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FACTORS ASSOCIATED WITH ADHERENCE OF HEALTH WORKERS TO HAND HYGIENE PRACTICES AT LUBAGA HOSPITAL, KAMPALA CITY

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Abstract

Background: Hand hygiene is the most effective and cost-efficient measure for preventing healthcare-associated infections (HAIs). However, adherence among healthcare workers remains suboptimal, particularly in low-resource settings.

Purpose/Aim: This study assessed the level of adherence to hand hygiene practices and the factors associated with adherence among healthcare workers at Lubaga Hospital, Kampala City.

Methods: An analytical cross-sectional study was conducted among 216 healthcare workers selected using stratified random sampling. Data were collected through direct observation using the WHO "Five Moments for Hand Hygiene" checklist and a structured, self-administered questionnaire. Data were analyzed using SPSS version 20. Descriptive statistics were used to summarize the data, while inferential analysis

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included Pearson's Chi-square tests and Modified Poisson regression to estimate crude and adjusted prevalence ratios (cPR and aPR) with 95% confidence intervals at a significance level of $p \leq 0.05$.

Results: Overall adherence to hand hygiene practices was 69.9%, while 30.1% of participants were non-adherent. At the individual level, gender, cadre, and attitude toward hand hygiene were significantly associated with adherence. Male healthcare workers were less likely to adhere compared to females (aPR = 0.490, 95% CI: 0.226–0.969), while nurses and midwives were more than twice as likely to adhere compared to other cadres (aPR = 2.213, 95% CI: 1.113–4.398). Participants with a positive attitude toward hand hygiene were also significantly more likely to adhere (aPR = 1.462, 95% CI: 1.227–3.226). Resource-related factors, including the availability of alcohol-based hand rub and timely replenishment of supplies, were not significantly associated with adherence. Organizational factors such as recent training in hand hygiene and infection prevention (aPR = 1.771, 95% CI: 1.673–2.989), presence of reminders (aPR = 1.747, 95% CI: 1.538–5.949), feedback on performance (aPR = 0.339, 95% CI: 0.156–0.738), and teamwork (aPR = 3.006, 95% CI: 1.424–6.348) were significantly associated with improved adherence.

Conclusion: Adherence to hand hygiene practices among healthcare workers was moderate but remains suboptimal. Behavioral and organizational factors, particularly training, feedback, teamwork, and attitude, play a mo**re** significant role in influencing and adherence than resource availability alone.

Key words: Adherence to Hand Hygiene Practice, Hand Hygiene Practices, Individual-level Factors, Institutional or Organizational Factors.

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Introduction: According to the United States Centers for Disease Control and Prevention (CDC), hand hygiene involves cleaning hands with soap and water, alcohol-based hand rub (ABHR), or surgical antisepsis to remove or kill microorganisms and prevent infection transmission in healthcare settings [1]. It is the most effective and cost-efficient measure for preventing healthcare-associated infections (HAIs), yet global adherence among health workers remains suboptimal, particularly in low- and middle-income countries [2]. In Uganda, persistent gaps in hand hygiene compliance have been linked to limited infrastructure, heavy workloads, inadequate supplies, and inconsistent availability of ABHR at points of care [3,4].

Although quality improvement initiatives have enhanced knowledge and compliance, significant barriers (including workflow constraints, resource limitations, and behavioral factors) remain in many facilities in Uganda [5]. Understanding these factors is critical for strengthening infection prevention and control efforts. Therefore, this study investigated the factors that are associated with the adherence of health workers to hand hygiene practices at Lubaga Hospital, Kampala City.

Materials and methods

Study design and study setting

This study employed a quantitative analytical cross-sectional research design to assess factors associated with health workers' adherence to hand hygiene practices at Lubaga Hospital, Kampala District. A cross-sectional design is appropriate because it allows for the collection of data at a single point in time, enabling the measurement of the current level of hand hygiene adherence and examination of the relationship between adherence and the independent variables (individual-level factors, availability of hand hygiene resources, and institutional/organizational determinants). This design is justified for

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several reasons, namely, its ability to examine multiple factors simultaneously/concurrently [6], thereby providing an efficient and evidence-aligned method for examining the multifactorial determinants of hand hygiene adherence at Lubaga Hospital.

This study was conducted at Lubaga Hospital, also known as Uganda Martyrs' Hospital Lubaga, a major private not-for-profit, community hospital located on Lubaga Hill in Lubaga Division, in the western part of Kampala District, Uganda's capital city. The hospital is one of the oldest and most established health facilities in the country, having been founded in 1899 by the Missionary Sisters of Our Lady of Africa, and is recognized as the oldest Catholic hospital in Uganda. Lubaga Hospital is owned by the Roman Catholic Archdiocese of Kampala and is accredited by the Uganda Catholic Medical Bureau (UCMB), functioning as both a referral and teaching hospital for the region. Geographically, Lubaga Hospital is situated approximately 5.5 km southwest of Mulago National Referral Hospital and about 5 km west of Kampala's central business district, making it easily accessible to a large urban population. The hospital sits adjacent to the historic Lubaga Cathedral, further anchoring it within an important religious and social hub on Lubaga Hill. The coordinates of the facility are 0°18′15.0″N, 32°33′10.0″E, at an elevation of approximately 1,249 meters above sea level

Study population and selection criteria

The study population consisted of health workers employed at Lubaga Hospital, a major private, not-for-profit community hospital located on Lubaga Hill in Lubaga Division, Kampala City. The target population included all categories of health workers who are directly involved in patient care or who handle clinical materials. These included medical officers, clinical officers, nurses, midwives, laboratory personnel, pharmacists, and infection control staff. Health workers in such roles routinely interact with patients,

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handle equipment, and perform procedures that require strict adherence to the World Health Organization's "Five Moments for Hand Hygiene." Given the hospital's sizeable workforce and its broad patient care activities, spanning outpatient care, inpatient care, emergency services, surgical theatres, maternity, pediatrics, renal services, and diagnostics, the study population provides a robust and contextually relevant sample for examining how individual, resource-related, and institutional factors associated with adherence to hand hygiene practices.

