

Levels of Hospital Hand Washing Compliances in Rwanda for Selected Healthcare Practitioners in Nursing and Midwifery Professions

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Abstract:

➤ *Background:*

Healthcare-associated infections (HCAs) significantly contribute to neonatal morbidity and mortality, particularly in developing countries. Proper hand hygiene is the most effective, simple, and cost-efficient measure for preventing HCAs, yet compliance among healthcare workers remains suboptimal.

➤ *Objective:*

To assess handwashing knowledge, practices, and barriers among nurses and midwives for infection prevention in neonatology and maternity departments at Ruhengeri District Hospital, Rwanda.

➤ *Methods:*

A quantitative, descriptive cross-sectional study was conducted. The study population included 56 nurses and midwives, with a convenience sample of 50 participants. Data were collected using a structured questionnaire divided into four sections: socio-demographics, knowledge, practices, and barriers. Knowledge items were adapted from WHO Hand Hygiene Guidelines, while practices and barriers were based on CDC and WHO recommendations. Validity was confirmed through expert review, and reliability via a pilot study (Cronbach's alpha = 0.86). Data were analyzed using descriptive statistics and Chi-square tests to assess associations.

➤ *Results:*

The majority of participants (72%) demonstrated good knowledge of hand hygiene, while 28% had moderate knowledge. Regarding practices, 46% had good practice, 36% moderate, and 18% poor practice, with a mean practice score

of 71.27%. Alcohol-based hand rub was routinely used by 62%, and only 28% had received formal hand hygiene training in the last three years. A significant association was found between department of work and handwashing practice ($p = 0.012$).

➤ Conclusion:

Nurses and midwives exhibit good knowledge but variable hand hygiene practices. Continuous training, policy reinforcement, and monitoring are essential to improve compliance and reduce HCAs in neonatal care settings in Rwanda.

Keywords: Hand Hygiene, Infection Prevention, Nurses, Midwives, Neonatology, Rwanda, Healthcare-Associated Infections.

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I. INTRODUCTION

Health care-associated infections (HAIs) are one of the most common adverse events in care delivery and a major public health problem with an impact on morbidity, mortality and quality of life (WHO, 2016, p. 9). At any given time, up to 7% of patients in developed and 10% in developing countries will acquire at least one HAI (WHO, 2016, p. 9).

In sub-Saharan Africa, the data available show that the incidence of nosocomial infections ranges from 2-49% with patients in intensive care units having the highest rate ranging from 21.2 to 35.6% (Elizabeth, 2016, p. 1).

Globally, serious neonatal infections cause an estimated 36% of neonatal deaths. In some settings where mortality rates >45% per 1000 live births, neonatal infections are estimated to cause 40% to 50% of all neonatal deaths (Darmstadt, Zaidi and Stoll, 2011, p. 1). About 30-40% of infections resulting in neonatal sepsis deaths are transmitted at the time of childbirth (Blencowe et al., 2011, p. 2). In developed countries incidence of neonatal infections in NICUs range from 6% to 25% (Uwaezuoke and Obu, 2013, p. 1).

According to the Report on the Burden of Endemic Health Care-Associated Infection Worldwide Clean Care is Safer Care (2011, p. 18), neonatal infection rates in developing countries are 3 to 20 times higher than in industrialized countries and among hospital-born babies these infections are responsible for 4% to 56% of all causes of death in the neonatal period, with the ¾ occurring in the South-East Asia Region and Sub-Sahara Africa.

In Rwanda among the causes of neonatal mortality in 2010 sepsis was 29% (Surveys, 2010, p. 3). In 2012 neonatal mortality due to infection was 16% (MOH, 2012, p. 41), in 2013 neonatal mortality due to neonatal infection was 11% (Statistics booklet, 2013, p. 43) and in 2014 neonatal mortality was 9%, due to infections among others causes. (Statistics, 2014, p. 39).

Hand hygiene is the primary measure proven to be effective in preventing HCAI and the spread of antimicrobial

resistance (WHO, 2009b, p. 5). In addition, proper hand hygiene is the single most important, simplest, and least expensive means of reducing the prevalence of HAIs and the spread of antimicrobial resistance in health care setting (Mathur, 2011, p. 3). A study done by, (Lam et al., 2004, p. 1) show an increase in hand hygiene compliance from 40% to 53% before patient contact and 39% to 59% after patient contact. More marked improvement was observed for high-risk procedures 35%–60%, that compliance with hand hygiene reduces the health care– associated infection rate from 11.3 to 6.2 per 1000 patient-days.

