Nurses' perception, barriers and the impact of sociodemographic factors of hand hygiene, towards the prevention of healthcare acquired infections in the intensive care units of three referral hospitals Rwanda.

ABSTRACT

Introduction: Health-acquired infections develop within 30 days post-discharge, at least 48 hours after admission, and are not present at the time of admission. They particularly impact critically ill patients due to their weakened immune systems, with hand washing being the most effective prevention method. **Objective of the study:** Assessing nurses' perceptions, barriers, and the impact of socio-demographic factors of hand hygiene in ICUs of three referral hospitals in Rwanda. **Methods:** The study included 65 ICU nurses from three referral hospitals, using a quantitative descriptive cross-sectional design and whole population sampling. Data analysis was conducted with SPSS software version 21. **Results:** Seventy percent of participants viewed health-acquired infections (HAIs) as serious and susceptible, while 83.1% recognized the benefits of hand hygiene. The most commonly cited barrier to hand hygiene was allergies to products, reported by 32.3% of respondents. Positive perceptions of hand hygiene were significantly associated with the working institution and in-service training, with a P-value of less than 0.05. **Conclusion:** The study found that most participants in the ICU believe hand hygiene is crucial for preventing HAIS, and in-service training positively correlated with this perception. Barriers include allergies, supplies, facilities, and uncertainty. R**ecommendations:** There is a need for conducting research using an observational checklist to assess HH adherence among ICU nurses, enhancing nursing education on HH, and improving in-service training for managerial teams in three hospitals.

Keywords: assessment, perceptions, barriers, hand hygiene.

1. INTRODUCTION

Health Care-Acquired Infections occur within 30 days after discharge, not less than 48 hours after admission, and that weren't present or incubating at the time of admission for both health care providers and patients (1). In low and middle-income countries, 42% of healthcare-associated infection (HAI) cases are reported, compared to just 5-10% in developed nations (1). They are the leading cause of death and illness among hospitalized patients, making them a significant global health issue and a threat to healthcare safety (2). Moreover, in the United States, one in every 25 hospital patients acquires an HAI daily, leading to an estimated 90,000 deaths annually among the two million Americans affected by HAIs (1). Patients in intensive care units (ICUs) face a significant risk of healthcare-acquired infections (HAIs) because of the frequent use of invasive procedures and devices, induced

Comment [ZA1]: Seventy-two hours after admission to the hospital, right?

Comment [ZA2]: More recent data is available from the CDC.

immunosuppression, underlying health conditions, frailty, and advanced age (2). Each year, approximately 2,609,911 new cases of healthcare-associated infections (HAIs) are reported in the European Union and the European Economic Area (2). A total of 112 surveillance studies on HAIs in intensive care units across 20 European countries showed that 86.3% of cases were identified. The main contributing factors were the use of central lines and ventilators, along with procedures such as colon surgeries and hip replacements. Among the risk factors for surgical site infections, caesarean sections were responsible for 95.5% of HAIs. (3).

A significant multi-center study in Turkey revealed that 15.8% of 1,499 critically ill patients developed an infection without exhibiting signs of systemic inflammatory response syndrome (SIRS), while 10.8% had both an infection and SIRS. The respiratory system was mainly impacted, accounting for 71.6% of the infections (4). Data on healthcare-associated infections (HAIs) in Sub-Saharan Africa is limited, but the reported incidence varies between 2% and 49%. In intensive care units, the rate is higher, ranging from 21.2% to 35.6%. In countries such as Burkina Faso, Tanzania, Ghana, Mali, Cameroon, Gabon, Uganda, Burundi, the Democratic Republic of the Congo, and Senegal, HAIs are more prevalent than other types of infections, with rates from 1.6% to 28.7%.(5)

A study conducted at CHUK hospital in Rwanda, which examined 41 patients in the ICU, neonatal ICU, and orthopedics/burn units, revealed a healthcare-related infection rate of 15.1%. Notably, half of these infections occurred in the ICU wards (5). Effective hand hygiene is the most crucial, straightforward, and cost-effective method for preventing healthcare-associated infections (2). In 1847, Hungarianphysician Ignaz Semmelweis providedscientific proof thatchildbedfevercouldbetransmittedbetween patients via the dirty hands of healthcareworkers(6). Althoughhisfindingswereinitiallyignored, the medicalcommunity, especially surgeons, graduallyembraced hand hygiene practices, leading to a reduction in postoperative infections (6). In recent times, hand hygiene has evolvedthroughtwo main approaches:chemistry-basedmethods, like disinfectants, and thosethat use water or detergents. The discovery of chlorine in the 18th century iscredited to Carl Wilhelm Scheel (7). Hand hygienetheoreticalframeworks must be concise, active, and clear(8). The history of healthcare-associated infections (HAIs) in Rwanda is not welldocumented, but recent efforts by public healthofficials have recognizedHAIs as a significantconcern. To

Comment [ZA4]: You can benefit from the World Health Organization's hand hygiene web page.