The study included Health workers who had worked at the hospital for at least one month, allowing adequate exposure to institutional IPC practices, workflows, and hand hygiene resources, and those who consented to participate in the study. These criteria ensure that participants have sufficient experience with the hospital's hand hygiene systems, resource availability, and organizational environment.

Sample size and sampling method

The sample size was determined using the Krejcie and Morgan formula for estimating a single population proportion [7]. In the absence of a facility-specific estimate of hand hygiene adherence at Lubaga Hospital, a conservative prevalence of 50% was adopted to maximize the sample size and enhance representativeness. Using a 95% confidence level and a 5% margin of error, an initial sample size of 384 participants was obtained. Given that the population of eligible health workers at Lubaga Hospital is finite, the sample size was adjusted using the finite population correction (FPC) formula. Based on the estimated number of eligible health workers within the hospital, the adjusted sample size was 216 participants. This sample was considered adequate to assess the factors associated with health workers' adherence to hand hygiene practices. The study employed a stratified random sampling technique to select 216 health

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workers from Lubaga Hospital. Stratification was used to ensure proportional representation of the different professional cadres and clinical departments involved in patient care. This approach minimized sampling bias and enhanced the representativeness of the sample, thereby improving the validity of findings on factors associated with hand hygiene adherence among health workers.

Data Collection: Data were collected using two complementary tools: a WHO Hand Hygiene Direct Observation Checklist and a structured self-administered questionnaire. These tools were selected to assess health workers' adherence to hand hygiene practices and the factors associated with adherence.

A standardized WHO Hand Hygiene Direct Observation Checklist was used to determine the level of adherence to hand hygiene practices among health workers. The tool is based on the WHO Five Moments for Hand Hygiene and was used to record hand hygiene opportunities and corresponding actions during routine patient care activities.

A structured self-administered questionnaire was used to collect data on individual and institutional factors associated with hand hygiene adherence. The questionnaire assessed knowledge, attitudes, training, workload, perceptions of hand hygiene, leadership support, supervision, and the availability of hand hygiene resources. Data collection was conducted in four phases: training of research assistants, participant recruitment, direct observation, and questionnaire administration.

Prior to data collection, research assistants received training on the study objectives, data collection procedures, research ethics, and the use of study tools to ensure consistency and reliability. Eligible health workers were then approached, informed about the study, and invited to participate after providing written informed consent. Following consent, participants were observed during routine clinical practice using the

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WHO Hand Hygiene Direct Observation Checklist. Observations were conducted discreetly across different departments and work shifts to minimize observation bias. Immediately after the observation period, participants completed a structured self-administered questionnaire in a private setting to obtain information on factors associated with hand hygiene adherence.

Data Analysis: Data were entered, cleaned, and analyzed using Statistical Package for Social Sciences (SPSS) version 20. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize participants' characteristics and study variables. Findings were presented using tables, figures, and narrative summaries.

Inferential analysis was conducted to examine factors associated with adherence to hand hygiene practices. Pearson's Chi-square test was initially used to assess associations between the dependent and independent variables. Given that hand hygiene adherence was a common outcome, Modified Poisson regression with robust error variance was employed to estimate prevalence ratios, which provide a more appropriate measure of association than odds ratios for cross-sectional studies with common outcomes [8,9]. Variables that were statistically significant at the bivariate level ($p \leq 0.05$) were included in the multivariable model. Crude prevalence ratios (cPRs) and adjusted prevalence ratios (aPRs) with corresponding 95% confidence intervals were calculated to identify factors independently associated with hand hygiene adherence. Statistical significance was considered at a p-value of ≤ 0.05.

Results

Background Characteristics of Respondents

A total of 216 respondents participated in the study. The majority of participants were aged below 40 years (184, 85.2%), while only 32 (14.8%) were aged 40 years and above.

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Most respondents were female (182, 84.3%), with males representing a much smaller proportion (34, 15.7%). Regarding professional cadre, over half of the participants were in nursing (115, 53.2%), followed by others (69, 31.9%) and midwifery (32, 14.8%). Participants were drawn from various units of work. The largest proportion worked in the theatre (56, 25.9%), followed by the maternity ward (42, 19.4%), the outpatient department (OPD) (36, 16.7%), the nursing department (26, 12.0%), and the mother-to-child transmission (MTCT) area (25, 11.6%). Smaller proportions were from the emergency ward (12, 5.6%), postnatal ward (11, 5.1%), and children's ward (8, 3.7%) (Table 1).

Table 1: Background Characteristics of Respondents

Characteristic	Frequency (N = 216)	Percent %)
Age		
<40 Years	184	85.2
40 Years and above	32	14.8
Gender		
Male	34	15.7
Female	182	84.3
Cadre		
Nursing	115	53.2
Midwifery	32	14.8
Others	69	31.9
Unit of work		
Nursing Department	26	12
Theatre	56	25.9

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Maternity Ward	42	19.4
MTCT Area	25	11.6
OPD	36	16.7
Postnatal Ward	11	5.1
Children's Ward	8	3.7
Emergency ward	12	5.6
Working experience		
<10 Years	101	46.8
10 Years or more	115	53.2
Current shift pattern		
Morning	70	32.4
Day	104	48.1
Evening	17	7.9
Night	25	11.6

In of terms of working experience, slightly more than half of the respondents had 10 years or more of experience (115, 53.2%), while 101 (46.8%) had less than 10 years of experience. Regarding shift patterns, the largest share of participants were on day shifts (104, 48.1%), followed by those on morning shifts (70, 32.4%). Fewer respondents were on night shifts (25, 11.6%) and evening shifts (17, 7.9%) (Table 1).