However, Lack of knowledge on infection prevention among nurses and midwives can increase the rate of HCAs. This is supported by a study done by, Mohesh (2014), showed different level of knowledge on some elements where hand hygiene can prevent infection, 50% of them accepted that, hand hygiene practices before and after handling a patient will prevent health care associated infections. Although 94% agreed, 6% refused that hand hygiene as an important preventive measure for cross infections. 95% of them washed their hands before and after their food intake. 70% of them used soap and water whereas only 6.36% used alcohol based agents (Mohesh, 2014, p. 2).

In addition, nurses and midwives are engaged in direct contact with the newborn while delivering care, so they have an important role in infection control. Ensuring that nurses and midwives recognize the importance of handwashing in prevention of HCAs, know when and how handwashing should be performed, and follow recommended practice is important. In this context, the present research aimed to evaluate handwashing knowledge and practice of nurses and midwives for infection prevention in neonatology at selected district hospital. The findings from this study should be added to the existing literature and may be used to develop interventions to reduce the spread of infection in neonatology.

II. LITERATURE REVIEW

➤ Introduction

Healthcare-associated infections (HAIs), also known as nosocomial infections, are a global concern affecting both developed and developing countries. According to WHO

(2009), up to 7% of patients in developed countries and 10% in developing countries acquire at least one HAI during hospitalization. HCAs arise across diverse clinical conditions, affecting patients of all ages, and can result from invasive procedures, delayed recovery, or exacerbation of underlying conditions (Nejad et al., 2011; NICE, 2012). The main vectors of transmission are contaminated healthcare workers' (HCWs) hands, patient skin, inanimate objects, medical equipment, and the hospital environment (Khan, Ahmad, & Mehboob, 2015).

In neonatology, effective infection prevention relies heavily on nurses and midwives' knowledge and adherence to hand hygiene protocols. Key measures include proper hand hygiene, environmental cleanliness, correct use of personal protective equipment (PPE), safe sharps disposal, and adherence to aseptic techniques (Loveday et al., 2014). Hand hygiene can be performed through handwashing with soap and water or alcohol-based hand rubbing. Handwashing is essential when hands are visibly soiled, contaminated with blood or body fluids, whereas alcohol-based hand rub is effective in all other clinical situations (Mathur, 2011; Shinde & Mohite, 2014). The CDC also highlights factors that increase microbial colonization, such as artificial nails and jewelry (CDC, 2002). WHO emphasizes the "Five Moments for Hand Hygiene," which include before patient contact, before aseptic procedures, after exposure to body fluids, after patient contact, and after contact with the patient environment (WHO, 2009c).

➤ Knowledge, Practice, and Barriers of Hand Hygiene

• Knowledge of Hand Hygiene

Multiple studies have evaluated nurses' and midwives' knowledge of hand hygiene. Shinde and Mohite (2014) found that among nursing staff and students at a tertiary care hospital in India, only 9% demonstrated good knowledge, while 74% had moderate knowledge. Similarly, in Asir governmental hospitals, graduate medical students showed moderate knowledge on germ transmission, with 96% and 90% demonstrating high awareness of critical hand hygiene moments before patient contact and aseptic procedures, respectively (Res et al., 2017). In contrast, a study at Armed Forces Military Hospitals in Taif revealed that only 28% correctly identified that germs already present on or within the patient are the main source of HCAs (Alsofiani, Alomari & Alqarny, 2016). Knowledge gaps were also observed among primary healthcare personnel in Lucknow, India, particularly regarding hand hygiene after exposure to body fluids or patient surroundings (Shukla, Tyagi & Gupta, 2016). Hand Hygiene Practices

Evidence suggests that improved hand hygiene significantly reduces HCAs; however, compliance remains suboptimal. In Palestine, 91% of healthcare personnel demonstrated good infection prevention practices despite intermediate knowledge levels (Fashafsheh, 2015). In Italy, nurses exhibited good knowledge and positive attitudes toward hand hygiene, yet compliance with standard precautions was low (Parmeggiani et al., 2010). Studies also

show that education programs can reduce infection rates; for example, a neonatal care intervention decreased nosocomial bloodstream infections from 17.3 to 13.5 per 1,000 patients (Helder et al., 2010).