Comment [ZA3]: The article is very old, there are existing studies on this subject

strengthenitshealthcare system, the Rwandangovernment has partneredwith the global Human Resources for Health Program and otherorganizations. A key goal of this initiative is to establish an infection prevention and control (IPC) system, whichemphasizes hand washing as a crucial method for preventingdisease spread in healthcare settings (5).

A 2017 study carried out in the ICUs of two referral hospitals in Kigali, Rwanda, found that 39.22% of the participants exhibited insufficient practices for preventing healthcare-associated infections (HAIs), and 74.5% failed to wash their hands before entering the ICU (9). Despite promising advancements, critical care nursing is still a growing specialty in Rwanda. However, issues like the scarcity of critical care nurses and the poor training provided to nurses working in ICUs still exist. In Rwanda, an ICU is present in four referral hospitals, which restricts the opportunity for enough nurses to practice (10).

There is a shortage of specialized nurses in clinical settings who possess the necessary training and experience for critical care environments like intensive care units. Most of these nurses have trained abroad, while only a few local cohorts of critical care and trauma nurses have received training domestically. Additionally, many of these locally trained nurses are often assigned to academic or other non-clinical roles rather than working directly in clinical settings (10). A significant challenge in critical care nursing is the lack of adequate training for staff in this specialized field (10). Consequently, it was essential to gather updated and generalizable data through scientific research to identify gaps in various nursing areas, particularly for nurses working in ICUs in Rwanda, in order to improve evidence-based practices.

In a study at CHUK, 48 bedside nurses from surgical departments and 58 from intensive care participated. The findings revealed that 100% of the surgical nurses and 79.8% of the ICU nurses held negative perceptions regarding barriers to hand hygiene practices, indicating an overall negative outlook (11). The author noted that these results specifically pertain to nurses in CHUK's surgical and ICU units, and the impact of socio-demographic factors on ICU nurses' views of hand hygiene was not assessed(11). My study aimed to shed light on the conditions in other referral hospitals' ICUs across Rwanda, focusing on nurses' perceptions and the barriers they face, as well as how socio-demographic factors related to their views on hand hygiene.

Comment [ZA5]: More recent studies on hand hygiene may be used

1.1. Rational of the Study

The study's recommendations can be implemented by IPC committees and management teams to improve hand hygiene protocols in ICUs. It will also provide baseline data for Rwanda's human resources for health and nursing education, identifying gaps in prevention of HAIs among nurses. The study will alert academics to infection control and nursing research needs. It will also inform the quality of care, enabling hospitals to improve and intervene accordingly.

2. METHODS

2.1 Study Setting and Data Collection

A quantitative study approach was used, as it involves the quantification and analysis of numerical data by using the specific statistical techniques. The study was conducted in the ICUs of KFH; RMH and CHUB, and 65 nurses who worked in the ICUs of the aforementioned referral hospitals were the study's subjects. A self-administered perception questionnaire designed with two main sections and based on the concepts of the Health Belief Model was used. The first session is made of socio-demographic characteristics of the respondents which are made of 6 questions, whereas the second one consists of 43 perception-related questions that have been divided into four categories using a five-point Likert scale ranging between 4 to 1 : (strongly disagree =1), (disagree = 2), (agree =3) ; and (strongly agree= 4). A total population sampling technique was used. The pilot study was conducted to assess the reliability and validity of the tool.

2.2. Study Objectives

1. To assess the perception about hand hygiene among nurses working in the ICU of three referral hospitals in Rwanda
2. To assess the impacts of socio-demographic factors on perception of hand hygiene among nurses working

in the ICU of three referral hospitals in Rwanda.

3. To assess the nurse's perceived barriers to hand hygiene in the prevention of HAIs.

2.3 Inclusion and Exclusion Criteria

All consented nurses working in the intensive care unit in the three selected referral hospitals above mentioned was enrolled, however, Nurses who was not working in ICU, those who did not give consent and those who was in their leaves, was not enrolled in the study.

3. RESULTS

Data were analyzed through the Statistical Package for Social Sciences (SPSS software version 21). Descriptive statistics was used to describe the nurses' perceptions of hand hygiene in the prevention of HAIs, whereas inferential statistics with a chi-square test were used to measure the association between socio-demographic characteristics with nurses' perceptions of hand hygiene.