Level of Adherence to Hand Hygiene Practices

Level of Adherence of Health Workers to HH Practices

Figure 1: Adherence to Hand Hygiene Practices

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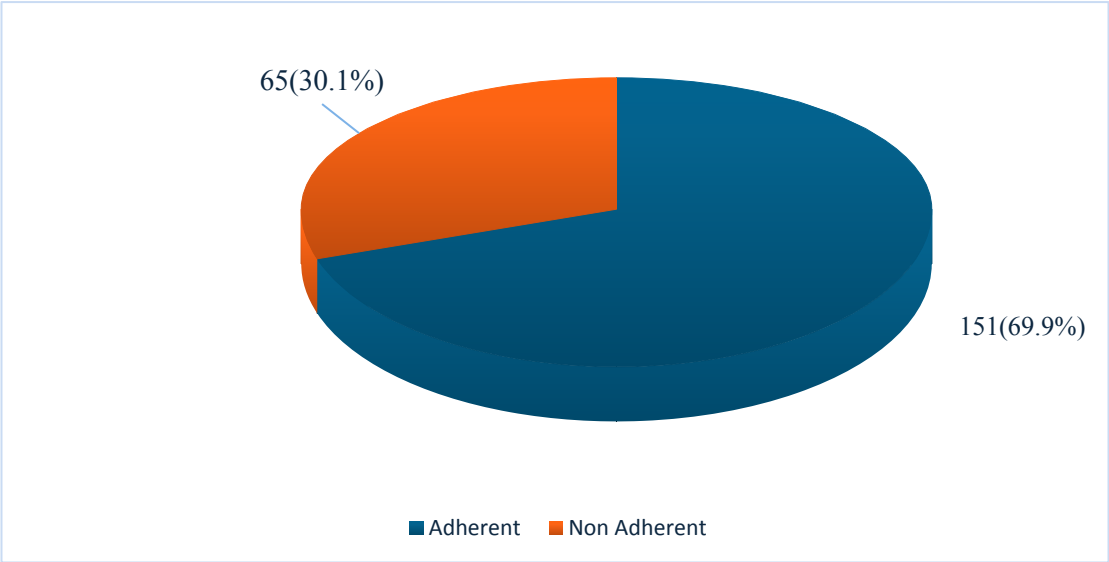

More than two-thirds of the participants, 151(69.9%) were adherent to hand hygiene practice (perform hand hygiene at ≥ 80% of required moments), while nearly one-third, 65(30.1%) were non-adherent (perform hand hygiene at < 80% of required moments) (Figure 1).

Individual-Level Factors Associated with Adherence to Hand Hygiene Practices. The individual-level factors assessed in this study were: age, gender, cadre, working experience, knowledge-related factors, and attitude toward HH practices. Table 2 below shows the results according to the individual-level factors associated with adherence to HH practice Lubaga Hospital, Kampala City

Table 2: Individual-Level Factors Associated with Adherence to Hand Hygiene Practice

Factor	Adherence to Hand Hygiene Practices				cPR (95% CI); p-value	aPR (95% CI); p-value
	Adherent		Non Adherent			
	Freq. (N = 152)	Percent (%)	Freq. (N = 64)	Percent (%)		
Age						
<40 Years	133	87.5	51	79.7	1.784(0.821-3.876); *p*=0.144	1.346(0.579-3.130); *p*=0.490
40 Years and above	19	12.5	13	20.3		
Gender						
Male	19	12.5	15	23.4	**0.467(0.220-0.990); *p*=0.047**	**0.490(0.226-0.969); *p*=0.048**

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Female	133	87.5	49	76.6		
Cadre						
Nursing/Midwifery	113	74.3	34	53.1	**1.572(1.136-2.175); *p*=0.006**	**2.213(1.113-4.398); *p*=0.023**
Others	39	25.7	30	46.9		
Working experience						
<10 Years	73	48	28	43.8	1.188(0.660-2.138); *p*=0.565	1.249(0.687-2.273); *p*=0.466
10 Years or more	79	52	36	56.3		
ABHR is recommended for most routine HH opportunities						
True	98	64.5	47	73.4	0.656(0.344-1.253); *p*=0.202	0.681(0.351-1.323); *p*=0.257
False/Not sure	54	35.5	17	26.6		
HH should be performed before aseptic procedures, even if gloves are worn						
True	136	89.5	54	84.4	1.574(0.672-3.685); *p*=0.296	1.447(0.345-6.081); *p*=0.614
False/Not sure	16	10.5	10	15.6		
Visibly soiled hands require soap and water, not ABHR						
True	138	90.8	59	92.2	0.835(0.288-2.425); *p*=0.741	0.827(0.195-3.506); p=0.797
False/Not sure	14	9.2	5	7.8		
Minimum rubbing time with ABHR is 20–30 seconds						
True	129	84.9	52	81.3	1.294(0.600-2.792); *p*=0.511	1.599(0.660-3.871); p=0.298
False/Not sure	23	15.1	12	18.8		
HH is required after touching patients' surroundings						
True	145	95.4	62	96.9	0.668(0.135-3.308); *p*=0.621	0.533(0.064-4.426); *p*=0.560
False/Not sure	7	4.6	2	3.1		
HH is recommended before donning gloves						
True	127	83.6	52	81.3	1.172(0.548-2.507); *p*=0.682	1.791(0.741-4.327); *p*=0.195
False/Not sure	25	16.4	12	18.8		
ABHR is more effective than soap for routine care						
True	101	66.4	37	57.8	1.445(0.793-2.632); *p*=0.229	1.396(0.736-2.649); *p*=0.307
False/Not sure	51	33.6	27	42.2		
HH reduces HAIs						
True	137	90.1	60	93.8	0.609(0.194-1.911); *p*=0.395	0.418(0.112-1.553); *p*=0.193
False/Not sure	15	9.9	4	6.3		
Wet hands reduce ABHR effectiveness						
True	110	72.4	42	65.6	1.372(0.733-2.567); *p*=0.323	1.529(0.765-3.058); p=0.230
False/Not sure	42	27.6	22	34.4		
Jewellery can reduce HH effectiveness						
True	125	82.2	56	87.5	0.661(0.283-1.547); *p*=0.340	0.618(0.243-1.571); p=0.312
False/Not sure	27	17.8	8	12.5		
Attitude toward HH Practices						
Good	128	84.2	58	90.6	**1.551(1.125-2.247); *p*=0.005**	**1.462(1.227-3.226); *p*=0.039**
Poor	24	15.8	6	9.4		

Age

Age was not significantly associated with adherence in both crude and adjusted analyses (cPR = 1.784, 95% CI: 0.821–3.876, p = 0.144; aPR = 1.346, 95% CI: 0.579–

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3.130, p = 0.490). Accordingly, age was not associated with adherence to hand hygiene practices among participants (Table 2).

