



Research article

Exploring nurse educators' experiences and perceptions of healthcare-associated infection prevention and control in two countries of sub-Saharan Africa: An exploratory qualitative study

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ABSTRACT

Aim: To explore the experiences and perceptions of nurse educators about prevention and control of healthcare-associated infections in two countries of Sub-Saharan Africa.

Design: Qualitative descriptive study.

Methods: A multimodal approach was employed to investigate the reality of hospital-associated infections. In-depth interviews were conducted with educators (n = 24) to gain comprehensive insights, and 14 focus group discussions were facilitated with academic and clinical educators (n = 96). Collected data was analysed using the content analysis method.

Results: It was identified one major category, "Education about Infection Prevention and Control," with five categories and twelve subcategories. Key findings highlighted pedagogical challenges in nursing education stemming from the imbalance between theory and practice, coupled with insufficient hours dedicated to infection control training. Participants noted gaps in the collaboration between lecturers and clinical instructors, as well as a lack of equipment in all the learning contexts, hindering the HAI protocols and limiting the effectiveness of infection prevention and control measures in both SSA countries.

Conclusion: Addressing the identified pedagogical challenges, enhancing collaboration between nursing educators, providing adequate equipment, and developing a contextually adapted model for infection prevention is essential for improving education and practices in both countries of Sub-Saharan Africa.

1. Introduction

The incidence and prevalence of healthcare-associated infections (HAIs) and the rise of antimicrobial resistance (AMR) represent a global public health burden, with particularly severe impacts in Sub-Saharan Africa (SSA) (Fraser et al., 2021; Ikuta et al., 2022).

Key contributing factors to the increase in HAIs and AMR include limited knowledge of infections, inadequate application of basic infection control measures, and misuse of antimicrobial agents (World Health Organization [WHO], 2011a, 2011b, 2022a; Katyali et al., 2023; Mboya et al., 2018; Rasamiravaka, 2020).

Available data indicate a notably higher incidence of HAIs in low- and middle-income countries (LMICs), where an estimated 15 out of every 100 hospitalized patients acquire an HAI, more than double the rate observed in high-income countries, where prevalence is approximately 7 per 100 (WHO, 2011a). Alarming, only 15.6 % (23 out of 147) of LMICs reported that they had an operational national surveillance system for HAIs, and 66 % (97 out of 147) lacked published data on the endemic burden. A meta-analysis found a pooled HAI prevalence of 10.1 % in LMICs, with high-quality studies reporting rates as high as 15.5 %.

Looking ahead, AMR is projected to cause more than 10 million deaths annually by 2050, surpassing mortality from cancer, diabetes, and diarrheal diseases (O'Neill, 2016). This staggering forecast is attributed to factors such as inadequate infrastructure, insufficient financial resources, and a shortage of trained healthcare personnel to support AMR surveillance and response programs.

Among healthcare professionals, nurses make up the largest segment of the workforce in SSA. Despite their central role in patient care and antimicrobial use, their potential in addressing AMR remains underutilized. Although infection prevention and control (IPC) is included in many nursing curricula across the region, the training provided is often inconsistent, overly theoretical, and insufficiently aligned with the realities of clinical practice. Bulabula et al. (2018) reported that fewer than 40 % of nurses received AMR training during undergraduate education. Similarly, Rahiman et al. (2018) found that while nursing students possessed basic IPC knowledge, most lacked the necessary attitudes and practical skills to apply it effectively. These findings highlight the urgent need to strengthen undergraduate nursing education to better prepare future nurses for emerging infectious disease threats and to enhance patient safety (Goni-Fuste et al., 2021).

Higher Education Institutions (HEIs) have a pivotal role to play in this transformation. While providing a strong academic foundation in IPC and AMR is essential, HEIs must also serve as agents of change by fostering collaborative partnerships with healthcare facilities (Barrera-Cancedda et al., 2019). These collaborations help ensure that curricula

are responsive to local healthcare needs, offer meaningful clinical learning opportunities, and support lifelong professional development. In the context of increasing AMR and recurring pandemics, HEIs are uniquely positioned to advance interdisciplinary, implementation-focused education that bridges academic learning with frontline clinical realities (Labrague et al., 2023).

Regionally, the WHO African Region continues to report some of the lowest levels of IPC capacity (WHO, 2022a). Considering this, and consistent with WHO recommendations (WHO, 2021a), strengthening IPC education and training at the HEI level is essential to ensure that nursing graduates are fully equipped for clinical practice. National investments in HAI-focused training programs and curriculum development are crucial, as a country's capacity to respond to HAI threats depends directly on the preparedness and expertise of its healthcare workforce. Evidence shows that hospitals with better-trained nursing staff report significantly lower rates of HAIs, reinforcing the need for educational institutions to prioritize IPC training and ensure nurses have the competencies required to implement effective infection control measures.

Despite these concerns, little is currently known about how best to capacitate nurse educators in SSA to teach effective HAI prevention and control (HAI-PC) strategies. This includes gaps in pedagogical tools, teaching methods, and faculty development to support IPC education. Thus, the aim of this study is to explore the experiences and perceptions of nurse educators regarding HAI prevention and control in two countries in Sub-Saharan Africa.

2. Material and methods

2.1. Study design

A qualitative, exploratory, and descriptive study with focus group discussion and in-depth interviews. The study report followed consolidated criteria for reporting qualitative research (COREQ) guidelines (Tong et al., 2007).

2.2. Setting

The study was carried out at four nursing HEIs in two countries in SSA, from October to December 2023. The institutions included in this study were purposively selected based on their participation in the InfPrev4Africa consortium (<https://infprev4frica.eu/pt/home-pt>), a funded Erasmus+ collaborative network of European and Sub-Saharan African nursing schools. This consortium was established to promote the exchange of best practices in nursing education for HAI-PC, making them ideal partners for exploring educator perspectives in this area.