3.1. Socio-demographic characteristics of the respondents

35.4% of the participants were from the University Teaching Hospital of Butare (CHUB), 33.8% were from Rwanda Military Hospital, and 30.8% were from King Faisal Hospital. 63.1% were female, while 36.9% were male. 49.2%, 40%, and 9.2% had advanced diplomas, bachelor's degrees, and master's degrees, respectively. 63.1% of the participants had received hand hygiene training within the last three years, whereas 36.9% had never received such training. 38.5% ranged in the age of 31 to 37 years old, while 7.70% ranged between 45 and 51 years old. 38.5% ranged between 6 and 11 years of working experience, versus 3.10%, whose years of experience ranged between 21 years and above.

Comment [ZA6]: The Hand Hygiene Belief Scale and Practice Inventory, which have proven validity and reliability, can be used. Has the validity and reliability of the scale used been proven?

Table1: Socio-demographic characteristics of the respondents (n=65)

Variables		Frequency	Percentages
Institution	CHUB	23	35.40%
	KFH	20	30.80%
	RMH	22	33.80%
Gender of the respondents	Male	24	36.90%
	Female	41	63.10%
Qualification of the respondents	Master's degree	6	9.20%
	Bachelor's degree (A0)	26	40.00%
	Advanced diploma (A1)	32	49.20%
	Secondary school diploma (A2)	1	1.50%
	Others specify	0	0.00%
In service training in hand hygiene in the last three years	Yes	41	63.10%
	No	24	36.90%
	In service training by institutions		
	KFH	16	80%
	CHUB	16	69.5%
	RMH	9	40.9%
Age of participants	24-30	18	27.70%
	31-37	25	38.50%
	38-44	17	26.20%
	45-51	5	7.70%
Working experience	1-5	24	36.90%
	6-10	25	38.50%
	11-15	12	18.50%
	16-20	2	3.10%
	21 and above	2	3.10%

Table 2: Association between socio-demographic characteristics and perception of hand hygiene among nurses working in ICU (n=65).

Sociodemographic characteristics		Agree n(%)	Disagree n(%)	Chi- test/Fischer square	P-value
Institution				5.971	0.044
	CHUB	18(78.3)	5(21.7)		
	KFH	20(100	0(0)		
	RMH	17(77.3)	5(22.7)		
Gender of the respondents				1.572	0.201
	Male	22(91.7)	2(8.3)		
	Female	33(80.5)	8(19.5)		
Qualification of the respondents				1.469	0.665
	Master's degree	6(100)	0(0)		
	Bachelor's degree (A0)	21(80.8)	5(19.2)		
	Advanced diploma (A1)	27(84.4)	5(15.6)		
	Secondary school diploma A2)	1(100)	0(0)		
Any service training in hand hygiene in the last three years				5.552	0.031
	Yes	38(92.7)	3(7.3)		
	No	17(70.8)	7(29.2)		
Age of participants				0.703	1.000
	24-30	15(83.3)	3(16.7)		
	31-37	21(84)	4(16)		
	38-44	14(82.4)	3(17.7)		
	45-51	5(100)	0(0)		
Working experience				2.167	0.739
	1-5	21(87.5)	3(12.5)		
	6-10	19(76)	6(24)		
	11-15	11(91.7)	1(8.3)		
	16-20	2(100)	0(0)		
	21 and above	2(100)	0(0)		

The association between socio-demographic characteristics and perception of hand hygiene among nurses working in ICU was carried out, and the results showed that institution and training in hand hygiene were statistically associated with the perception of hand hygiene (P-value <0.05). Whereas among other socio-demographic characteristics such

as age, gender, qualification, and working experience, statistically were not associated with nurses' perception of hand hygiene in the prevention of HAIs with P values of 1.00, 0.2, 0.665, and 0.739, respectively.

Table 3: Regression analysis of socio-demographic characteristics and perception of hand hygiene among nurses working in ICU (n=65).

Sociodemographic characteristics		OR	95%CI	P-value
Institution	CHUB	2.452	1.233-6.543	0.023
	KFH	4.321	2.433-9.876	0.043
	RMH	**Ref**		
Any service training in hand hygiene in the last three years	Yes	3.544	1.344-10.333	0.038
	No	**Ref**		

Variables that showed significant association in crosstabulation analysis were recruited into multiple logistic regression analyses to study their effect on hand hygiene perception, and the results showed that the participants from CHUB were more than two times more likely to have positive perception compared to those from RMH (OR = 2.452, 95% CI = 1.233-6.543, P-value = 0.023). Participants from KFH were more than four times more likely to have positive perceptions compared to those from RMH (OR=4.321, 95%CI=2.433-9.876, P-value=0.043). Those who were trained in hand hygiene were more than three times more likely to have positive perception compared to those who were not trained (OR = 3.544, 95% CI = 1.344-10.333, P-value = 0.038).

Comment [ZA7]: When comparing, were the hand hygiene policies the same across the three institutions?