Gender

Gender showed a statistically significant association with adherence (p≈0.038–0.048). Females demonstrated higher adherence (87.5%) compared to males (12.5% adherence vs 23.4% non-adherent among males). The crude prevalence ratio (cPR=0.467) and adjusted prevalence ratio (aPR=0.490) indicate that males were less likely to adhere to HH practices than females (Table 2).

Cadre

Gender was significantly associated with adherence (cPR = 0.467, 95% CI: 0.220–0.990, p = 0.047; aPR = 0.490, 95% CI: 0.226–0.969, p = 0.048). Accordingly, male participants were less likely to adhere to hand hygiene practices compared to female participants. (Table 2).

Working Experience

There was no significant association between working experience and adherence (cPR = 1.188, 95% CI: 0.660–2.138, p = 0.565; aPR = 1.249, 95% CI: 0.687–2.273, p = 0.466), suggesting that level of experience was not associated with adherence to HH Practices (Table 2).

Cadre

Cadre was significantly associated with adherence (cPR = 1.572, 95% CI: 1.136–2.175, p = 0.006; aPR = 2.213, 95% CI: 1.113–4.398, p = 0.023). As such, nursing and midwifery staff were significantly more likely to adhere to hand hygiene practices compared to other healthcare workers (Table 2).

ABHR Recommendation for Routine Use

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This variable was not significantly associated with adherence (cPR = 0.656, 95% CI: 0.344–1.253, p = 0.202; aPR = 0.681, 95% CI: 0.351–1.323, p = 0.257), indicating no relationship between this knowledge and adherence (Table 2).

Hand Hygiene Before Aseptic Procedures

Knowledge of this was not significantly associated with adherence (cPR = 1.574, 95% CI: 0.672– 3.685, p = 0.296; aPR = 1.447, 95% CI: 0.345–6.081, p = 0.614) (Table 3).

Use of Soap and Water for Soiled Hands

This variable was not significantly associated with adherence (cPR = 0.835, 95% CI: 0.288–2.425, p = 0.741; aPR = 0.827, 95% CI: 0.195–3.506, p = 0.797).

Minimum ABHR Rubbing Time

Knowledge of this was not significantly associated with adherence (cPR = 1.294, 95% CI: 0.600– 2.792, p = 0.511; aPR = 1.599, 95% CI: 0.660–3.871, p = 0.298) (Table 2).

Hand Hygiene After Patient Surroundings

This variable showed no significant association with adherence (cPR = 0.668, 95% CI: 0.135– 3.308, p = 0.621; aPR = 0.533, 95% CI: 0.064–4.426, p = 0.560) (Table 3).

Hand Hygiene Before Donning Gloves

There was no significant association with adherence (cPR = 1.172, 95% CI: 0.548–2.507, p = 0.682; aPR = 1.791, 95% CI: 0.741–4.327, p = 0.195) (Table 2).

ABHR Effectiveness Compared to Soap

This variable was not significantly associated with adherence (cPR = 1.445, 95% CI: 0.793–2.632, p = 0.229; aPR = 1.396, 95% CI: 0.736–2.649, p = 0.307) (Table 2).

Hand Hygiene and Reduction of HAIs

This was not significantly associated with adherence (cPR = 0.609, 95% CI: 0.194–1.911, p = 0.395; aPR = 0.418, 95% CI: 0.112–1.553, p = 0.193) (Table 2).

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Effect of Wet Hands on ABHR Effectiveness

This factor was not significantly associated with adherence (cPR = 1.372, 95% CI: 0.733–2.567, p = 0.323; aPR = 1.529, 95% CI: 0.765–3.058, p = 0.230) (Table 2).

Effect of Jewellery on Hand Hygiene

This variable was not significantly associated with adherence (cPR = 0.661, 95% CI: 0.283–1.547, p = 0.340; aPR = 0.618, 95% CI: 0.243–1.571, p = 0.312) (Table 2).

Attitude Toward Hand Hygiene

Participants with a good attitude toward hand hygiene constituted 84.2% of adherent and 90.6% of non-adherent individuals. Attitude was significantly associated with adherence (cPR = 1.551, 95% CI: 1.125–2.247, p = 0.005; aPR = 1.462, 95% CI: 1.227–3.226, p = 0.039), an indication that respondents with a positive attitude were more likely to adhere to hand hygiene practices (Table 3).

Availability of Relevant Resources and Adherence to Hand Hygiene Practice

The study assessed the association between availability of hand hygiene resources and adherence of health workers to hand hygiene practices at Lubaga Hospital, Kampala City.

Table 3: Availability of Relevant Resources and Adherence to HH Practice

Factor	Adherence to Hand Hygiene Practices				cPR (95% CI); p-value	aPR (95% CI); p-value
	Adherent		Non Adherent			
	Freq. (N = 152)	Percent (%)	Freq. (N = 64)	Percent (%)		
ABHR sufficiently available at points of care						
Yes	80	52.6	34	53.1	1.072(0.748-1.538); *p*=0.704	1.027(0.120-4.308); *p*=0.371
No	72	47.4	30	46.9		
HH supplies are replenished promptly						
Yes	12	7.9	4	6.3	0.883(0.586-1.329);*p*=0.550	0.754(0.697-3.429); p=0.101
No	140	92.1	60	93.8		

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Availability of Alcohol-Based Hand Rub (ABHR) at Points of Care

The crude analysis showed no significant association between ABHR availability and hand hygiene adherence (cPR = 1.072, 95% CI: 0.748–1.538, p = 0.704). Similarly, in the adjusted analysis, the association remained non-significant (aPR = 1.027, 95% CI: 0.120–4.308, p = 0.371).

