depending on their applicability. The test was significant if the p-value was less than 0.05. Variables with a p-value of less than 0.25 were entered into the model using simple lo-

gistic regression with R software. The adjusted odds ratio, surrounded by its confidence interval, was used to quantify the strength of the relationships found.

2.7. Ethical Considerations

Authorization for the survey was obtained from the Chief Medical Officer of the Keur Massar Health District before the study began. After a verbal explanation of the purpose and interest of the study, a consent form was offered to participants before submission of the questionnaire. Data were collected anonymously and confidentially using identification codes, and no personal identification was left on the questionnaire.

3. Results

3.1. Socio-professional Characteristics

The nursing staff at the Keur Massar Health Center were predominantly female, accounting for 74.4%, with a sex ratio of 2.91 in favor of women. The majority were under 40 years of age (71.1%). The average age was 35 (+/- 9.37). Nurses were in the majority, accounting for 46.7% of all claimants.

More than a quarter of the staff worked in the medical department (28.9%), with an average seniority in medical practice of 8 years (+/-7.53), and more than half the staff (65.4%) had less than or equal to 10 years' experience (Table 1).

Table 1. Breakdown of participants by socio-professional characteristics.

Socio-professionnal characteristics (N=90)		Absolute frequency (N)	Relative frequency (%)
Sex			
	Men	23	25,6
	Female	67	74,4
Age group			
	≤ 40 years	64	71,1
	> 40 years	26	28,9
Profession			
	Nurse	42	46,6
	Midwives	20	22,2
	Doctors	15	16,7
	Orderlies	7	7,8
	Senior biology technicians	5	5,6
	Dentists	1	1,1
Care services			

Socio-professionnal characteristics (N=90)	Absolute frequency (N)	Relative frequency (%)
Medicine	41	45,6
Surgery	18	20,0
Other	31	34,4
Professional experience		
> 10 years	32	35,6
≤ 10 years	58	64,4

3.2. Knowledge of Healthcare-associated Infections

Over half the staff (60%) knew the correct definition of healthcare-associated infections, and 42.2% were able to cite at least three examples. The main risk factors for HAI were only identified by more than a quarter of staff (27.8%), while

23.3% of providers knew their modes of transmission. Only a small proportion of participants (12.2%) knew the categories of people potentially exposed to HAIs, but less than half knew the eight standard precautions to prevent HAI transmission (46.7%). The majority (65.6%) said they regularly updated their knowledge of the latest HAI prevention practices. Overall, only 22.2% of staff had a good knowledge of healthcare-associated infections (Table 2).

Table 2. Breakdown of participants by knowledge of HAIs.

Knowledge of healthcare associated infections (N=90)	Absolute frequency (N)	Relative frequency (%)
Defining healthcare-associated infections		
Yes	54	60
No	36	40
Three examples of healthcare-associated infections		
Yes	38	42,2
No	52	57,8
Risk factors contributing to healthcare-associated infections		
Yes	25	27,8
No	65	72,2
HAIs transmission modes		
Yes	21	23,3
No	69	76,7
People exposed to HAIs		
Yes	11	12,2
No	79	87,8
Standard precautions		
Yes	42	46,7
No	48	53,3
Updating knowledge of HAIs prevention		
Yes	59	65,6

Knowledge of healthcare associated infections (N=90)	Absolute frequency (N)	Relative frequency (%)
No	31	34,4
Overall knowledge of HAIs		
Good	20	22,6
Wrong	70	77,8

3.3. HAIs Practices

Most providers (85.6%) said they were correctly following established HAI prevention protocols. Among them, the majority (78.9%) felt that care materials (gloves, masks, antiseptics, etc.) were provided in sufficient quantities and on a regular basis. Regarding HAI risk assessment in the Keur Massar health district, 47.8% of providers stated that it was carried out regularly. Most providers communicated and educated patients and their families about HAI risks and preventive measures (83.3%). Nearly three quarters of staff (64.4%) had not taken part in any awareness-raising activities on HAI prevention by providers in the Keur Massar Health District. As for the frequency of use of this PPE, 84.4% of staff claimed to use it systematically when providing care. Only 28.9% of participants were familiar with the five indications for hand hygiene. With regard to the choice of hand hygiene technique, more than half the staff (58.9%) preferred hand washing with soap and water to rubbing with hydroalcoholic gel. Hand hygiene was systematically performed between each patient by most participants (76.7%). The same applied to mastery of the simple hand-washing technique (74.4%) and surgical hand-washing (63.3%). 78.9% of staff felt that there were enough functional water points and de-