Table 4: Perceptions about susceptibility and severity of healthcare-associated infections (n=65).

Statements		Disagree	Agree
Healthcare workers, patients and patient relatives are at risk of acquiring healthcare associated.	N	2	63
	%	3	97
Nurses are more vulnerable than other healthcare workers to contamination with health care associated infections since they are in contact with patients.	N	5	60
	%	7.7	92.3
Contaminated health care worker's hands impose the greatest risk of transmitting healthcare associated infections to patientspatient relatives and to oneself.	N	3	62
	%	4.6	95.4
Health care associated infection is globally a major problem in Hospitals.	N	8	56
	%	13.8	86.2
Health care-associated infection is a major cause of preventable deaths and disability worldwide.	N	34	45
	%	30.8	69.2
Health care associated infection is associated with prolonged patient hospital stay.	N	5	60
	%	7.7	92.3
Health care associated infection causes high costs for the health systems	N	9	56
	%	13.9	86.1
Health care associated infection causes emotional stress for patients and their families.	N	11	54
	%	16.9	83.1
In general, the impact of health care-associated infection on a patient's clinical outcome is high.	N	9	56
	%	13.9	86.1

AGGREE: Positive perception

Participants were questioned about their perceptions about healthcare-associated infections and hand hygiene. 97% agreed that healthcare workers, patients, and patient relatives are at risk of acquiring healthcare-associated infections. 92.3% agreed that nurses are more vulnerable than other healthcare workers to be contaminated with healthcare-associated infections since they are in contact with patients.

95.4% agreed that contaminated healthcare workers' hands impose the greatest risk of transmitting healthcare-associated infections to patients, patient relatives, and oneself. 86.2% agreed that healthcare-associated infection is globally a major problem in hospitals. 69.2% agreed that healthcare-associated infection is a major cause of preventable deaths and disability worldwide. 92.3% agreed that healthcare-associated infection is associated with prolonged patient hospital stay. 86.1% agreed that health care-associated infections cause high costs for the health systems. 83.1% agreed that health care-associated infection causes emotional stress for patients and their families, and 86.1% agreed that the impact of health care-

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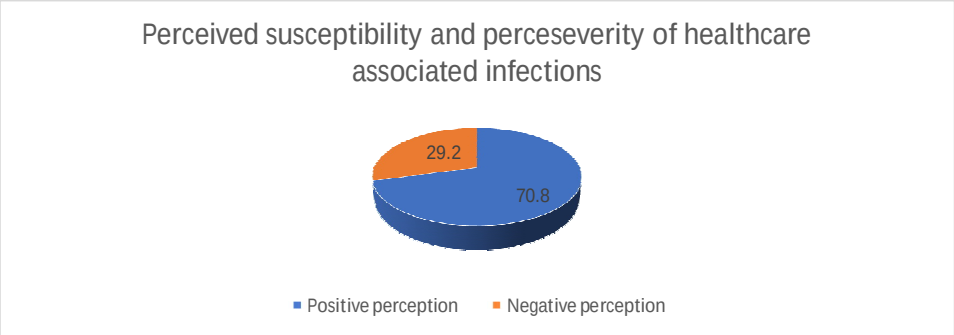
DISAGGREE: Negative perception

associated infection on a patient's clinical outcome is high.

However, 3% disagreed that healthcare workers, patients, and patient relatives are at risk of acquiring healthcare associated. 5.5% disagree that nurses are more vulnerable than other healthcare workers to contamination with health care-associated infections since they are in contact with patients. 4.6% disagree that contaminated health care workers's hands impose the greatest risk of transmitting healthcare-associated infections to patients's relatives and to themselves. 13.8% disagree that healthcare-associated infection is globally a major problem in hospitals. 30.8% disagreed that healthcare-associated infection is a major cause of preventable deaths and disability worldwide. 7.7% disagreed that healthcare-associated infection is associated with prolonged patient hospital stay. 13.9% disagreed that health care-associated infection causes high costs for the health systems. 16.9% disagreed that health care-associated infections cause emotional stress for the patients and their families. 13.9% disagreed that, in general, the impact of healthcare-associated infection on a patient's clinical outcome is high

Figure 1: Perceptions about susceptibility and severity of healthcare-associated infections (n=65).



3.2. Perceived benefits of hand hygiene.

Table 5: Perceived benefits of hand hygiene (n=65).