Accordingly, availability of ABHR at points of care was not significantly associated with adherence to hand hygiene practices among participants (Table 3).

Timely Replenishment of Hand Hygiene Supplies

The crude prevalence ratio indicated no significant association (cPR = 0.883, 95% CI: 0.586– 1.329, p = 0.550). After adjustment, the association remained statistically non-significant (aPR = 0.754, 95% CI: 0.697–3.429, p = 0.101). Accordingly, prompt replenishment of hand hygiene supplies was not significantly associated with adherence to hand hygiene practices (Table 3).

Organizational Factors Associated with Adherence to Hand Hygiene Practice

The study examined several organizational-level factors (namely, workload and patient load factors, training in HH and infection prevention, availability of visual reminders, leadership and organizational support, feedback and supervision, and teamwork and safety culture) influencing adherence to HH practices among healthcare workers at Lubaga Hospital.

Average Number of Patients Per Shift

There was no statistically significant association between the number of patients per shift and adherence to hand hygiene practices in both crude and adjusted analyses (cPR = 0.926, 95% CI: 0.515–1.667, p = 0.926; aPR = 0.839, 95% CI: 0.460–1.533, p = 0.569), suggesting that workload in terms of patient volume was not significantly associated with adherence to hand hygiene practices (Table 4).

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298 **Number of Direct Care Procedures Per Shift**

299 This variables was not statistically significant with hand hygiene practices(cPR = 1.531,

300 95% CI: 0.851–2.754, p = 0.155; aPR = 1.724, 95% CI: 0.932–3.188, p = 0.083) (Table

301 4).

302 **Table 4: Organizational Factors Associated with Adherence to Hand Hygiene Practice**

Factor	Adherence to Hand Hygiene Practices				cPR (95% CI); p-value	aPR (95% CI); p-value
	Adherent		Non Adherent			
	Freq. (N = 152)	Percent (%)	Freq. (N = 64)	Percent (%)		
Average number of patients per shift in the past week						
Less than 100	66	43.4	29	45.3	0.926(0.515-1.667); *p*=0.926	0.839(0.460-1.533); p=0.569
100 and above	86	56.6	35	54.7		
Number of direct care procedures per shift						
<10	85	55.9	29	45.3	1.531(0.851-2.754); *p*=0.155	1.724(0.932-3.188); p=0.083
10 or more	67	44.1	35	54.7		
Self-rated workload						
Very low/Low	79	52	38	59.4	0.740(0.410-1.338); *p*=0.320	0.650(0.351-1.203); p=0.170
Moderate/High	73	48	26	40.6		
Received formal HH/IPC training in the past 12 months						
Yes	89	58.6	38	59.4	**1.967(1.534-2.758); *p*<0.001**	**1.771(1.673-2.989); *p*=0.001**
No	63	41.4	26	40.6		
When formal training in HH/IPC was received						
<12 months back	62	40.8	28	43.8	0.886(0.491-1.598); *p*=0.687	0.768(0.414-1.425); *p*=0.403
12 or more months ago/Not Applicable	90	59.2	36	56.3		
Posters/reminders are visible and helpful						
Yes	13	8.6	5	7.8	**1.945(1.667-5.339); *p*=0.028**	**1.747(1.538-5.949); *p*=0.042**
No	139	91.4	59	92.2		
Unit leadership supports HH						
Yes	129	84.9	53	82.8	0.932(0.671-1.296); *p*=0.677	0.768(0.414-1.425); *p*=0.403
No	23	15.1	11	17.2		
Receive feedback on HH performance						
Yes	132	86.8	50	78.1	**0.704(0.512-0.968); *p*=0.031**	**0.339(0.156-0.738); *p*=0.006**
No	20	13.2	14	21.9		
HH supervision frequency						
Daily	111	73	42	65.6	1.418(0.757-2.657); *p*=0.276	1.871(0.575-6.090); *p*=0.298
Not Daily	41	27	22	34.4		
Staff freely speak up about infection risks						
Yes	143	94.1	63	98.4	1.834(0.906-3.712); *p*=0.092	1.856(0.815-4.230); p=0.141
No	9	5.9	1	1.6		
Management acts on safety concerns						
Yes	143	94.1	55	85.9	1.639(0.908-2.961); *p*=0.101	1.874(0.203-3.767); *p*=0.857
No	9	5.9	9	14.1		
Teamwork supports safe care						
Yes	129	84.9	56	87.5	**1.444(1.007-2.068); *p*=0.045**	**3.006(1.424-6.348); *p*=0.004**
No	23	15.1	8	12.5		

303

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Self-Rated Workload

There was no significant association between self-rated workload and adherence to hand hygiene practices (cPR = 0.740, 95% CI: 0.410–1.338, p = 0.320; aPR = 0.650, 95% CI: 0.351–1.203, p = 0.170). Accordingly, perceived workload did not significantly affect hand hygiene adherence (Table 4).

Received formal HH/IPC training in the past 12 months

This factor was strongly and significantly associated with adherence to hand hygiene practices in both crude and adjusted analyses (cPR = 1.967, 95% CI: 1.534–2.758, p < 0.001; aPR = 1.771, 95% CI: 1.673–2.989, p = 0.001). Those who received formal HH/IPC training were significantly more likely to adhere to hand hygiene practices (Table 4).

Timing of formal HH/IPC training

This variable was not significantly associated with adherence to hand hygiene practices (cPR = 0.886, 95% CI: 0.491–1.598, p = 0.687; aPR = 0.768, 95% CI: 0.414–1.425, p = 0.403), an indication that timing of training is not significantly associated with adherence to hand hygiene practices (Table 4).

Posters/Reminders Visibility and Usefulness

This factor was significantly associated with adherence (cPR = 1.945, 95% CI: 1.667–5.339, p = 0.028; aPR = 1.747, 95% CI: 1.538–5.949, p = 0.042). Availability of visible reminders was associated with improved adherence, although the small numbers suggest this should be interpreted cautiously (Table 4).