HAI-PC program content and practices were studied based on the collected data and expressed as experiences and perceptions of the nurse educators.

2.3. Sample and recruitment

A purposive sampling method was utilized to recruit nurse educators for focus group discussions (FGD) and HEI leaders/managers for in-depth interviews (IDI). The choice of FGD and IDI was due to the fact that the researchers wanted to collect data from all those responsible for the nurses' training process. In this study, to make it easier to understand, the authors considered "nurse educators" all of the teachers, lecturers, nurses, clinical supervisors, or clinical instructors who come into contact with nursing students during their training process.

The inclusion criteria stipulated that participants must possess relevant experience in the field of HAI education and be actively engaged in HAI-PC programs. This criterion was applicable regardless of the length of their teaching tenure if they had contributed to the teaching, coordination, or development of infection prevention content within nursing degree programs. The participant selection process was intentionally designed to ensure a diverse array of perspectives and experiences, thereby facilitating a more comprehensive understanding of the issues being examined.

All educators and HEI leaders/managers were first approached by research members throughout WhatsApp™ or face-to-face, with assistance from the university management, informing their leaders about the study's purpose. All of the invited participants agreed to take part in the study. Participation was voluntary, ensuring privacy and obtaining informed consent from each participant before commencement of the FGD or IDI session.

The educators (teacher, lecturer, nurse, clinical supervisor, or clinical instructor) were allocated to the FGD. The IDI were carried out with individuals responsible for one of the management levels at the HEI (director, scientific council, pedagogical council, head of nursing, head of department).

In total, 14 focus groups were convened, each consisting of six to ten participants, with representation from both male and female educators. The participants were allocated to the focus groups according to their availability. In all HEIs, educators were placed in each focus group, regardless of their role. The FGD took place before the IDI.

2.4. Data collection

2.4.1. Focus group discussions

The FGD interview guide comprised eight open-ended questions designed to elicit information regarding the issue of HAI-PC within the institution (see [Appendix 1](#)). The questions aimed to gather insights into participants' opinions concerning the preparation and significance of HAI, the contexts and methodologies employed by students during their practical experiences, as well as the challenges and other relevant experiences encountered. Additionally, the guide sought to explore the strategies utilized by students to enhance their competencies in issues related to the field or clinical practicum sites, and their concerns regarding the integration of knowledge pertinent to HAI. The discussants were invited to share their comprehensive experiences related to teaching and learning, including the collaborative relationships between clinical site staff and university instructors. The FGD was conducted by CM and PK in HEI_1; LN and PN in HEI_2; ZA and MR in HEI_3; SA and NR in HEI_4.

2.4.2. In-depth interviews

The IDI guide included six questions to elicit the interviewees' opinions regarding the curricular plan, learning content, and the number of hours allocated for learning opportunities (see [Appendix 2](#)). Participants were prompted to express their perceptions of the educational opportunities provided by the teaching staff and to identify what

they deemed essential in the context of education. Furthermore, the interview questions explored interviewees' views on potential areas for improvement and the specific skills they expected students to exhibit in relation to HAI-PC. The IDI was conducted by C.M. and P.K. in HEI_1; L.N. and P.N. in HEI_2; G.R. in HEI_3; Z.R. and P.R. in HEI_4.

All the researchers were familiar with the study context and qualitative interview data collection. Each interviewee had the opportunity to ask questions. Clarification on the benefits of the study was asked for by one of the participants, who elaborated on the point accordingly.

Data saturation was determined when no new themes or codes emerged from the FGDs or IDIs. After the second interview at each site, we observed redundancy in responses, and no additional insights were gained ([Saunders et al., 2018](#)). Nonetheless, all consenting participants were interviewed to ensure inclusivity and robustness of perspectives across HEI.

No one besides the interviewer, assistants and participants was present during the interview or focus group. When necessary, the interviewer asks additional questions to clarify the participants' given answers. During the FGD and IDI the assistants took some notes about how the participants explain themselves and about their nonverbal expressions.

The interviews took place in person. Both FGD and IDI were facilitated by an experienced researcher with expertise in qualitative research in each HEI. The FGD lasted between 60 and 120 min, while each individual interview was conducted over a duration of 45 to 60 min. Participants chose their preferred quiet locations at the University and meeting times for the FGD and IDI. All the data collected during the survey was handled confidentially and utilized solely for research purposes, with audio recordings of the FGDs and IDI transcribed verbatim.

2.5. Data analysis

This study adopted and employed content analysis ([Graneheim and Lundman, 2004](#)). In two HEIs, FGD and IDI were conducted in the local language. The translation into English was carried out by a research member of each HEI (S.A.; Z.A.). Subsequently, another member of each team (E.R.; L.R.), also proficient in both languages, did the back-translation into the local language, which was compared with the original transcript. This process was carried out for all the FGD and IDI transcripts to guarantee the fidelity of the data to be analysed. Following the transcription and translation FGD and interview into English, these documents were utilized to facilitate peer debriefing sessions. The analysis was conducted manually, with the FGD and IDI scripts serving as the units of analysis. All researchers at each study site are fluent in local languages and English.

The data was analysed by two members of each team (S.A., N.R., L.N., P.N., P.K., C.M., Z.A., L.R.). Each researcher independently examined the transcripts in detail, developing codes as the analysis progressed. After coding the first FGD and first IDI, the meanings derived from these codes formed the basis for analyzing subsequent transcripts, which followed a consistent pattern of reading, re-reading, and coding. To maintain consistency, three researchers (M.P.S.; C.N.; K.J.), not belonging to any of the SSA teams, initially met with each HEI team to advise on the coding process; subsequently, these three researchers met with all the researchers of all the HEI teams to discuss the coding and participants' quotations that supported them. All of the researchers met online and summarized the meaning units generated from the codes, condensing them into coherent units that were categorized into categories and subcategories. This systematic approach to data analysis ensured a thorough and meaningful interpretation of the qualitative data collected throughout the study.