Statements		Disagree	Agree
Hand hygiene is the primary measure for preventing and reducing health care-associated infections.	N	4	61
	%	6.1	93.8
Hand hygiene is an economical method for reducing healthcare associated infections.	N	0	65
	%	0	100
Hand hygiene practices help control epidemics in health-care Facilities.	N	5	60
	%	7.7	92.3
Hand hygiene is cost- saving.	N	7	58
	%	10.7	89.3
Hand hygiene practice before touching a patient interrupts microbial transmission to the patient.	N	6	59
	%	9.2	90.8
Hand hygiene practice before a clean/aseptic procedure interrupts microbial transmission to the patient.	N	3	62
	%	4.6	95.4
Hand hygiene practice after touching a patient interrupts microbial transmission to the health care- worker.	N	2	63
	%	3	97
Hand hygiene practice after body fluid exposure risk interrupts microbial transmission to the health care- worker.	N	5	60
	%	7.7	92.3
Hand hygiene practice after touching patient surroundings interrupts microbial transmission to the health care- worker.	N	1	64
	%	1.5	99
In general, the effectiveness of hand hygiene in preventing health care-associated infectionis high.	N	6	59
	%	9.2	90.8

AGREE: Positive perception. **DISAGREE**: Negative perception.

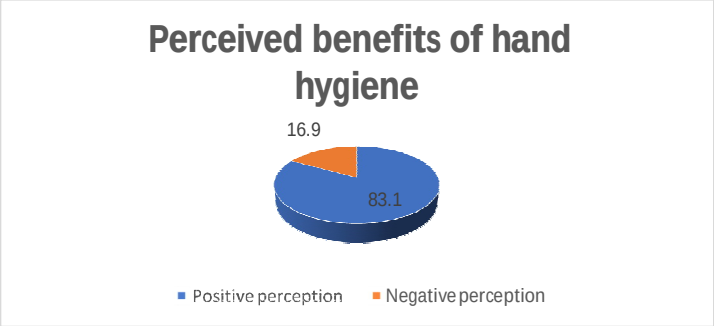
Perceived benefits were assessed, and the results showed that the majority 61(93.8%) agreed that hand hygiene is the primary measure for preventing and reducing health care-associated infections, versus four (6.1%) who disagreed. The totality 65(100%) agreed

that hand hygiene is an economical method for reducing healthcare associated infections. Sixty (92.3%) agreed that hand hygiene practices help control epidemics in health-care facilities, versus five (7.7%) who disagreed. Fifty-eight (89.3%) agreed that hand hygiene is cost-saving, versus seven (10.7%) who disagreed. Fifty-nine (90.8%) agreed that hand hygiene practice before touching a patient interrupts microbial transmission to the patient, versus six (9.2%) who disagreed. Sixty-two (95.4%) agreed that hand hygiene practice before a clean/aseptic procedure interrupts microbial transmission to the patient, versus three (4.6%) who disagree. Sixty-three (97%) agreed that hand hygiene practice after touching a patient interrupts microbial transmission to the health care-worker, versus two (3%) who disagreed. Sixty (92.3%) agreed that hand hygiene practice after body fluid exposure risk interrupts microbial transmission to the health care-worker, versus five (7.7%) who disagreed. Sixty-four (99%) agreed that hand hygiene practice after touching patient surroundings interrupts microbial transmission to the health care- worker and of them versus one (1.5%) who disagreed, and fifty-nine (90.8%) agreed that in general, the effectiveness of hand hygiene in preventing health care-associated infection is high, versus six (9.2%) who disagreed.

93.8% agreed that hand hygiene is the primary measure for preventing and reducing healthcare-associated infections, versus 6.1% who disagreed. 100% agreed that hand hygiene is an economical method for reducing healthcare-associated infections. 92.3% agreed that hand hygiene practices help control epidemics in healthcare facilities, versus 7.7% who disagreed that. 89.3% agreed that hand hygiene is cost-saving, versus 10.7% who disagreed. 90.8% agreed that hand hygiene practice before touching a patient interrupts microbial transmission to the patient, versus 9.2% who disagreed. 95.4% agreed that hand hygiene practice before a clean/aseptic procedure interrupts microbial transmission to the patient, versus 4.6% who disagreed. 97% agreed that hand hygiene practice after touching a patient interrupts microbial transmission to the healthcare worker, versus 3% who disagreed. 92.3% agreed that hand hygiene practice after body fluid exposure risk interrupts microbial transmission to the healthcare worker, versus 7.7% who disagreed. 99% agreed that hand hygiene practice after touching patient surroundings interrupts microbial transmission to the health care worker and of them versus 1.5% who disagreed, and 90.8% agreed that in general, the effectiveness of

hand hygiene in preventing health care-associated infection was high, versus 9.2% who disagreed.

Figure 2: Perceived benefits of hand hygiene (n=65).