Unit Leadership Support for Hand Hygiene

Most participants reported that unit leadership supported hand hygiene (84.9% adherent and 82.8% non-adherent). However, no significant association was observed (cPR = 0.932, 95% CI: 0.671– 1.296, p = 0.677; aPR = 0.768, 95% CI: 0.414–1.425, p = 0.403).

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Accordingly, leadership support was not significantly associated with adherence to HH Practice in this study (Table 4).

Feedback on Hand Hygiene Performance

This variable showed a significant association in both crude and adjusted analyses (cPR = 0.704, 95% CI: 0.512–0.968, p = 0.031; aPR = 0.339, 95% CI: 0.156–0.738, p = 0.006). Accordingly, receiving feedback significantly improved adherence to hand hygiene practices (Table 4).

Hand Hygiene Supervision Frequency

This variable was not significantly associated with adherence (cPR = 1.418, 95% CI: 0.757–2.657, p = 0.276; aPR = 1.871, 95% CI: 0.575–6.090, p = 0.298). Accordingly, frequency of supervision did not significantly affect adherence to hand hygiene practices (Table 4).

Staff Speaking Up About Infection Risks

There was no statistically significant association with adherence (cPR = 1.834, 95% CI: 0.906– 3.712, p = 0.092; aPR = 1.856, 95% CI: 0.815–4.230, p = 0.141). Accordingly, speaking up culture was not significantly associated with adherence to hand hygiene practices (Table 4).

Management Action on Safety Concerns

This variable was not significantly associated with adherence (cPR = 1.639, 95% CI: 0.908–2.961, p = 0.101; aPR = 1.874, 95% CI: 0.203–3.767, p = 0.857). Accordingly, management action on safety concerns was not significantly associated with adherence to hand hygiene practices (Table 4).

Teamwork Supporting Safe Care

This variable was significantly associated with adherence in both crude and adjusted analyses (cPR = 1.444, 95% CI: 1.007–2.068, p = 0.045; aPR = 3.006, 95% CI: 1.424–

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354 6.348, p = 0.004). Accordingly, strong teamwork was a key predictor of adherence,
355 with participants being about three times more likely to adhere when teamwork
356 supported safe care (Table 4).

357 **Discussion**

358 **Level of Adherence to Hand Hygiene Practices**

359 This study found that 69.9% of healthcare workers were adherent to hand hygiene (HH)
360 practices. This relatively high adherence level may be attributed to increased awareness
361 of infection prevention and control (IPC), especially following global and national
362 emphasis during outbreaks such as COVID-19. This finding is higher than reports from
363 several Ugandan and East African studies, where adherence levels ranged between 30%
364 and 60% [10]. However, it is consistent with studies conducted in better-resourced or
365 training-focused settings, where adherence levels above 65% have been reported [11].
366 Conversely, some high-income settings report adherence exceeding 80%, indicating
367 that while Lubaga Hospital performs relatively well, there is still a gap compared to
368 optimal standards.

369 Accordingly, while progress has been made, nearly one-third of healthcare workers
370 remain non- adherent, posing a continued risk for healthcare-associated infections
371 (HAIs). These findings imply that sustained interventions are needed to further improve
372 adherence to HH practices expected of healthcare professionals. Without this, the health
373 facility might experience HIAs, along with associated negative consequences, such as
374 increased healthcare costs.

375 **Individual-Level Factors Associated with Adherence to Hand Hygiene Practice**

376 **Gender**

377 Female healthcare workers were significantly more likely to adhere to HH practices
378 than males. This may be explained by differences in risk perception, hygiene behavior,

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and compliance tendencies, as females are often reported to demonstrate more health-conscious behaviors. This finding agrees with studies from Kenya and Ethiopia, which found higher HH compliance among female workers [12, 13]. However, some studies in Europe have found no gender differences, suggesting that cultural and contextual factors may be linked to this relationship [14]. This finding implies that gender-responsive strategies may be needed, particularly targeting male healthcare workers to improve adherence.

Cadre

Nurses and midwives were more likely to adhere compared to other cadres. This is likely due to their frequent patient contact, structured IPC training, and strict nursing protocols. This aligns with findings from Uganda and Tanzania, where nurses exhibited higher compliance due to continuous bedside care responsibilities [15]. However, some studies in high-income countries show minimal cadre differences due to standardized protocols across all professions [16]. This finding implies that non-nursing cadres may require targeted training and accountability systems to improve adherence.

Attitude toward HH Practices

A positive attitude was strongly associated with adherence. This suggests that beliefs, motivation, and perception of the importance of HH are critical determinants of behavior. This is consistent with studies globally showing that attitudinal factors outweigh knowledge in predicting compliance [17]. In contrast, some studies in resource-limited settings have found knowledge to play a stronger role, indicating contextual differences [18]. This finding implies that behavioral change interventions should prioritize attitude transformation rather than knowledge alone.

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Availability of Relevant Resources and Adherence to Hand Hygiene Practices

The study found no significant association between the availability of ABHR or supply replenishment and adherence. This may be due to uniform distribution of resources across the facility, limiting variation, or due to behavioral factors outweighing structural ones. This finding contrasts with WHO evidence that improved access significantly increases compliance [19-21]. However, it aligns with studies from Uganda showing that availability alone is insufficient without behavioral reinforcement [22-23].

Organizational Factors Associated with Adherence to Hand Hygiene Practice

Training in HH/IPC

Healthcare workers who received training were significantly more likely to adhere. This may be because training reinforces knowledge, builds skills, and increases awareness of infection risks. This agrees with findings from Rwanda [24] and Uganda [4, 10], where training doubled compliance rates. However, the timing of training was not significant, suggesting that continuous reinforcement may be more important than frequency [25,26]. This, therefore, calls for the need for ongoing training programs in order to improve healthcare workers' adherence to HH practices.

Visual Reminders

Posters/reminders significantly improved adherence. These act as constant cues that trigger appropriate behavior at the point of care. This aligns with WHO guidelines emphasizing reminders as a core strategy [19. Similar findings have been reported in Ethiopia and Kenya [12].