Researchers employed triangulation throughout the entire research process. The teams then discussed the data for each country and then between all the teams. The whole process was assisted by three researchers who closely monitored the entire process.

Participants' quotations were therefore identified using a

combination of letters and a number, namely “FP_HEI_1” to indicate a quote from a participant of a FGD in HEI_1; or “IP_HEI_2” to indicate a quote from a participant of an IDI in HEI_2. There was no distinction between participants' gender or position as the IDI was done.

2.6. Ethical considerations

Prior to data collection, permission to conduct the study was sought from each country. The ethical approval was obtained under the designation CREC/726/2023 for HEI_1 and HEI_2; and the designation IORG00001212 for HEI_3 and HEI_4.

In adherence to ethical research principles, participants were provided with comprehensive information regarding the study's objectives and methodologies, as well as the voluntary nature of their involvement. Participants were made aware that, due to the nature and objectives of the research, no harm or risks were anticipated, and they would not receive any monetary compensation for their participation. The study team implemented measures to ensure the confidentiality of the data collected.

Participants had the autonomy to decline participation and were permitted to withdraw from the study at any time without requiring any justification. Those who consented to take part were required to sign a written informed consent form. The signed informed consent forms were stored separately from the collected data by the researchers, ensuring that participant identities remained concealed during the publication process.

All electronic data were safeguarded through secure access protocols, with key passwords known exclusively to the researchers from each site. Audio recordings were stored securely in a locked cupboard, and hard copies of the materials were similarly kept in a safe location known only to each site interviewer.

Participants were treated equitably and respectfully throughout the research process, in accordance with the principle of justice. The data collectors were vigilant in upholding ethical standards. Individual privacy was prioritized during interviews by conducting them in private rooms, and participants were allowed to select both the time and setting for the FGD and IDI. Participants were oriented to the purpose of the study and to those for the individual interviews. The participants chose the time and dates of the FGD or IDI. All participants preferred meeting during the evening, after work hours.

2.7. Rigor

The trustworthiness of findings in qualitative research is established through four key criteria: credibility, dependability, confirmability, and transferability (Corbin and Strauss, 2015). The FGD and IDI questions were rigorously discussed with members of Consortium, who possess substantial expertise in capacity-building projects related to HAI-PC.

To enhance credibility, the codification process was conducted by two researchers at each research site, followed by verification from three additional reviewers. This collaborative review process took place across all study sites to ensure data saturation was achieved not only within individual sites but also across the entire study, thereby standardizing the results obtained. Additionally, two participants initially reviewed the transcripts and subsequently validated the findings independently.

To ensure confirmability, the research employed triangulation among researchers to mitigate potential biases arising from individual researchers' perspectives, thereby enhancing the quality of the information collected. The research team consisted of individuals with expertise in HAI-PC, HEI management, and pedagogy, which further strengthened the comprehensibility of the data gathered during FGD and IDI.

Finally, to support transferability, a comprehensive description of the study's development and methodology was provided, facilitating the application of the findings across different contexts.

3. Findings

A total of 120 nursing educators, including professors/lecturers, clinical instructors and clinical nurses from four HEI of two Sub-Saharan African countries were interviewed to inform their experiences and perceptions of HAI-PC (see Table 1).

The analysis of the data from the FGD and IDI revealed one major category, “Education about Infection Prevention and Control”, five (5) categories, and twelve (12) subcategories. The major category encapsulates the primary focus of our study, categories represent specific areas within that focus, and subcategories detail finer aspects that elucidate the challenges and findings related to infection prevention and control education. This hierarchical structure allows for a comprehensive analysis of the complexities inherent in nursing education. The results are presented in Table 2 and further detailed in the following sections.

3.1. Category 1: pedagogical issues

Nursing education encompasses both theoretical and practical components, which are equally important yet serve distinct but complementary purposes. Achieving a balance between these two aspects can present pedagogical challenges for universities in effectively teaching HAI and IPC-related topics.

In both countries, significant issues were found in the articulation between professors/lecturers and clinical nurses/instructors. The participants reported that lecturers are responsible for teaching both theory and practical sessions, while clinical nurses/instructors teach in the clinical area. This situation was illustrated by one of the participants.

“University lecturers teach the theory and develop the objectives of the practical training”

(HEI_3)

Other participant added that the professors' role is to coordinate practical training and theoretical courses (HEI_3).

One participant noted

“University lecturers and nurses are interdependent and communicate well, both administratively and in terms of student progress”

(FP_HEI_4)

Although both groups of teachers were perceived as interdependent, each focused on different tasks. In country one, participants reported

Table 1
Participants' role/position per HEI.

		SSA_country_one		SSA_country_two		Total (n=)
		HEI_1	HEI_2	HEI_3	HEI_4	
“Educator” role of the participants in FGD (n)	Professor	0	0	7	2	9
	Lecturer	8	5	2	13	28
	Nurse	0	2	5	21	28
	Clinical supervisor	8	0	4	1	13
	Clinical instructor	0	10	3	5	18
Position of the participants IDI (n)	Total	16	17	21	42	96
	Director Dean Provost	1	0	1	1	3
	Scientific Council	0	0	7	3	10
	Pedagogic Council	0	0	1	1	2
	Head of Nursing Course/ School	1	0	1	1	3
	Head of Department	2	2	1	1	6
	Total	4	2	11	7	24

FGD: focus group discussion; IDI: in-depth interview.

Table 2

Categories and Subcategories which emerged from focus group discussions and in-depth interviews.