3.3. Cues to action (hand hygiene action)

Table 6: Cues to action (hand hygiene action) (n=65)

Statements		Disagree	Undecided	Agree
Leaders and senior managers at your institution support and openly promote hand hygiene	N	4	7	54
	%	6.1	10.8	83.1
The health care facility makes alcohol-based hand rub always available at each point of care.	N	4	6	55
	%	6.2	9.2	84.6
Hand hygiene posters are displayed at point of care as reminders	N	11	1	53
	%	16.9	1.5	81.6
Each health care worker receives in service education on hand Hygiene.	N	8	5	52
	%	12.3	7.7	80
Clear and simple instructions for hand hygiene are made visible for every health care worker.	N	8	2	55
	%	12.3	3.1	84.6
Health care workers regularly receive feedback on their hand hygiene performance.	N	18	7	40
	%	27.7	10.8	61.5
You always serve as a role model for your colleagues by performing hand hygiene as recommended by WHO.	N	18	10	37
	%	27.7	15.4	56.9
Patients are invited to remind health care workers to perform hand hygiene.	N	26	4	35
	%	40	6.2	53.8
Hand hygiene campaigns are conducted at your institution.	N	22	4	39
	%	33.8	6.2	60
Safe continuous water supply, soap and towels are always available at your institution Peers always advise hand hygiene	N	10	5	50
	%	15.3	7.7	77
The organization conducts mass media advertisement of hand Hygiene.	N	16	6	43
	%	24.6	9.2	66.2

AGREE: Positive perception. **DISAGREE**: Negative perception.

52.3% agreed and 30.8% strongly agreed that their leaders and seniors at the institution support and promote openly hand hygiene. 44.6% agreed and 40% strongly agreed that the health care facility always avails of an alcohol-based hand rub at each point of the care. 43.1% agreed and 38.5% strongly agreed that posters are displayed at the point of care to remind hand hygiene practices in ICU. 44.6% agreed and 35.4% strongly agreed that they had in-service training about hand hygiene in the last three years. 55.4% agreed and 29.2% strongly agreed that clear and simple instructions for hand hygiene are available for every health care worker. 44.6% agreed and 16.9% strongly agreed that health care workers regularly get feedback on their hand hygiene performance. 33.8% agreed and 23.1% strongly agreed that they always serve as a role model for their colleagues by performing hand hygiene as recommended by WHO.

33.8% agreed and 23.1% strongly agreed that patients could remind health care workers to perform hand hygiene. 36.9% agreed and 23.1% strongly agreed that campaigns about hand hygiene are done in their institutions. 46.2% agreed and 30.8% strongly agreed that their institutions avail continuous water supply, soap, and towels at the care point. 43.1% agreed and 23.1% strongly agreed that peers always advise the enhancement of hand hygiene practices. 29.2% agreed and 15.4% strongly agreed that the organization conducts mass media hand hygiene advertisements.

Table 7: Perceived barriers to hand hygiene (n=65).

Statements		Disagree	Agree
Perceiving hand hygiene as not convenient	N	40	19
	%	61.5	29.3
Lack of material (soap, paper towel).	N	38	19
	%	58.4	29.3
Allergic reactions with hand hygiene product	N	39	21
	%	60	32.3
Being too busy	N	49	12
	%	75.4	18.4
Forgetfulness.	N	45	14
	%	69.3	21.6
Unsure of need	N	42	18
	%	64.6	27.7
Inadequate hand washing facilities	N	43	19
	%	66.1	29.3
Belief that when using gloves, no need for hand hygiene	N	49	13
	%	75.4	20
	N	51	11
Hand hygiene interferes with Health care worker-patient Relationship.	%	78.5	16.9
Lack of institutional priority for hand hygiene	N	47	14
	%	72.3	21.5
Lack of rewards/encouragement hygiene	N	46	14
	%	70.8	21.5

The most perceived barriers for hand hygiene were that 26.2% of participants perceived hand hygiene as not convenient, 26.2% perceived allergic reactions with hand hygiene products as a barrier, 26.2%. were unsure of the need for hand hygiene. The majority of participants were in disagreement concerning numerous barriers for hand hygiene, such as hand hygiene interfering with health care worker-patient relationship 50.8%, being too busy 49.2%, lack of institutional priority for hand hygiene 47.7%, and lack of rewards/encouragement hygiene 46.2%.

4. Discussion

4.1. SOCIO-DEMOGRAPHIC CHARACTERISTICS OF THE RESPONDENTS

Large percentage of respondents was females forty one (63.1%). This is linked to the fact that females are still in good number in the nursing profession than males as 65% of nurses were female in African regions as reported by WHO in 2019 (12). Thirty-two (49.2%) had an advanced diploma (AI) and it was reported that 80% of ICU nurses in Rwanda, had an advanced diploma(A1) (10).