Feedback on HH Performance

Receiving feedback significantly improved adherence. This may be due to increased accountability and awareness of performance gaps. This is consistent with global

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evidence showing that audit and feedback interventions significantly improve compliance [21].

Teamwork and Safety Culture

Strong teamwork significantly improved adherence. This suggests that peer influence, shared responsibility, and supportive environments promote compliance. This agrees with studies showing that positive safety culture is a key predictor of HH compliance [16, 27-29].

Conclusion

The study established that adherence to hand hygiene practices among healthcare workers at Lubaga Hospital was moderately high at 69.9%; however, this level remains suboptimal when compared to recommended infection prevention and control standards. The findings demonstrate that adherence is significantly shaped by both individual and organizational dynamics. Specifically, gender, professional cadre, and attitude toward hand hygiene were key individual determinants, while organizational factors such as training, availability of visual reminders, performance feedback, and teamwork significantly enhanced compliance.

In contrast, structural and resource-related factors, including the availability of hand hygiene supplies and workload indicators, were not significantly associated with adherence, suggesting that the mere presence of resources does not guarantee appropriate practice. Overall, this study underscores that behavioral, cultural, and system-level linkages, particularly those that reinforce motivation, accountability, and teamwork, are more critical in driving hand hygiene compliance than infrastructural provisions alone. Therefore, effective interventions must prioritize integrated strategies that combine behavioral change approaches with supportive institutional frameworks to achieve optimal and sustained adherence to hand hygiene practices.

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Acknowledgements

Gratitude goes out to my Supervisor and the Biostatistician. Special appreciation is extended to the management and staff of Lubaga Hospital for their cooperation and support during data collection. Finally, heartfelt appreciation to family, friends and colleagues whose encouragement and support made this research possible.

Ethical approval

Ethical considerations involved approval of the research proposal by the administration of the faculty of health sciences of Uganda Martyrs University, followed by ethical approval by the Research Ethics Committee (REC) of Mildmay Uganda, and administrative clearance from Lubaga Hospital, Kampala. The study respondents gave informed consent before being enrolled to participate in the study. They were informed that participation in the study is at free will and that they are at liberty to withdraw their participation at any stage. Anonymity was maintained using codes as opposed to respondents' specific identifiers. Permission for access to electronic data was obtained from the Ministry of Health Assistant Commissioner in charge of Health Information Management and the director of Lubaga Hospital, Kampala.

Consent for publication

Study participants gave informed consent for publishing the study outcomes.

Availability of data and materials

All the data analyzed during this study are included in this manuscript. The data sets generated and analyzed during the study are also available from the corresponding author on request.

Competing interests

The authors declare that they have no competing interests

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Funding

No external sources of funding

Author's Contributions: NF conceptualized and designed the study, coordinated data collection, performed statistical analysis, interpreted the findings, and drafted the manuscript. KO contributed to the study design, provided methodological guidance, supervised the research process, and critically reviewed the manuscript for intellectual content.

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Supporting information

S1: REC APPROVAL

MILDMAY UGANDA

Research Ethics Committee (MUREC)

01 April 2026

Nambi Flavia
Principal Investigator

Type: [x] Initial Review
[ ] Expedited
[ ] Protocol Amendment
[ ] Continuing Review
[ ] Other, Specify

Dear Flavia,

RE: RESEARCH APPROVAL: #REC REF-2603-2026 "FACTORS ASSOCIATED WITH ADHERENCE OF HEALTH WORKERS TO HAND HYGIENE PRACTICES AT LUBAGA HOSPITAL, KAMPALA CITY."

Thank you for submitting this application for approval of the above-referenced protocol to MUREC.
I am glad to inform you that approval is hereby given to conduct the study; this approval is given following your exhaustive responses to initial comments raised by MUREC. The approval is for one year, effective 01 April 2026, and will expire on 01 April 2027.

As Principal Investigator of the research, you are responsible for fulfilling the following requirements of approval:

1. All co-investigators must be kept informed of the status of the research.
2. Changes, amendments, and addenda to the protocol or the consent form must be submitted to the REC for re-review and approval **prior** to the activation of the changes.
3. Reports of unanticipated problems involving risks to participants or any new information that could change the risk benefit ratio must be submitted to the REC.
4. Only approved consent forms are to be used in the enrollment of participants. All consent forms signed by participants and/or witnesses should be retained on file. The REC may Conduct audits of all study records, and consent documentation may be part of such audits.

Location/Correspondence
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P.O.Box 24985, Kampala

Communication
Tel: 0392174236
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Guiding Research For the Future

5. Continuing review application must be submitted to the REC **eight weeks** prior to the expiration date of **01 April 2027** in order to continue the study beyond the approved period. Failure to submit a continuing review application in a timely fashion may result in suspension or termination of the study.
6. The REC application number assigned to the research should be cited in any correspondence with the REC of record.
7. You are required to register the research protocol with the Uganda National Council for Science and Technology (UNCST) for final clearance to undertake the study in Uganda.

The following is the List of all documents approved in this application by the Mildmay Uganda REC (MUREC):

SN	Document Title	Language	Version	Version Date
1.	Protocol	English	1	12th March 2026
2.	Informed consent form	English	1	12th March 2026
3.	Questionnaire	English	1	12th March 2026
4.	Risk Management Plan for public Health emergencies	English	1	12th March 2026
5.	Community Engagement Plan	English	1	12th March 2026

Yours sincerely,

Dr. Jane Frank Nalubega
Chairperson MUREC.