• Barriers to Hand Hygiene

Several factors hinder hand hygiene compliance among HCWs. These include:

✓ Staff-Related Factors:

Lack of awareness, insufficient training, absence of role models, forgetfulness, or workload pressure (Mathur, 2011; Shinde & Mohite, 2014).

✓ Clinical Factors:

Patient overcrowding, understaffing, high-risk activities, and time constraints (Mathur, 2011).

✓ Environmental and Institutional Factors:

Inconvenient sink locations, shortage of soap or towels, hand irritation from hygiene agents, low perceived infection risk, lack of administrative enforcement, or weak institutional emphasis on infection control (Mathur, 2011).

Addressing these barriers requires structured training, institutional support, and continuous monitoring to improve compliance and reduce HCAI rates, particularly in neonatal units.

III. METHODOLOGY

This study employed a quantitative, descriptive cross-sectional design to assess handwashing knowledge, practices, and barriers among nurses and midwives in the neonatology and maternity departments at Ruhengeri District Hospital, Rwanda. The study population comprised 56 nurses and midwives, from which a sample of 50 participants was obtained using convenience sampling. Data were collected using a structured questionnaire divided into four sections: socio-demographic characteristics, knowledge, practices, and barriers to hand hygiene. Knowledge questions were adapted from the WHO Hand Hygiene Knowledge Questionnaire for Health-Care Workers, while practice and barrier questions were based on CDC and WHO guidelines. Validity was ensured through expert review by the hospital infection control committee, supervisor, co-supervisor, and a statistician. Reliability was tested via a pilot study of five participants, yielding a Cronbach's alpha of 0.86. Descriptive statistics were used to summarize data, and Chi-square tests assessed associations between demographic factors and hand hygiene knowledge and practices. Ethical considerations included informed consent, voluntary participation, anonymity, and confidentiality. Data were securely stored in both hard and soft formats. Limitations included single-site data collection and a small sample size, limiting generalizability. Findings were disseminated to hospital administration for informed decision-making.

IV. SUMMARY OF FINDINGS

➤ Demographic Characteristics of Respondents

In this section aimed to correct participant information contain 5 questions regarding age, gender, education level, working experiences and department of work.

Table 1 Demographic Variables (n =50)

Variables	Characteristic	Frequency	Percent
Age	20-30	16	32
	31-40	29	58
	41-50	4	8
	>50	1	2
Sex	Female	40	80
	Male	10	20
Education	Nursing Diploma	48	96
	Bachelor	2	4
Working experience	Less than 5 years	30	60
	5-10 years	11	22
	11-15 years	6	12
	Above 15 years	3	6
Department of work	Neonatology ward	14	28
	Maternity ward	36	72

In the above demographic Table 1 indicate that in 50 participants the majority 34(68) were above 30 years and 16(32) were between 20-30 of ages. It is thus evident that most of these nurses were chronologically mature. Concerning the level of education and experiences of work 48(96) had nursing diploma 2(4.0) had bachelor in nursing. According to the experience of work 30(60.0) were less than 5 years of experience while 20(28) were over 5 years of experience. This was important as understanding of the knowledge varies according to the level of education and experience of work.