Categories	Subcategories	Results Summary	
		HEI_1 and HEI_2	HEI_3 and HEI_4
Pedagogical issues	Professors/lecturers	Lecturers are responsible to teach both theory and practical sessions.	Lecturers provide theoretical and practical instruction.
	Clinical Nurses/Instructors	Nurses and clinical instructors teach in the clinical area.	Nurses and clinical instructors facilitate education in clinical settings.
Curricular issues	Number and structure of the hours attributed to the contents	Insufficient hours for both theory and practical hours while more emphasis is placed upon theory rather than practical. Limited time for skills laboratory practice prior to the practice on real patients.	While sufficient hours are allocated for both theoretical and practical instruction, there are frequent instances of teacher absenteeism. Furthermore, the time available for practice in skills laboratories prior to engagement with actual patients is limited. Conversely, the schedule allotted for courses focused on HAI is more than adequate yet is often underutilized.
	Contents of the curricular	Theory and practical sessions for IPC modules do not align. Sessions embedded in different courses not a standalone course. Gap between theory and practice. Lack of integration of practical scenarios in the curriculum impeding alignment of educational content with real world challenges encountered into clinical practice. Evaluation/assessment is not well captured as it sometimes gives less weight to subset of a major course.	The curriculum addresses HAI prevention but lacks a dedicated IPC course. There is a critical need for standardization across nursing, midwifery, and anesthetics programs, along with a comprehensive review of course content to address the lack of practical opportunities, tutorials, assessments, and simulation-based learning.
In-service training issues	Importance of keeping professors/lecturers up to date.	Enhance the skills and knowledge on prevention and control of HAI for both professors/lecturers.	Some teachers/lecturers have insufficient qualifications, are not motivated or don't consistently adhere to course hours.
	Importance of keeping Clinical nurses/instructor knowledge up to date.	Need for joint professional development programs that can enhance the skills and knowledge on prevention and control of HAI for clinical nurses/Instructors.	Enhancing the capabilities of instructors supervising student simulations and practical exercises, especially regarding HAI, is essential. Additionally, establishing training programs for trainers

Table 2 (continued)

Categories	Subcategories	Results Summary	
		HEI_1 and HEI_2	HEI_3 and HEI_4
Equipment needs	Simulation room	Need for training of trainers.	is critical. Continuous education on HAI prevention and control should be provided to healthcare professionals, facilitated by field experts. The aim of these initiatives is to update existing knowledge and develop context-specific protocols. The skills laboratory is inadequately equipped and is situated within a confined space. The absence of dedicated training laboratories at the institution significantly hampers the development of essential skills among students. The teaching materials utilized are old and outdated, and frequently malfunction, thereby adversely affecting the quality of instruction provided to students.
		Absence of a well-equipped simulation room which significantly affects the hands-on learning experience for the students.	
	In classroom	Inadequate equipment prevents creation of realistic exams, compromising assessment process. The need for conducive learning environment	
	Clinical wards	The lack of protective materials, or measures to address infection control in clinical practice settings, greatly hinders the prevention and control of infection associated with healthcare.	
HAI issues	Knowledge about procedures	Significant amount of improvisation, non-adherence to guidelines, negligence, and low importance given to IPC results in a lack of standard practices. Updates on IPC should focus on both nurses and lectures rather than clinical nurses alone. Gap on HAI knowledge transfer from the healthcare workers (nurses) to community.	Prior to the commencement of student internships, supervisors provide guidance on hand hygiene; however, adherence varies among students, with some following the instructions and others neglecting them. Updates on IPC should target both nurses and lecturers, rather than focusing solely on clinical nurses. Additionally, there is a lack of standardized protocols or technique sheets for the prevention and control of HAI.
	High infection incidence	Acknowledging the HAI to be a critical challenge contributing to reported incidences of AMR. HAI are perceived as a source of infection	There is currently no established rate for monitoring the prevention and control of HAI. It is essential to implement a system for collecting and

(continued on next page)

Table 2 (continued)

Categories	Subcategories	Results Summary	
		HEI_1 and HEI_2	HEI_3 and HEI_4
		in a vicious cycle, from hospital to community and then circulating back to the hospital, hence the need to break this cycle.	evaluating data related to HAI prevention and control. Moreover, some students lack awareness of the severity of HAI and require briefings on the significance of hospital hygiene.
	Protocols for intervention in HAI area	Some guidelines are not available, and among those that are accessible, some are not up to date. The hospital unit for IPC is in place but less weight is given on advocacy for the HAI issues.	The country has yet to establish a national ICP program, with the strategic plan in validation and no implementation plan or guidelines in place. As a result, students are often unsure about the standards to follow, as their training environments do not reflect classroom theory. These sites frequently lack adequate resources and rely on makeshift solutions due to financial limitations, making it difficult to apply hospital hygiene protocols due to a shortage of essential hygiene supplies.

AMR: antimicrobial resistance; HAI: health associated infection; IPC: infection prevention and control.

that professors base most on their teaching in the classroom, with a few clinical sessions. The clinical instructors, in turn, wait for students to attend their respective wards, supervise them, and prepare practicum objectives.

Such a division of responsibilities and tasks entailed some problems in teaching ICP-related skills. According to the participants in country two, the difficulty lies in the gap between theory and actual reality in hospitals. It was suggested that the HEI could standardize the IPC training and theoretical courses to improve the integration of students into the IPC's protocols. A participant pointed out,

“Coordinate practical training and theoretical courses, standardize them so that students don't get lost in them”

(FP_HEI_3)

In country one, the participants clearly acknowledged that IPC rarely received the focus it merits. They recognized the need to revisit HAI training approaches, which would also lead to higher engagement when teaching students on IPC at the practicum sites. One participant stated:

“For us nurses who already understand the aspects of infection control, (we) find it quite challenging to teach and supervise students because they have many gaps in skills. But we have come to realize that the main reason is their lack of understanding of basic principles of care for example the ‘5s’ principles”

(FP_HEI_1)

Another participant commented

“So, teachers should come to the clinical areas to collaborate with mentors and clinical instructors who are in the ward so that they put common plans between clinical instructors, teachers and students to create an easy way to implement IPC prevention infection control. There's a need for a more robust structure to address IPC in the curriculum”

(IP_HEI_1)

3.2. Category 2: curricular issues

A well-designed curriculum on HAI is crucial for teaching nursing students ICP-related skills effectively in a clinical environment. However, the study revealed significant issues in both countries. There was some concern regarding the number of hours and content structure for both practical and theoretical lessons.