The range of age from thirty one to thirty seven was predominant with a greater proportion of twenty five (38.5%), and those with years of experience ranging between six to eleven years outnumbered others with 38.5%. This predominance of age range is linked to other study conducted at CHUK about Workplace Stressors and Coping Strategies of ICU nurses, where about 50% of participants had ages below 35 years (13), seemingly to the clinical experience in the same study, where 46.7% of participants ranged between 1 to 5 years of experience (13), which is not quite different from what was obtained in the current study where the percentage is 36.1 %.

Working institution and in-service hand hygiene training proved to be associated with the positive perception of hand hygiene in the current study, as the P value was statistically significant (P-value <0.05). However, age, gender, qualification and working experience did not correlate with nurses' perception of hand hygiene in the prevention of HAIs as P values were (P>0.05) respectively.

100 % of ICU nurses from KFH, had positive perception of hand hygiene than those from CHUB and RMH who rated 78.3% and 77.3

Comment [ZA8]: Percentage is given in the discussion

% respectively. This can be linked to the fact that 80% of ICU nurses at KFH had had in-service training, whereas ICU nurses trained at CHUB and RMH were 69.5% and 40.9% respectively, which is quite similar to the study conducted in Zambia among nursing students, whereby positive perception to hand hygiene was statistically proved to be associated with hand hygiene trainings with (p=0.018) (14).

Positive perception among ICU nurses in Iraq was linked to level of education and in service training for ICU nurses while administrative support and their encouragement was the factors which influenced their perception to hand hygiene practice in the prevention of HAIs (15).

Socio-demographic variables are modifying factors, which impact the perception of a health behaviors change as stated in the health belief model(16). In the current study, hand hygiene was a health behavior and, it revealed how much the study results, have been consistent with the conceptual framework.

4.2. Perceptions about susceptibility and severity of healthcare associated infections.

Sixty-three (97%) had positive perception about that the healthcare workers, patients and patient relatives are at risk of acquiring healthcare associated infections, versus two (3%) of the participants who had negative perception. Sixty (92.3%) had positive perception about that the nurses are more vulnerable than other healthcare workers to contamination with health care associated infections since they are in contact with patients, whereas five (5.5%) had negative perception. Sixty-two (95.4%) had positive perception about that the contaminated health care worker's hands, impose the greatest risk of transmitting healthcare associated infections to patient, patient relatives and to oneself, versus three (4.6%) who had negative perception. Fifty-six (86.2%) who had positive perception about that the health care associated infection is globally a major problem in hospitals, versus eight (13.8%) who had negative perception. Fourth five (69.2%) had positive perception about that the health care-associated infection is a major cause of preventable deaths and disability worldwide, whereas thirty-four (30.8%) who had negative perception. Sixty (92.3%) agreed that health care associated infection is associated with prolonged patient hospital stay, versus five (7.7%) who had negative perception. Fifty-six (86.1%) agreed that health care associated infection causes high costs for the health systems, versus nine (13.9%) who had negative perception. Fifty-four (83.1%)

Comment [ZA10]: The findings were replicated

Comment [ZA9]:

agreed that health care associated infection causes emotional stress for patients and their families, versus eleven (16.9%) who had negative perception and fifty-six (86.1%) agreed that the impact of health care-associated infection on a patient's clinical outcome is high, versus nine (13.9%) who had negative perception.

The results of the current study revealed that 70.8% had positive perceptions about perceptions of susceptibility and perceived severity of HAIs. These results are not far from what was obtained in the similar study at CHUK among nurses working in the different departments including ICU, where (65.5%) agreed and (21.4%) strongly agreed that HAIs impact prominently patient clinical outcomes (11). This shows how much ICU nurses in RWANDA perceive the susceptibility of health acquired infections and how burden it is to modern medicine.

Intensive care units treat critically ill and immunocompromised patients which increases their susceptibility to HAIs (17). This, is associated with increased morbidity and mortality among ICUs patients(17). Nurses are the only ones who spend much more time with the patients in ICU than any other health worker, hence the positive perception to hand hygiene would be crucial in mitigating HAIs in ICUs (17). However, 29.2% of participants had negative perception about this statement. This is an alarm number among ICU nurses who take care of the immunocompromised patients, thus, susceptible to HAIs. The poor awareness about the susceptibility and severity of HAIs, have been linked to the increase of HAIs incidence rate in the clinical settings especially in ICUs (18).

This may be mitigated by creating awareness by providing proper hand hygiene education, and in service training in the prevention of health acquired infections (19). Furthermore, the positive perception found in the majority of ICU nurses about hand hygiene perception in preventing HAIs, could be taken as a path to enhance hand hygiene compliance among health care workers, especially ICU nurses.