tergents for hand washing when the need arose. With regard to instrument handling, the majority of staff stated that reusable equipment was systematically decontaminated and sterilized after each procedure (86.7%). With regard to the disinfection of examination tables between each patient, 46.7% of staff stated that this was carried out, while 67.8% supported this same statement for the disinfection of operating tables between each patient. With regard to treatment tables and hospital beds, 65.6% and 67.8% of staff respectively stated that they were regularly disinfected, while 43.3% supported this statement for bedside tables. Only 10% of staff knew how to isolate a patient. With regard to the availability of staff responsible for hygiene and maintenance of the premises, 92.2% stated that they were always available, particularly during night shifts and weekends. With regard to the practice of systematically sorting biomedical waste, 66.7% of staff claimed to do so. Only 26.7% made proper use of the containers intended for the disposal of sharps. This low proportion was also found for mastering the right moment to institute antibiotic prophylaxis when the indication arose (28.9%). More than half the staff said they had never been directly involved in the management of a healthcare-associated infection in the course of their practice (60%). Overall, more than half the respondents had good overall practices with regard to healthcare-associated infections (56.7%) (Table 3).

Table 3. Breakdown of participants according to HAIs practices.

Practices on healthcare associated infections (N=90)	Absolute frequency (N)	Relative frequency (%)
Monitoring infection prevention protocols		
Yes	77	85,6
No	13	14,4
Equipment availability		
Yes	71	78,9
No	19	21,1
Regular assessment of IAS risks		
Yes	43	47,8
No	47	52,2
Communication and patient education		

Practices on healthcare associated infections (N=90)	Absolute frequency (N)	Relative frequency (%)
Yes	75	83,3
No	15	16,7
Raising awareness and training staff in HAI prevention		
Yes	32	35,6
No	58	64,4
Use of Personal Protective Equipment		
Yes	76	84,4
No	14	15,6
Applying the five Indications of hand hygiene		
Yes	26	28,9
No	64	71,1
Choice of hand hygiene technique		
Rubbing with hydroalcoholic gel	37	41,1
Wash with soap and water	53	58,9
Systematic hand hygiene		
Yes	69	76,7
No	21	23,3
Mastery of the simple hand-washing technique		
Yes	67	74,4
No	23	25,6
Mastery of surgical hand-washing techniques		
Yes	57	63,4
No	33	36,6
Availability of hand-washing stations		
Yes	71	78,9
No	19	21,1
Treatment of instruments and reusable materials		
Yes	78	86,7
No	12	13,3
Hygiene of the patient's immediate environment		
Disinfection of examination tables between patients		
Yes	42	46,7
No	48	53,3
Disinfection of operating tables between each patient		
Yes	61	67,8
No	29	32,2
Disinfection of treatment tables		
Yes	59	65,6
No	31	34,4

Practices on healthcare associated infections (N=90)	Absolute frequency (N)	Relative frequency (%)
Disinfection of hospital beds		
Yes	61	67,8
No	29	32,2
Bedside table disinfection		
Yes	39	43,3
No	32	56,7
Mastering the indications for patient isolation		
Yes	9	10
No	81	90
Permanent availability of hygiene and maintenance staff		
Yes	83	92,2
No	7	7,8
Systematic sorting of biomedical waste		
Yes	60	66,7
No	30	33,3
Disposal of sharp objects in appropriate containers		
Yes	24	26,7
No	66	73,3
Appropriate antibiotic prophylaxis practice		
Yes	26	28,9
No	64	71,1
Participation in the management of a healthcare-associated infection		
Yes	36	40,0
No	54	60,0
Global IAS practice		
Good	51	56,7
Wrong	39	43,3

3.4. Factors Associated with HAIs Knowledge

Occupation was statistically related to knowledge of HAIs ($p = 0.001$). Doctors were more likely to have good knowledge than paramedics (Oraj=19.30 [4.07 - 126.00]). Professional experience was also statistically related to knowledge of HAIs ($p = 0.039$). Care providers with more than 10 years' seniority were six times more likely to have good knowledge than those with less than 10 years' experience (Oraj=5.88 [1.15 - 33.33]) (Table 4).

Table 4. Factors associated with knowledge about healthcare-associated infections.