➤ Nurses and Midwives' Knowledge on Hand Hygiene

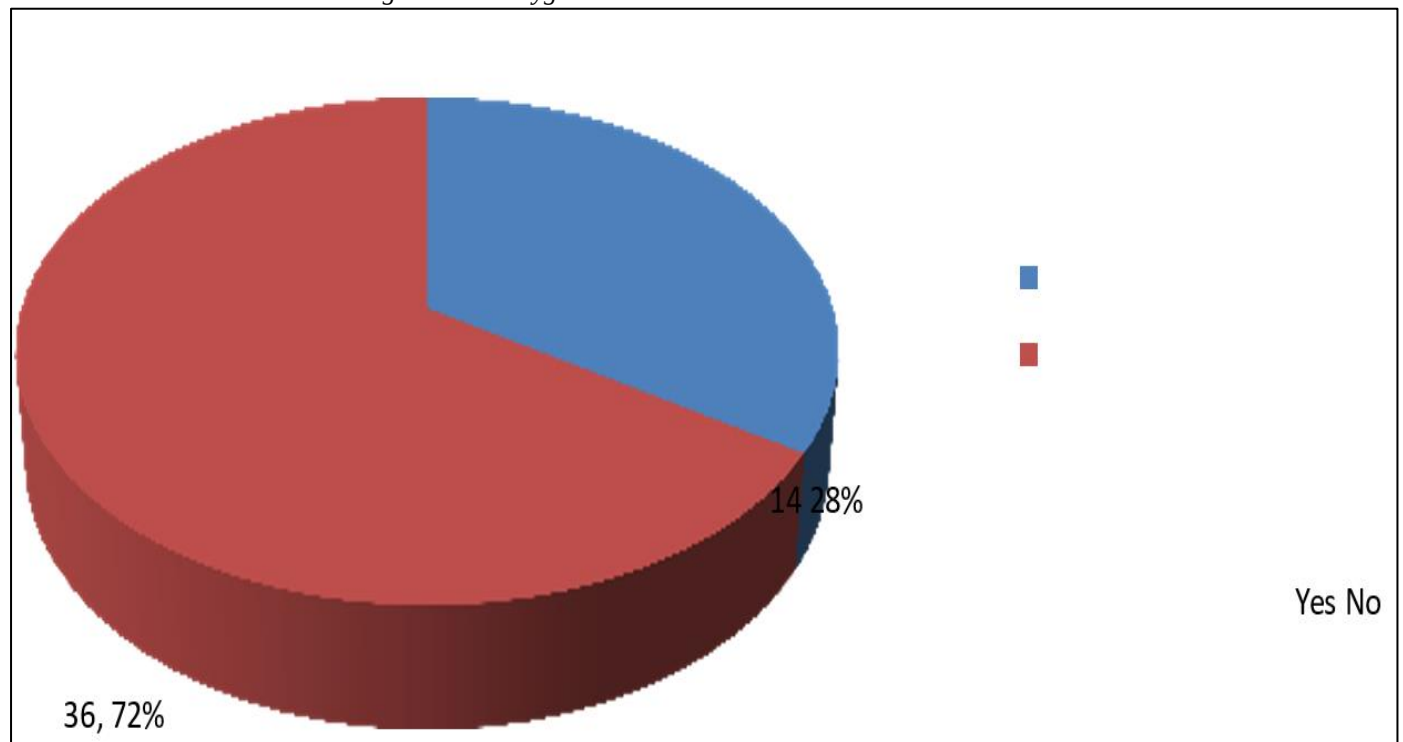


Fig 1 Distribution of Respondents Who Have Received Formal Training

Fig 1 Shows The Opposition of Respondents According to The Training on Hand Hygiene in The Last Three Years. The Majority 36(72%) Indicated That They Did Not Receive Training in Hand Hygiene.