In country one, several participants were uncertain about the amount of time dedicated specifically to HAI and ICP despite their observation that more time is spent on theoretical hours instead of practical/clinical learning. One of the stakeholders reported,

“I don't know how many hours are allocated specifically for ICP training, but we know it is taught”

(FP_HEI_2)

Other participants highlighted that the number of hours allocated for both theory and practice is insufficient, and at the same time, more emphasis is placed on the theory part. They also expressed their concerns about limited time for skills laboratory practice before the practice on real patients, also admitting that simulation is a crucial strategy to develop ICP skills. One participant commented,

“what we have noted is that, the proportion of lecture hours and the clinical need to be revisited, we very much wish to see more hours in clinical practice whereby students can learn so that the students will be exposed in the skill lab to learn more and then when they go for practice, they will be well equipped with the skills which are required to practice infection prevention.”

(FP_HEI_1)

In addition to pointing out the imbalance of classes to clinical hours, the participants also emphasized the need for a more robust structure to address IPC in the curriculum. One of the stakeholders stated,

“IPC, it should be given more time for students to be taught broadly, but also you know teaching is a continuous process, a teacher teaching a group from this year has a guideline stating this and next year the guideline has changes, this teacher should also be informed that the guideline changes so that he/she goes with it so that they have the same language with staff from hospital”

(IP_HEI_2)

In country two, somewhat different concerns were expressed. Participants reported that the number of hours for both theory and practice is sufficient and that the timetable of courses dedicated to HAI is more than adequate, adding,

“There is a gap between theory and practice: Theoretical courses provide a great deal of knowledge, but not enough practice”

(FP_HEI_3)

However, they noted that teachers were often absent, and the timetable was sometimes not followed. One of the participants commented,

“Then, the hourly volume of theoretical courses is sufficient, but some of the allocated hours are not used”

(IP_HEI_4)

Similarly, as in country one, the participants pointed out the shortage of time for training laboratories addressing the IPC. One of them stated,

“To improve the teaching and learning process in the field of HAI-PC, it is necessary to set up a skills laboratory, to facilitate simulation with repetition”

(FP_HEI_4)

Another major curricular issue identified in the study concerned the contents of the curricula. In both countries, participants emphasized that there are no specific stand-alone courses allocated to only IPC; instead, the subject is embedded within other courses. One participant stated,

“The foundation of the nursing module in the nursing program has limited hours and does not directly address IPC as a stand-alone course”.

(FP_HEI_1)

Another participant noted:

“The current program is more focused on infections (nosocomial or not) than on prevention, considering the units related to infections. The content and organization of teaching do not clearly highlight the preventive aspects that are implicit in all units” (IP_HEI_3).

There was a suggestion that a specific syllabus focused on IPC should be added,

“The necessity of a specific teaching unit for IPC”

(IP_HEI_4)

In view of the highlighted deficiencies in the curricula, participants in both countries expressed the need for revision, and, in addition to the suggested improvements presented above (see [Sections 3.1 and 3.2](#)), the participants from country two pointed to the need for curriculum standardization and the extension of internships.

“The content of the curricular needs to be reviewed. Infectious diseases courses need to be standardized across all pathways. More tutorials would stimulate the development of critical thinking skills”

(FP_HEI_4)

“Internships should be implemented from the first year of each pathway. The course content is very theoretical overall”

(IP_HEI_3)

3.3. Category 3: in-service training issues

Maintaining updated course contents is essential for nursing educators to maintain high educational standards, ensure curriculum relevance, and improve student outcomes.

Keeping professional knowledge up to date was identified as an important need for participants from both countries. One participant emphasized,

“Reinforce trainers' skills in infection prevention and control is essential to improve the “Educational approach of IPC in our country” Healthcare HEI”

(IP_HEI_3)

Similarly, in country one, participants highlighted the need to improve and update their knowledge and skills in HAI and IPC to guide students during clinical practice.

Participants in both countries indicated the need for scientific and training days dedicated to prevention and control of HAI. The statements serve as examples:

“Inviting experts in HAI-PC, organization staffs about HAI-PC, are essential, in order to establish a draft of protocols adapted to our context”

(IP_HEI_4)

“The exchange of experience about the skills and knowledge on HAI-PC is very necessary for both faculties/lecturers and nurses, to improve the quality of care, as well as the skills of the students”

(IP_HEI_3)

The participants agreed that updating knowledge and skills is an essential element of professional development. The stakeholders and the nurses in the study believe that continuous education is the key as even experienced staff members needed to be regularly updated to be current with new information.

“I wish that, if possible, during daily reports, we could identify someone, maybe a ward leader or someone overseeing IPC and quality care issues, to remind us of simple things that could be done at a low cost.”

(FP_HEI_1)

On the other hand, some participants revealed that the syllabus is largely sufficient. However, the flaws lie mainly in its implementation because of the teachers' lack of qualifications and motivation. One participant pointed out,

“I find the syllabus to be correct, but the implementation is insufficient (qualification of teachers, motivation of teachers, rate of teaching not properly honoured)”

(IP_HEI_3)

3.4. Category 4: equipment needs

The lack of adequate equipment emerged as a significant barrier to effective HAI-PC education in both countries.

In country two, the absence of proper training laboratories and simulation equipment was identified as a critical issue. Participants stressed that without adequate facilities, students are unable to fully integrate HAI-PC competencies into their practice. A participant stated,

“Students are neither aware of nor prepared in the field of HAI-PC, it is necessary to set up a skills laboratory, to facilitate simulation with repetition (...) Some teaching materials are not available, affecting the quality of the transmission of knowledge”

(FP_HEI_4)

Another participant highlighted that the environment for teaching is very important to develop critical thinking in students.