Variables		Knowledge		P value
		Adjusted odds ratio	95% confidence interval	
Sex	Male	0,56	0,10 - 2,41	0,463

Variables		Knowledge		P value
		Adjusted odds ratio	95% confidence interval	
Age group	Female	R �.	-	-
	> 40 years	0,57	0,12 - 2,64	0,474
	� 40 years	R �.	-	-
Profession	Paramedics	R �.	-	-
	Doctors	19,30	4,07 - 126	0,001
	Other	1,26	0,05-12,65	0,856
Health Services	Medicine	R �.	-	-
	Surgery	0,10	0,03 - 443	0,991
	Other	0,48	0,12 - 1,75	0,275
Professional experience	> 10 years	5,88	1,15-33,33	0,039
	� 10 years	R �.	-	-

3.5. Factors Associated with HAIs Practices

HAI practices were statistically related to profession ($p = 0.019$). Paramedics were five times more likely to have good practices than doctors (Oraj = 5 [1.37 - 20.00]) (Table 5).

Table 5. Factors associated with practices about healthcare-associated infection practices.

Variables		Practices		P value
		Adjusted odds ratio	95% confidence interval	
Sex	Female	R �.	-	-
	Male	1,17	0,40 – 3,71	0,775
Age group	� 40 years	R �.	-	-
	> 40 years	1,61	0,42 – 6,41	0,490
Profession	Doctors	R �.	-	-
	Paramedics	5,00	1,37 - 20	0,019
	Other	0,17	0,01 – 1,30	0,133
Health Services	Medecine	R �.	-	-
	Surgery	1,23	0,34 – 4,82	0,752
	Others	0,50	0,17 – 1,46	0,210
Professional experience	� 10 ans	1,49	0,40 – 5,66	0,546
	> 10 ans	R �.	-	-
Knowledge	Good	1,87	0,69 – 5,22	0,219
	Wrong	R �.	-	-

4. Discussion

The aim of our study was to identify factors associated with staff knowledge and practices regarding healthcare-associated infections. Out of 100 healthcare providers contacted to complete the questionnaire, we obtained 90 responses, i.e. a response rate of 90%. Our results are similar to those of Irutingabo in Burundi in 2020 (91.90%) [22]. This satisfactory participation rate can be explained, on the one hand, by the authorization obtained from the health center authorities and, on the other hand, by the prior information and reminders sent to all staff in the various departments during the data collection phase [24].

Socio-professional characteristics of the study population

In our work, most of the staff surveyed were under 40 (64%). The average age was 35 \pm 9.37 years. Our results are comparable to those of Irutingabo in Burundi in 2020, who found an average age of 36. [22]. The young age of the staff could be explained by the fact that the Senegalese population itself is predominantly young, with the under-35s accounting for 75% of the population in 2023 [19].

Of the 90 staff surveyed, 74.4% were female, compared with 25.6% male. The sex ratio was 2.91 in favor of women. Our results are similar to those of Ojo et al, Nigeria in 2023, who found a 79% predominance of females versus 21% males, with a sex ratio of 3.8 [25]. The predominance of women has also been noted by other authors such as Foga Sebro et al. [26] obtained 52% female participation in Ethiopia. By contrast, Bayleyegn et al in Ethiopia in 2021 found more men than women (60.6%) [27]. This predominance of women could be explained by the fact that women are generally more numerous in health facilities, and according to the WHO represent 67% of health and care personnel worldwide [28]. Among the professional categories, we had a high level of participation from nurses (46.7%), followed by midwives (22.2%) and doctors (16.7%). Ilori et al. in their study at the National Hospital Center in Abuja (Nigeria) in 2024 found nurses at 17.1%, followed by doctors at 11.2% [29]. Wu et al, found in China in 2021 that nurses were the most represented at 86.8% [30]. This may be due to the fact that in Africa, a WHO study showed that paramedics (nurses, midwives) outnumber doctors in health facilities [31].

Knowledge of healthcare-associated infections

In total, only 22.2% of caregivers had good knowledge of healthcare-associated infections. These results are well below those of Bayleyegn et al in 2021, who found that 90.12% of caregivers in Ethiopia had good knowledge of HAIs, and those of Ojo et al in 2023 in Nigeria, who found 77.8% of staff with good knowledge. This low level of knowledge among respondents could be due to the lack of ongoing staff training, refresher seminars on infection prevention and the non-availability of guidelines accessible to staff [32].