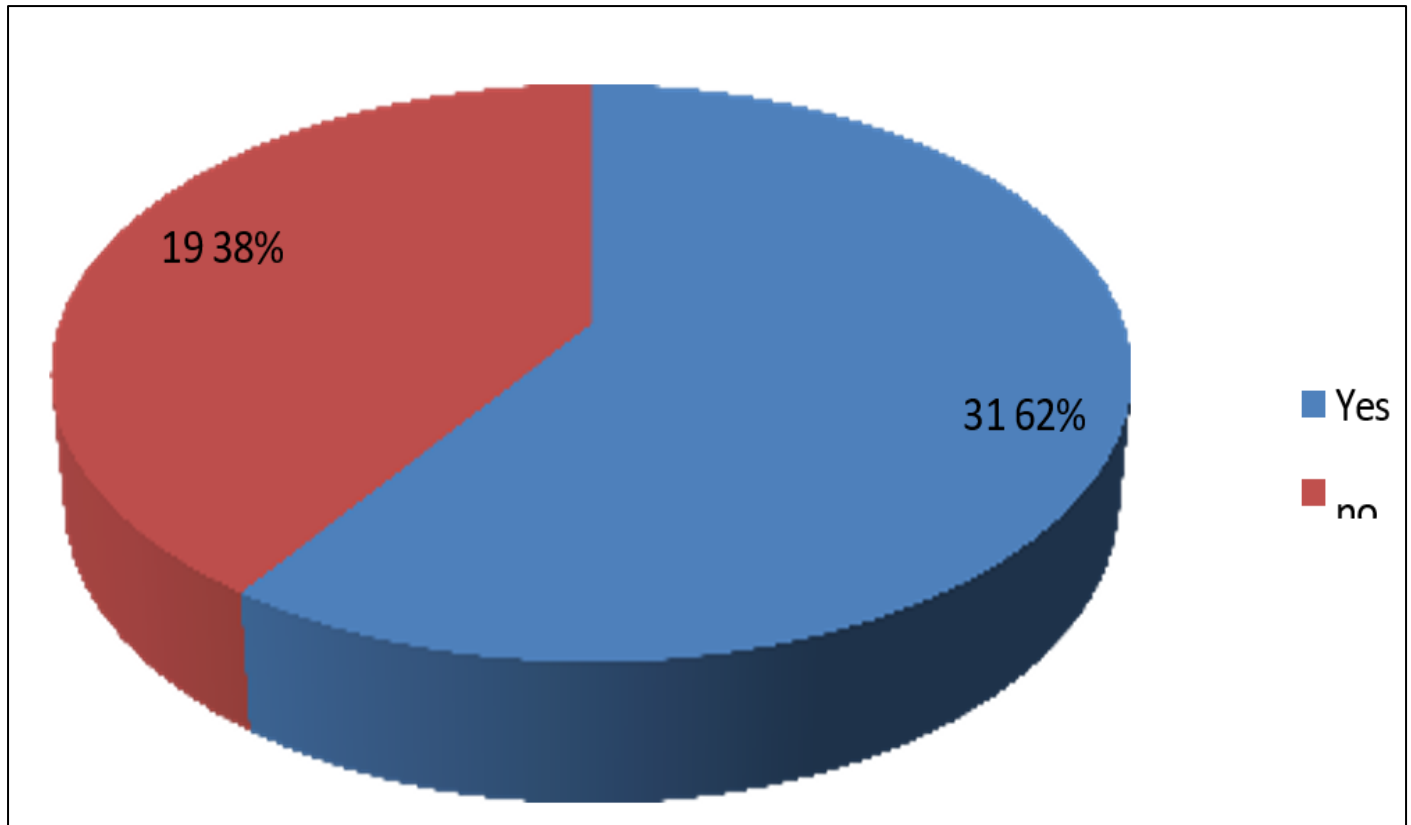


Fig 2 Distribution of Respondent on Use of Alcohol-Based Hand Rub for Hand Hygiene (n=50)

Fig 2 The Majority 31(62) Indicated That They Routinely Use an Alcohol-Based Hand Rub for Hand Hygiene While 19 (38) Do Not Use It.

Table 2 Respondent's Knowledge on the Main Route of Cross Transmission of Potentially Harmful Germs Between Patients in a Health-Care Facility.

Items	Yes (%)	No (%)
Health-care workers' hands when not clean	42(84%)	8(16%)
Air circulating in the hospital	49(98%)	1(2%)
Patients' exposure to colonized surfaces (i.e., beds, chairs, tables, floors)	44(88%)	6(12%)
Sharing non-invasive objects (i.e., tethoscopes, pressure cuffs, etc.)	49(98%)	1(2%)

The above Table 2 only 42 (84%) New That The Main Route of Cross Transmission of Potentially Harmful Germs Between Patients in a Health-Care Facility. Is Health care Workers When not clean.

Table 3 Knowledge on the Most Frequent Source of Germs Responsible for Health Care- Associated Infections

Items	Yes (%)	No (%)
The hospital's water system	41(82)	9(18)
The hospital air	45(90)	5(10)
Germs already present on or with the patient	32(64)	18(36)
The hospital environment	46(92)	4(8)

In Table 3 the Respondents Had to Show the Most Frequent Source of Germs Responsible for Health Care Associated Infections, only 32(64) Indicated that the Germs Already Present on or Within the Patient as The Correct Answer.

Table 4 Respondents Knowledge on the Hand Hygiene Actions That Prevent Transmission of Germs to the Patient n=50

Items	Yes n (%)	No n (%)
Before touching a patient	48(96)	2(4)
Immediately after a risk of body fluid exposure	27(54)	23(46)

After exposure to the immediate surroundings of a patient	17(34)	33(66)
Immediately before a clean/aseptic procedure	44(88)	6(12)

In the Table 4 the Majority 48(96) Indicated That Hand Hygiene Before Touching a Patient is the Actions That can Prevent Infection, 44(88) Indicate Immediately Before Clean/Aseptic Procedure, 27(54) Immediately After a Risk of Body Fluid Exposure.