“The school does not have training laboratories and simulation, and repetition is important to improve integration”

(IP_HEI_3)

Similarly, in country one, participants reported that the absence of well-equipped simulation rooms was a major hindrance to practical learning. A participant noted,

“To improve the teaching and learning process in the field of HAI-PC it is necessary to set up a skills laboratory to facilitate simulation with repetition”

(FP_HEI_1)

This lack of simulation equipment prevents students from gaining the practical experience necessary to effectively apply HAI-PC practices in real-world settings. In both countries, the shortage of basic classroom equipment, such as projectors and sound systems, was also highlighted as a barrier to effective teaching and learning.

“At least to minimize the difficulties and challenges that occur during learning and teaching in the classroom and practical settings I support the idea of having simulation models, use of videos and many demonstrations. This will help memory retention and maintaining IPC skills among students”

(FP_HEI_1)

Moreover, in both countries, the shortage of personal protective equipment (PPE) and other essential materials in clinical training sites was a significant challenge. In country two, participants noted that this shortage complicates the implementation of HAI-PC protocols and

creates a gap between theoretical knowledge and practical application. One participant mentioned,

“The lack of equipment designed for prevention and control of HAI (e.g., personal protective equipment, informative posters) complicated the integration of student's knowledge and encourages non-compliance with hygiene protocols”

(FP_HEI_3)

This issue was echoed in country one, where the lack of adequate equipment was seen as a major barrier to the effective practice of IPC.

3.5. Category 5: healthcare-associated infections issues

The management of HAI-PC was identified as a critical challenge in both countries, with significant implications for education.

In country two awareness of the seriousness of HAI was found to be lacking among both students and healthcare professionals. Participants noted that students were not sufficiently prepared for the prevention and control of HAI. Also, there was a general lack of adherence to HAI-PC protocols in clinical settings. One participant stated,

“Students are neither aware of nor prepared for the prevention and control of HAI”

(FP_HEI_4)

This lack of awareness and preparation was compounded by the absence of a national IPC program, which further complicates efforts to standardize and implement effective IPC practices across the country.

In country one, participants reported a significant amount of improvisation and non-adherence to IPC guidelines, which contributed to a high incidence of HAI. One participant highlighted the lack of standard practice:

“I find it challenging, especially in the wards where we all know that infections are high. The decontamination process and timing are crucial, yet sometimes they are overlooked” (FP_HEI_2).

This lack of adherence to guidelines was linked to the broader issue of AMR, with HAI being a key factor in the spread of resistant infections. Participants also emphasized the need for updated and accessible HAI-PC guidelines, noting that some of the existing ones were outdated or not readily available.

“We are taught the essential aspects of infection prevention for our own CPD not for teaching students or for our families, and for institutions. I can give an example. When we put on gloves for procedures, a single pair may be used for multiple patients or even a whole ward. It's hard to remember when to change them during a busy day. We need someone to remind us”

(FG_HEI_1)

In both countries, the cyclical nature of infections between hospitals and communities was recognized as a significant issue, with participants calling for strategies to break this cycle. In country one, one participant noted,

“HAI are perceived as a source of infection in a vicious cycle from hospital to community and then circulating back to the hospital hence the need to break this cycle”

(FP_HEI_2)

This recognition of the broader impact of HAI highlights the importance of a comprehensive approach to IPC that involves not only healthcare professionals but also the community at large.

Participants in both countries emphasized the need for a coordinated and comprehensive approach to IPC, involving better education, more effective implementation of protocols, and a stronger emphasis on the prevention of HAI. This approach is seen as essential for reducing the burden of HAI and improving overall patient outcomes.

Protocols and guidelines are essential for the effective prevention and control of HAI. The study revealed several challenges related to the development, implementation, and adherence to IPC protocols in both countries.

Participants pointed out that Country Two has not yet institutionalized a national IPC program, and the strategic plan is still in the validation phase. Moreover, there are no existing IPC guidelines or framework documents, which create confusion and inconsistency across healthcare facilities. In this line, they recommend having a

“Regular scientific day about the prevention and control of HAI, would enable all healthcare personnel to update their knowledge” [additionally to] *“develop a curriculum, protocol or technique sheet to standardize the prevention and control of HCAIs”*

(FP_HEI_4)

Therefore, this lack of standardized protocols makes it difficult for students to apply IPC practices consistently, leading to varied and often ineffective infection control measures.

The situation is compounded by the fact that even where protocols exist, they are often not adhered to or are difficult to apply due to resource constraints. Participants mentioned that hygiene hospital protocols, which follow international guidelines, are sometimes challenging to implement in the local context due to the unavailability of necessary hygiene consumables. This issue was highlighted by one participant who stated,

“Our national hygiene hospital protocols follow international guidelines, but both are sometimes difficult to apply in our context”

(IP_HEI_3)

This gap between protocol and practice significantly hampers effective IPC, leading to increased risks of HAI.

In country one, while some IPC guidelines exist, their implementation and adherence are inconsistent. Participants noted that some IPC guidelines are outdated or not readily accessible to healthcare workers and students. One participant expressed concern about the lack of updated protocols stating,

“Some guidelines are not available, and among those that are accessible, some are not up to date”

(FP_HEI_1)

This situation leads to improvisation and non-adherence to standard procedures, contributing to the spread of HAI within healthcare facilities.

Moreover, there it was recognized that IPC issues are often given less priority within healthcare settings, which further undermines the effectiveness of existing protocols. A participant pointed out,

“The hospital unit for IPC is in place, but less weight is given on advocacy for the HAI issues”

(FP_HEI_1)

This lack of emphasis on IPC advocacy and enforcement of guidelines contributes to the high incidence of HAI, creating a vicious cycle of infection that is difficult to break.

Participants in both countries stressed the need for stronger, more accessible IPC protocols and better training for healthcare workers and students to ensure adherence to these guidelines. The development of a national IPC program in country two and the updating and dissemination of IPC protocols in country one were identified as critical steps toward improving infection control practices and reducing the burden of HAI.