4.3. Perceived benefits of hand hygiene

Sixty one (93.8%) had positive perception about that hand hygiene is the primary measure for preventing and reducing health care-associated infections, versus four (6.1%) who had negative perception. The totality sixty five (100%) had positive perception about that hand hygiene is an economical method for reducing healthcare associated infections. Sixty (92.3%) had positive perception about that hand hygiene practices

help control epidemics in health-care facilities, versus five (7.7%) who had negative perception. Fifty-eight (89.3%) had positive perception about that hand hygiene is cost-saving, versus seven (10.7%) who had negative perception. Fifty-nine (90.8%) who had positive perception about that hand hygiene practice before touching a patient interrupts microbial transmission to the patient, versus six (9.2%) who had negative perception. Sixty-two (95.4%) who had positive perception about that hand hygiene practice before a clean/aseptic procedure interrupts microbial transmission to the patient, versus three (4.6%) who had negative perception. Sixty-three (97%) had positive perception about that hand hygiene practice after touching a patient interrupts microbial transmission to the health care- worker, versus 2 (3%) who had negative perception. Sixty (92.3%) had perception about that hand hygiene practice after body fluid exposure risk interrupts microbial transmission to the health care- worker, versus 5(7.7%) who had negative perception. Sixty-four (99%) had positive perception about that hand hygiene practice after touching patient surroundings interrupts microbial transmission to the health care- worker and of them versus one (1.5%) who had negative perception, and fifty-nine (90.8) who had positive perception that in general, the effectiveness of hand hygiene in preventing health care-associated infection is high, versus 6 (9.2%) who had negative perception.

The current study results revealed that the overall percentage rated 83.1% who had positive perceptions about the benefits of hand hygiene in the prevention of HAIs. These results are quite similar to what obtained in the similar study at CHUK among nurses working in different departments, including ICU nurses, whereby 96.4% had a positive perception of the importance of hand hygiene at the WHO five moments of hand hygiene while 100 % perceive hand hygiene as the primary mean for mitigating HAIs (11).

Based on the current study results, Rwanda ICU nurses have shown a positive perception about hand hygiene benefits, in mitigating HAIs. HAIs in ICU affect both patients and health care providers, especially ICU nurses (11). Positive perception of the benefits of hand hygiene in the prevention of HAIs was linked with improved compliance to hand hygiene (20). However, the results of the current study revealed that 16.9% of the participants, had negative perception about the benefits of hand hygiene in the prevention of HAIs in ICU (21). This is an alarming number, and could augment the HAIs

incidence rate in ICUs, as WHO mentions hand hygiene as a simple means to reduce HAIs (20).

Perceiving hand hygiene benefits encompasses both medical and psychosocial benefits of engaging in hand hygiene as health-promoting behaviour (21). Besides, Hand Hygiene trainings as part of a multimodal intervention, was linked with the positive perception of hand hygiene benefits, in the prevention of HAIs (21). Furthermore, the positive perception about the benefits of hand hygiene among other ICU nurses in Rwanda, could be based on, in figuring out the poor hand hygiene perception and noncompliance practices among healthcare providers, especially nurses in the prevention of HAIs in ICU.

5. CONCLUSION.

The results of current study revealed that majority of participants showed positive perceptions about hand hygiene in prevention of HAIs. In service trainings were highly correlated with high perception of nurses towards hands hygiene and was statistically significant (P <0.005). Being allergic to hand hygiene products; lack of materials (soap, towel, paper); inadequate hand hygiene facilities and unsure of need were the most perceived barriers to hand hygiene compliance. The current findings might give a hand while enhancing hand hygiene perception in the enforcement of hand hygiene compliance in ICUs' nurses to mitigate health acquired infections.

6. RECOMMENDATIONS

Different recommendations are addressed via different levels of nursing, such as nursing education; nursing research and nursing management.

Nursing education

The study results reveal that most of participants had positive perception toward hand hygiene in the prevention of HAIs. But there are still some who still have negative perception. I recommend Rwanda human resources for health and nursing education, to enhance hand hygiene in nursing education, be it in general nursing or nursing specialties especially in critical care and trauma nursing.

Nursing research

The current study was about assessing perception of hand hygiene and barriers only. I wish to recommend the next researchers to use observational checklist to assess the adherence to hand hygiene among ICU nurses in these study settings.

Nursing management

Comment [ZA11]: The p-value can only be included in the findings section.

1. HAIs as a limitation to patient safety. Effective hand hygiene is an efficient mean to mitigate HAIs. I recommend the hospitals administration and managerial team, to minimize the barriers revealed by the current study results, for the enhancement of hand hygiene perception and practices in ICU.
2. I recommend managerial team to always emphasis on in service trainings about hand hygiene, while making policies and enhancing the mentality of ICU nurses, to let be reminded by the patients or their relatives to practice whenever forgotten, to improve hand hygiene perception and practice.

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