Table 5 Knowledge on Hand Hygiene Actions That Prevents Transmission of Germs to the Health-Care Worker

Items	Yes (N %)	None (N %)
After touching a patient	46(92)	4(8)
Immediately after a risk of body fluid exposure	47(94)	3(6)
Immediately before a clean/aseptic procedure	45(90)	5(10)
After exposure to the immediate surroundings of a patient	49(98)	1(2)

In the above Table 5 the Majority 49(98) Indicated That Hand Hygiene After Exposure to the Immediate Surroundings of a Patient, 47(94) Immediately After a Risk of Body Fluid Exposure, 46(92) After Touching a Patient, Those are Hand Hygiene Action Prevent Transmission of Germs to the Health Care Workers.

Table 6 Knowledge on Alcohol Based Hand Rub and Hand Washing with Soap and Water (Yes And No).

Items	Yes; (n %)	No (n %)
Handrubbing is more rapid for hand cleansing than hand washing	41(82)	9(18)
Handrubbing causes skin dryness more than hand washing	31(62)	19(38)
Handrubbing is more effective against germs than hand washing	29(58)	21(42)
Hand washing and handrubbing are recommended to be performed sequence	27(54)	23(46)

In The above Statements in Table 4.2.6 Where the Respondents Had to Show which is True 41(82%) Indicated That Hand rubbing is More Rapid for Hand Cleansing Than Hand Washing, 31(62) Indicated That Handrubbing Causes Skin Dryness Hand Washing.

Table 7 Knowledge on the minimal time needed for alcohol-based handrub to kill most germs on the hands? (Tick one answer only)

Items	Frequency	Percent
20 seconds	28	56
3 Seconds	17	34
1 minute	13	26

For The Question in Table 7, Where The Respondents Had to Indicate The Minimal Time Needed for Alcohol-Based Handrub The Majority 28(56) Indicated That 20 Seconds is The Minimum Time Needed ,17(34) 3seconds And Minor 9(18) Indicated 1 Minute

Table 8 Which Type of Hand Hygiene Method Is Required in the Following Situations

Items	Rubbing (%)	Washing (%)	None (%)
Before palpation of abdomen	34(68)	11(22)	5(10)
Before giving an injection	33(66)	16(32)	1(2)
After emptying bedpan		50 (100)	
After removing examination gloves	21(42)	29(58)	1(2)
After visible exposure to blood	17(34)	31(62)	1(2)
After making patient's bed	46(92)	4(8)	

In Table 8 Indicated The Hand Washing Actions Required in Different Situation. in The Situation of Before Palpation of The Abdomen 34(68) Indicated Rubbing While 11(22) Indicated Washing And 5(10) Said None Action Is Required. On The Situation Of Before Giving An Injection, 33(66) Indicated Rubbing, 16(32) Indicated Washing and 1(2) Indicated None Action. On The Situation Of After Removing Gloves 21(42) Indicated Rubbing, 29(58) Indicated Washing While 1(2) Indicated None Action. After Emptying Bedpan 100% Agreed Hand Washing, On The Situation Of After Visible Exposure To Blood 17(34) Indicated Rubbing While 31(62) ,After Making Patient _Bed 46(92) Indicated Rubbing And 4(8) Washing

Table 9 Knowledge on the Conditions or Items That is Associated with Increased Likelihood of Colonization of Hands With Harmful Germs

Items	Yes (N %)	No (N %)
Wearing jewellery	47(94)	3(6)

Damaged skin	37(74)	13(26)
Artificial fingernails	45(90)	5(10)
Regular use of a hand cream	39(78)	11(22)

The Above Table 9 Shows The Items That Are Associated to The Colonization of Hands with Harmful Germ. 47(94) Indicated Wearing Jewellery, 45(90) Indicated Artificial Fingernail, 37(74) Indicated Damaged Skin and 39(78) Said Regular Use of Hand Cream as the Factors That Are Associated With Increased Likelihood of Colonization of Hands with Harmful Germs

Table 10 Participants 'level of knowledge

LEVEL	Frequency	Percent	Mean	Standard deviation
god knowledge	36	72.0	78.09%	6.9
moderate knowledge	14	28.0		
Total	50	100		

Cut off point: poor knowledge < 50 score, 50-74 Moderate, >75 Good knowledge. The above table 10 shows that the majority 72% has good level of knowledge, minority 28% has moderate knowledge.