Practices relating to healthcare-associated infections

In our study, 85.6% of staff stated that they correctly followed established protocols for preventing

healthcare-associated infections. Our results are superior to those of Chpfuwa et al (Zimbabwe 2023), where only 22.48% followed established protocols [33]. This could be explained by an effective communication plan within the health center, including clear, structured communication on protocols and infectious risks, thus promoting better understanding and application of preventive measures [34]. Overall, only 56.7% of respondents had good HAI prevention practices. These results are similar to those of the Marrouk study in Morocco in 2023 [35]. These results could be due to differences in the availability of sanitary facilities and logistics required for HAI prevention activities at the study site [36]. Another possible explanation could be a lack of awareness on the part of staff regarding healthcare-associated infections and their share of responsibility [37].

Factors associated with HAIs knowledge

In our study, staff with more than 10 years' professional experience were more likely to have good knowledge than those with less than 10 years' experience. Our results are similar to those of Asfaw in 2021 in Ethiopia [38]. In his study, staff with 11 to 20 years' work experience were also more likely to have good knowledge than those with less than 10 years' work experience. This could be due to the fact that, as professional experience increases, staff acquire new knowledge in their daily practice [39, 40]. They have the opportunity to take part in more continuing education courses and seminars during which they can exchange knowledge about HAIs and infection prevention and control in general [41].

Doctors were more likely to have good knowledge of HAIs than paramedical staff (nurses, midwives and orderlies). Our results could be due to the fact that doctors have a higher level of education than paramedics. Indeed, the level of education influences the understanding of infectious risks and the implementation of preventive measures [20].

Factors associated with HAIs practices

Paramedical staff (nurses, midwives and orderlies) were more likely to have good practices than doctors. Angelozzi et al found that profession was a predictor of adequate practice [42]. Our results can be explained by the fact that paramedics carry out the bulk of essential care and are therefore in more direct contact with patients, which means that they have probably developed better prevention practices to protect both patients and themselves against HAIs [43].

Limits of the study

However, this study has certain limitations. Indeed, the questionnaire survey is more suited to assessing knowledge than professional practices. In addition, it should be noted that administering the questionnaire by interview may lead to a social desirability bias. Indeed, participants may not answer truthfully or accurately, thus providing socially acceptable answers rather than their true answers and practices [44]. What's more, the cross-sectional nature of the study makes it impossible to clearly establish a cause-and-effect relationship between the associated factors

identified and knowledge and practices regarding HAIs. However, these limitations have been taken into account, and measures have been put in place to minimize their impact on the results obtained.

5. Conclusions

Healthcare-associated infections (HAIs) are a major public health problem, affecting millions of people every year. This study shows that healthcare professionals' knowledge of HAIs remains inadequate, while their preventive practices are generally average. More than 10 years' professional experience and being a doctor are associated with better knowledge, while paramedical professions show practices more in line with prevention standards. It is crucial to strengthen continuing education, improve access to and adherence to clinical guidelines, and promote a culture of infection prevention. Raising awareness among young professionals, combined with regular assessment of knowledge and practices, can also reduce the incidence of HAIs. Such an effort, supported by robust policies and sustainable investment, is essential to improve the quality of care and limit antimicrobial resistance worldwide.

Abbreviations

HAIs Healthcare-associated Infections

Author Contributions

Ibrahima Ndiaye: Conceptualization, Methodology, Formal Analysis, Writing – original draft

Mamadou Makhtar Mbacké Lèye: Conceptualization, Methodology, Writing – review & editing, Validation

Mame Diarra Ndour: Methodology, Investigation, Formal Analysis

Ibrahima Seck: Conceptualization, Methodology, Writing – review & editing, Validation

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Data Availability Statement

The data is available from the corresponding author upon reasonable request.

Conflicts of Interest

The authors declare no conflicts of interest

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Biography



Ibrahima Ndiaye is a public health specialist and epidemiologist at Cheikh Anta Diop University in Dakar, Senegal, in the Department of Preventive Medicine and Public Health and at the Institute of Health and Development. He obtained his doctorate of practice in medicine and master's degree in public health with the option of epidemiology in 2022 and 2023 respectively, and his diploma of specialized studies in public health in 2024. He has been involved in a number of public health research projects on a variety of topics, including antimicrobial resistance, gender-based violence and cervical cancer screening. He has also taken part in several national and international scientific meetings, and is a member of the Senegalese Association of Public Health Professionals.

Research Field

Ibrahima Ndiaye: Antimicrobial resistance, gender-based violence, cervical cancer screening, antenatal care, social protection

Mamadou Makhtar Mbacke Leye: Gender-based violence, Covid-19, social protection, family planning, vaccination coverage among children

Mame Diarra Ndour: Antimicrobial resistance

Ibrahima Seck: Antimicrobial resistance, social protection, vaccination coverage among children, family planning, gender-based violence