4. Discussion

This qualitative study aimed to explore the realities of HAI in two SSA countries. The study focused on the capacity of teaching staff, their

pedagogical practices, as well as the availability of teaching resources, equipment, and supplies in universities with nursing schools in both countries. The curricula and local and national guidelines were examined by both the teaching staff for the classroom, hands-on training sites and other stakeholders. The identified categories of issues are presented in the existing literature to elucidate their nature and specificity within a broader context.

In both countries, a significant pedagogical challenge emerged regarding collaboration between academic teachers, responsible for theoretical instruction, and nurses acting as clinical instructors during practical training in hospitals. Despite perceptions of interdependence in shaping curricula and teaching methodologies, the study revealed that collaboration remains inadequate. Participants from country two noted a pronounced gap between theoretical knowledge and clinical practice, while those from country one identified deficiencies in the teaching of HAI-PC. Contributing factors included nurses' insufficient involvement in IPC education, a misalignment between students' theoretical preparedness and clinical supervision, inadequate teacher-to-student ratios, and the absence of academic staff in clinical environments. These findings align with existing literature on nursing education challenges. For instance, a qualitative study from Ethiopia cited poor communication between faculty and hospital authorities, lack of financial incentives for preceptors, and resource disparities as key issues (Tadesse et al., 2024). Similarly, an integrative review encompassing 25 studies from sub-Saharan Africa outlined collaboration issues between faculty and hospital administration, insufficient resources, and limited involvement from local health systems (Bvumbwe, 2016). Overall, the identified pedagogical issues are symptomatic of broader organizational, social, and economic complexities affecting nursing education.

The study revealed significant curricular challenges in both countries, particularly regarding structure and content. Key structural issues included inadequate didactic hours for practical training, an imbalance between theory and practice, and limited skills laboratory sessions. Consequently, students had fewer opportunities to develop practical skills, hindering their readiness to implement infection control practices, as supported by existing literature (Ewertsson et al., 2015; Relloso et al., 2021). This gap exacerbated content-related challenges, reinforcing the necessity for comprehensive curriculum revisions (Panda et al., 2021; Singh et al., 2024). Additionally, factors such as teacher shortages and inadequate qualifications further complicated effective teaching of infection control practices and HAI.

The findings from both countries underscore the necessity of enhancing the professional knowledge of nursing educators and nurses regarding infection control practices and HAI. As essential components of educational systems, quality nurse educators are vital for delivering effective education (Smith et al., 2023). Continuous professional development is imperative to ensure educators remain informed on the latest scientific evidence and guidelines. Adapting to evolving healthcare needs is crucial for fostering high-quality nursing education (Baker et al., 2021; WHO, 2021b). Addressing educators' continuing education requirements is essential for developing a sustainable nursing workforce, ultimately improving health outcomes across populations (United Nations, 2015).

Successful teaching of IPC and HAI necessitates specific essential conditions. While previous discussions highlighted the importance of updating nurse educators' theoretical and practical knowledge, creating a stimulating learning environment is equally crucial. This requires access to appropriate, modern equipment in classrooms. As Garvey and Kiegaldie (2023) demonstrate, outdated or malfunctioning materials undermine instructional quality, hinder student engagement, and fail to replicate real clinical scenarios, ultimately impairing the learning process. By addressing these equipment shortages, educational institutions can enhance alignment with contemporary healthcare standards, thereby improving assessment processes and student competencies.

The simulation of IPC content often occurs within dedicated laboratory contexts (Hien et al., 2024), emphasizing the need for universities

to provide adequately equipped spaces for practical training. Our findings indicate this as a pressing requirement in both countries. Malfunctioning or outdated equipment restricts the development of realistic clinical scenarios during assessments, jeopardizing the evaluation of nursing students' practical skills. Moreover, inadequate simulation environments fail to encapsulate real-world nursing challenges, adversely affecting the preparation of future professionals, as supported by existing literature (Magadze et al., 2022; Truong and PrevInf Group, 2024). Additionally, our results highlighted significant issues regarding clinical placements, which hindered effective IPC training due to inadequate materials for both health professionals and students (Igwe et al., 2024).

The findings from both countries indicate a significant lack of knowledge regarding HAI, alongside non-compliance with established guidelines and protocols. Students and healthcare professionals exhibited insufficient awareness of HAI risks and transmission mechanisms, a situation corroborated by the 2022 WHO report highlighting similar global challenges in infection prevention and control (WHO, 2022a). Key issues identified include the absence of guidelines aligned with international standards, non-conforming practices, and limited use of infection control (ICP) data to inform actions, especially given the high prevalence of HAI and antimicrobial resistance (Abubakar et al., 2022; WHO, 2022b).

The report emphasizes the necessity for sustained implementation of national IPC programs using multimodal strategies that incorporate IPC into educational and clinical settings. Participants in our study echoed this sentiment, highlighting the importance of recognizing the interplay between healthcare-acquired infections and community infections. While intervention protocols exist, their application varies significantly; one country lacks national protocols, while the other faces inconsistency and adherence challenges, hindering efforts to reduce infection rates.

Literature also identifies barriers related to outdated or inaccessible guidelines, which impede HAI management (Alhumaid et al., 2021). The systematic review by Barrera-Cancedda et al. (2019) indicates that nurses' adherence to IPC practices is contingent upon adequate institutional support and leadership. Furthermore, successful implementation requires adaptation to local contexts—for example, incorporating locally sourced materials for infection prevention.

Additionally, despite the presence of IPC units in many hospitals, HAI-related issues often receive inadequate attention. A lack of prioritization can diminish the effectiveness of these units, underlining the necessity of strong advocacy efforts within healthcare systems. For robust infection prevention strategies, a multidisciplinary approach is essential, ensuring the accessibility and enforcement of updated protocols across all levels of healthcare institutions (Magadze et al., 2022; Mutsonziwa et al., 2024).