➤ Results Nurses and Midwives Practices

Table 11 Respondents Practice of Hand Washing

Items	Yes (N %)	NO (N %)
Before contact with patients	45(90)	5(10)
After contact with individual patients or their immediate environment	23(46)	27(54)
Before manipulating medical devices such as intravenous catheters	16(32)	34(68)
before handling wound dressing	25(50)	25(50)
After touching potentially contaminated objects or surfaces	25(50)	25(50)
After removing gloves	45(90)	5(10)
After using bathroom, toilet, latrine	34(68)	16(32)

In the above table 11 The Respondents Had to Indicate the Situation the Health Care Personal Routinely Wash Their Hands with Soap and Water or a Waterless, Alcohol-Based Hand Antiseptic 45(90) Indicated Before Contact with Patient, 23(46) Indicated After Contact with Individual Patients or Their Immediate Environment, 16(32) Indicated Before Manipulating Medical Devices Such As Intravenous, 25(50) Indicated Before Handling Wound Dress, 25(50) Indicated After Touching Potentially Contaminated Objects or Surfaces, 45(90) Indicated After Removing Gloves And 34(68) Said After Using Bathroom, Toilet, And Latrine.

Table 12 Written Policies or Guide on Hand Hygiene in the Unit.

ITEMS	Frequency (%)
Written a policy on keeping finger nails short and/ or not using artificial nails or nails extenders	32 (64)
Is there a written policy or guide on hand hygiene on this unit	48(96)
Posters oh hand hygiene in the unity	49(98)

According To the above Table 12 the Majority 48(96) Indicated That There is A Written Policy/Guide on Hand Hygiene and are posted on Walls in Clinical 49(98). The Minority Indicated There a Policy on Keeping Finger Nails Short or Not Using Artificial Nails.

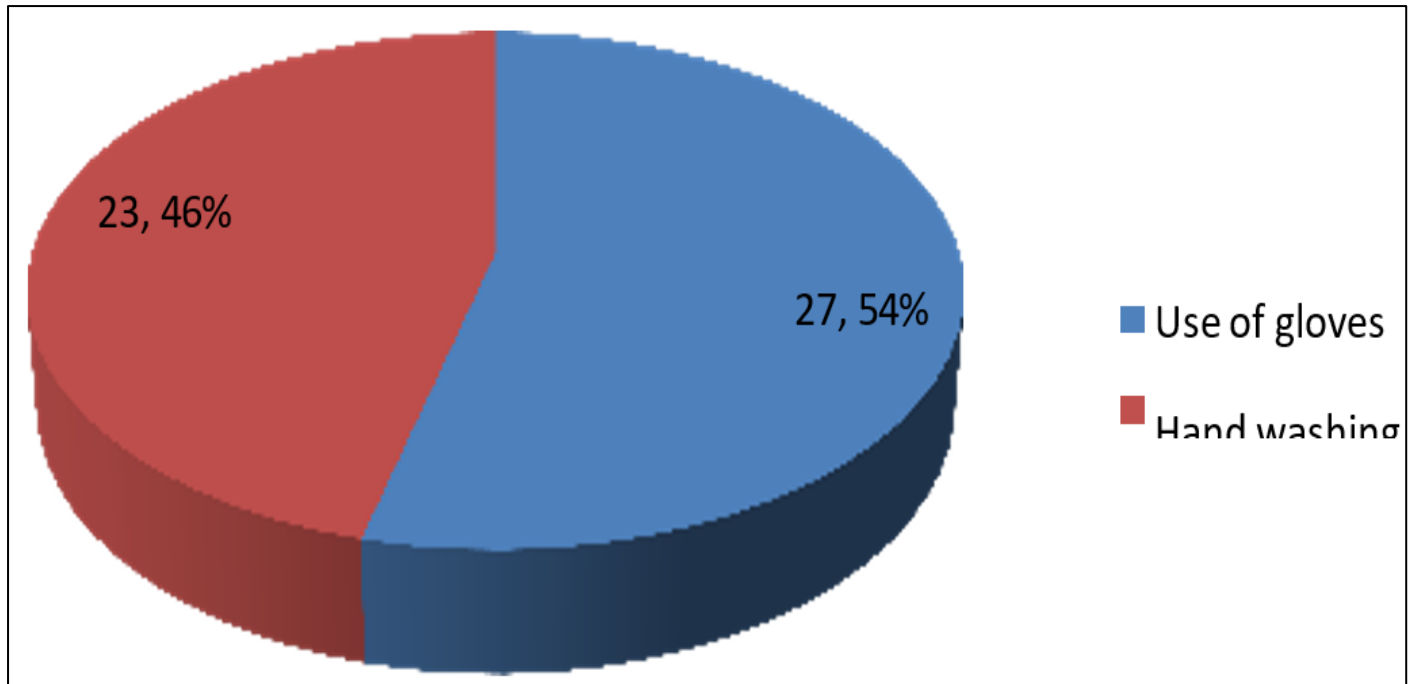


Fig 3 The Use of Gloves Versus Hand Washing Practice

Fig 3 Indicated That Majority 27(54) Showed That It Is Usual Practice To Wear Gloves Instead of Washing Hands For Contact With Patients Or Potentially Contaminated Environmental Surfaces.

Table 13 Level of Practice

	Frequency	Percent	Mean	Standard deviation
Poor Practice	9	18.0	71.27%	16.64
Moderate Practice	18	36.0		
Good Practice	23	46.0		
Total	50	100.0		

The Above Table 13 Shows That The Majority of Respondents Have Good Practice Which Were 23 (46), and 18 (36) Have Moderate Practice The Minority 9 (18) Have Poor Practice. The Mean Score of Practice Was 71.27% And The Standard Deviation 16.64.

V. DISCUSSION OF FINDINGS

According to the study finding the nurses and midwives have a good level of knowledge about hand washing as one of the standard of infection prevention where 36 (72%) had good knowledge. The mean score of nurses and midwives' knowledge was 78.09% and the standard deviation was 6.9. The level of practice of nurses and midwives was 23 (46%) have good practice and 18(36) have moderate practice 9 (18) have poor practice; the mean score was 71.27% and standard deviation was 19.64 prevention. The findings of the study showed also the association between the department of work and hand washing practice P- value= 0.012 at 95% of CI and level of significance of 0.05. The study results will be discussed in deep in the chapter five.

VI. LIMITATION AND FURTHER RESEARCH

This study was conducted in a single hospital, limiting the generalizability of the findings to other healthcare facilities in Rwanda. Data collection focused solely on the neonatology and maternity departments, excluding other hospital units where hand hygiene practices may differ. The small sample size (n = 50) may not fully represent the broader population of nurses and midwives, potentially introducing sampling bias. Additionally, the study relied on self-reported practices, which may be affected by social desirability bias, leading participants to overreport compliance with hand hygiene guidelines. The study did not explore in-depth the effectiveness of specific hand hygiene strategies, leaving gaps for understanding which interventions are most suitable for different clinical contexts. Future research could expand to multiple hospitals, include larger samples, and employ observational methods to validate self-reported practices and assess the impact of targeted training programs.

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The authors sincerely appreciate all nurses and midwives who willingly participated in this study. Their cooperation, honesty, and time dedicated to completing the questionnaires were invaluable for the successful completion of this research. Without their contribution, it would not have been possible to evaluate handwashing knowledge and practices in neonatology and maternity care. The authors recognize and thank the participants for their commitment to improving infection prevention and patient safety in their workplace. Their engagement not only facilitated this study but also contributes to the broader goal of enhancing hand hygiene practices in Rwandan healthcare settings.

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APPENDICES



COLLEGE OF MEDICINE AND HEALTH SCIENCES

SCHOOL OF NURSING AND MIDWIFERY

Kigali, on 30 / 01 /2017

Ref. No: 47 / UR-CMHS/SonM/17

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

Re: Request to collect data

Referring to the above subject, I am requesting for permission for **MUKASINE ANNE MARIE** , a final year student in the Masters of Science in Nursing at the University of Rwanda/College of Medicine and Health Science to collect data for her research dissertation entitled **Knowledge and practices of nurses on infection prevention in neonatology at a selected district hospital.**

This exercise that is going to take a period of 2 months starting from 13th February 2017 to 12th April 2017 will be done at RUHENGARI DISTRICT HOSPITAL.

We are looking forward for your usual cooperation.

Sincerely,

A handwritten signature in blue ink, likely belonging to Dr. Donatilla Mukamana.

Dr. Donatilla MUKAMANA, RN, PhD

Dean, School of Nursing and Midwifery

College of Medicine and Health Sciences



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