4.1. Study strengths and limitations

The fact that the study was conducted in four HEIs across two different countries in SSA represents a strong point. Another aspect that adds robustness to the work is that all those responsible for the training process of the students were consulted, from the dean/provost to teachers and even clinical supervisors. This allows us to have a comprehensive view of how education in health care prevention is structured in these countries and what needs to be done to enhance improvements.

Another strength of our findings on the barriers to HAI-PC education, such as curriculum limitations, faculty shortages, and limited clinical exposure, aligns with global patterns reported in other countries. Parreira et al. (2022) found similar inconsistencies in Portugal, noting significant variation in how IPC is taught and assessed, as well as a lack of standardized learning outcomes across nursing programs. Their work emphasized the need for cohesive pedagogical frameworks to bridge theory and clinical practice. Similarly, in Iran, Gorjian et al. (2024) highlighted the absence of specialized IPC curricula and advocated for formal integration into nursing education. An integrative review by

Amavasi and Zimmerman (2024) echoed these concerns across 15 countries, stressing the importance of continuous education using simulation and scenario-based tools. In Southeast Asia, Truong and PrevInf Group (2024) identified structural and pedagogical challenges in Vietnamese and Cambodian universities that limit effective IPC training. These international insights reinforce the broader relevance of our findings and suggest the need for globally informed curricular reform in IPC education.

Although data analysis involved two researchers at each HEI, with subsequent verification by three additional reviewers who closely monitored the process, this structure may still present a limitation in terms of potential subjectivity or interpretive bias. Additionally, the number of participants varied notably across contexts, which may affect the comparability of findings. Nevertheless, the research team intentionally chose to include all individuals who consented to participate to ensure that diverse perspectives were represented.

4.2. Recommendations for further research

For future investigations, we recommend that studies be developed including students, consulting them about topics related to infection associated with health care and prevention and control.

Having identified the weaknesses in infection prevention and control in SSA countries, we also recommend the development and testing of a culturally sensitive model tailored to this reality.

4.3. Recommendations for practice

HEIs should integrate dedicated IPC courses into nursing curricula while facilitating continuous professional development for educators. Also, there should be enhanced collaboration between faculty members and clinical instructors through regular meetings and co-created educational plans. Finally, substantial investment in infrastructure and equipment is necessary to establish well-equipped skills laboratories, providing nursing students with optimal training environments to develop practical competencies essential for effective IPC implementation. These actions will improve educational outcomes and patient care quality.

5. Conclusion

The study highlights significant pedagogical and curricular challenges in nursing education related to IPC in two SSA countries. The disconnect between theoretical knowledge and practical application hinders effective training, with a notable lack of standardized IPC protocols and inadequate resources further complicating the issues. Participants emphasized the urgent need for a comprehensive approach, including enhanced collaboration between educators and clinical instructors, increased practical training hours, and the development of robust IPC curricula. Additionally, the lack of adequate equipment and training facilities must be addressed, as these limitations impede effective teaching and ultimately reduce the quality of patient care outcomes.

CRediT authorship contribution statement

Márcia Pestana-Santos: Writing – review & editing, Writing – original draft, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Carla Nascimento:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Formal analysis, Data curation, Conceptualization. **Krystyna Jaracz:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Resources, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Rose Laisser:** Supervision, Project administration, Investigation. **Jane Rogathi:** Visualization, Validation, Supervision, Resources, Project administration, Investigation. **Emmanuel Guy Raelison:** Visualization, Validation,

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Author statement

The authors have appointed Márcia Pestana-Santos as the corresponding author to communicate with the journal during the editorial process.

All authors agree to be accountable for all aspects of the work and ensure that the questions related to the accuracy or integrity of any part of the work were appropriately investigated and resolved.

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The authors have declared no conflict of interest.

Appendix 1. Focus group discussion guide

The main objective of the project comprises the design of the InfPrev4frica model, a pedagogical model with the aim of developing essential competences in the prevention and control of HAI by nursing/paramedic students.

Participants: Educators

Questions

Regarding the issue of prevention and control of HAI, at your Institution:

1. In your opinion, are students aware of and well-prepared about the

importance of HAI prevention and control?

2. How can healthcare institutions, where the students carry out their clinical practice, facilitate or hinder their intervention regarding the prevention and control of HAI?

3. What are the strategies used with students, during their clinical practice, that allow them to improve their skills in the field of HAI prevention and control? How do you highlight these opportunities?

4. In your opinion, how is the integration of students' knowledge throughout the course in what concerns clinical practice, regarding the prevention and control of HAI?

5. What difficulties are highlighted by students? What solutions/strategies do you suggest implementing to improve the teaching and learning process in this area?

6. In this thematic subject, what skills should students be able to demonstrate at the end of the course?

7. What is the relationship between the healthcare institutions where students carry out their clinical practice and academic institutions?

8. How could collaboration between institutions in the field of HAI prevention and control be improved?

Appendix 2. In-depth interview guide

Participants: Consortium Institution's Academic Staff Questions

Regarding the issue of prevention and control of Healthcare Associated Infections (HAI), at your Institution:

1. What is your opinion about the curricular/curriculum plan of the Nursing/Paramedic Course on this topic?

(organization of contents by year, number of hours allocated, participation of teachers and invited experts, etc.)

2. How are the learning contents/hours/learning opportunities related to the prevention and control of HAI defined in the course? Which institutions participate? Which references, guidelines, consensus, etc. are followed?

3. What is your opinion/perception about the educational opportunities offered by the institution to teachers (staff and invited experts) on this topic?

4. What do you consider to be essential to implement in the nursing/paramedic curricula to improve the teaching and learning of students in this thematic area?

5. What should be improved in the educational offer in this area/(e.g. institutional actions to be maintained and/or implemented.)

6. In this thematic issue, what skills should students be able to demonstrate at the end of the course?

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