MILDMAY UGANDA RESEARCH ETHICS COMMITTEE (MUREC) APPROVED VALID UNTIL 01 APR 2027 P.O. BOX 24985 KAMPALA, UGANDA

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549 # S2. Institutional Approval For the Study

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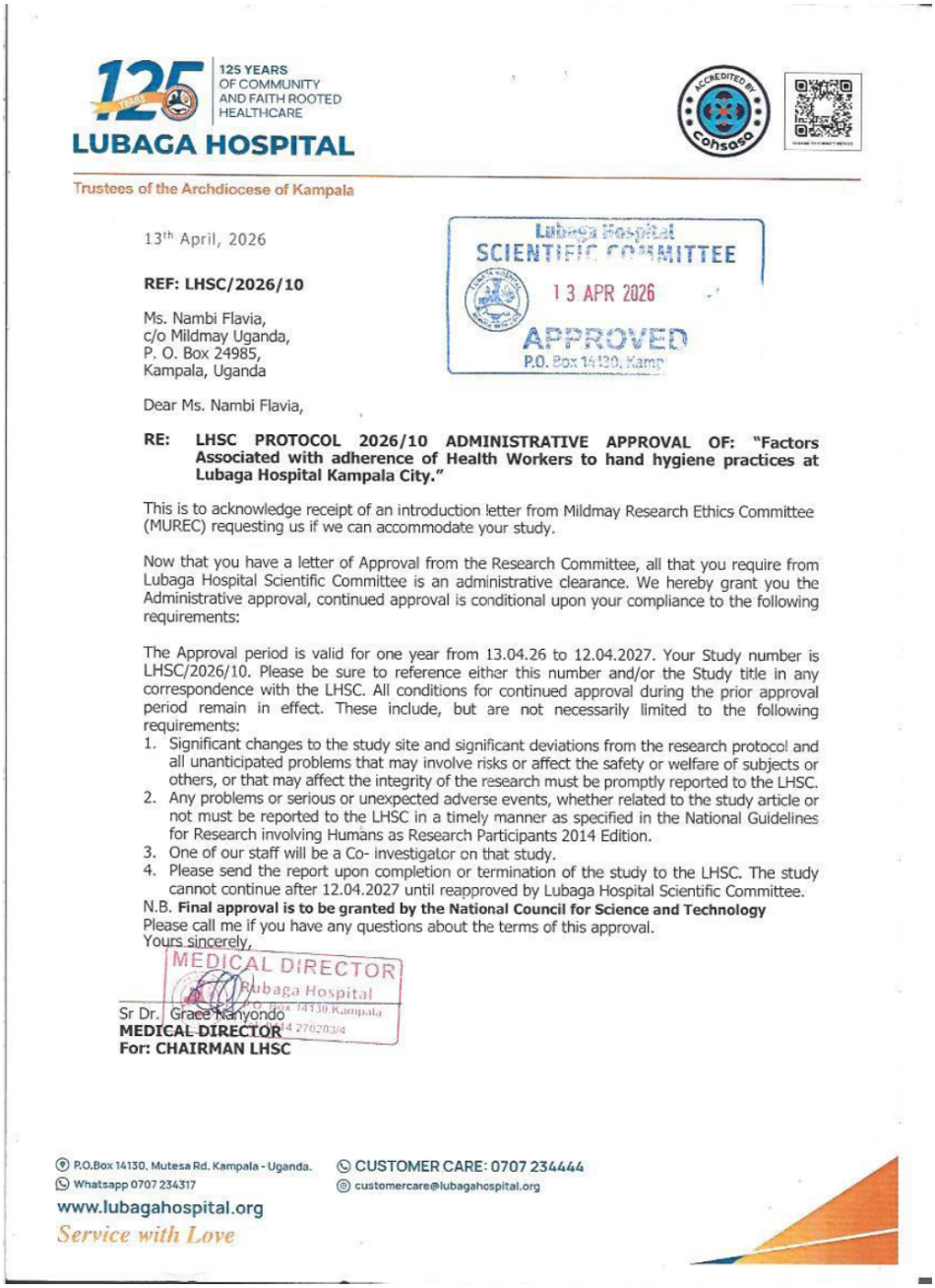

125 YEARS OF COMMUNITY AND FAITH ROOTED HEALTHCARE

LUBAGA HOSPITAL

Trustees of the Archdiocese of Kampala

13th April, 2026

Lubaga Hospital SCIENTIFIC COMMITTEE 13 APR 2026 APPROVED P.O. Box 14130, Kampala

REF: LHSC/2026/10

Ms. Nambi Flavia,
c/o Mildmay Uganda,
P. O. Box 24985,
Kampala, Uganda

Dear Ms. Nambi Flavia,

RE: LHSC PROTOCOL 2026/10 ADMINISTRATIVE APPROVAL OF: "Factors Associated with adherence of Health Workers to hand hygiene practices at Lubaga Hospital Kampala City."

This is to acknowledge receipt of an introduction letter from Mildmay Research Ethics Committee (MUREC) requesting us if we can accommodate your study.

Now that you have a letter of Approval from the Research Committee, all that you require from Lubaga Hospital Scientific Committee is an administrative clearance. We hereby grant you the Administrative approval, continued approval is conditional upon your compliance to the following requirements:

The Approval period is valid for one year from 13.04.26 to 12.04.2027. Your Study number is LHSC/2026/10. Please be sure to reference either this number and/or the Study title in any correspondence with the LHSC. All conditions for continued approval during the prior approval period remain in effect. These include, but are not necessarily limited to the following requirements:

1. Significant changes to the study site and significant deviations from the research protocol and all unanticipated problems that may involve risks or affect the safety or welfare of subjects or others, or that may affect the integrity of the research must be promptly reported to the LHSC.
2. Any problems or serious or unexpected adverse events, whether related to the study article or not must be reported to the LHSC in a timely manner as specified in the National Guidelines for Research involving Humans as Research Participants 2014 Edition.
3. One of our staff will be a Co- investigator on that study.
4. Please send the report upon completion or termination of the study to the LHSC. The study cannot continue after 12.04.2027 until reapproved by Lubaga Hospital Scientific Committee.

N.B. **Final approval is to be granted by the National Council for Science and Technology**

Please call me if you have any questions about the terms of this approval.

Yours sincerely,

MEDICAL DIRECTOR Lubaga Hospital P.O. Box 14130 Kampala

Sr Dr. Grace Nanyondo
MEDICAL DIRECTOR
For: CHAIRMAN LHSC

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Supporting information

S1: REC APPROVAL

MILDMAY UGANDA

Research Ethics Committee (MUREC)

01 April 2026

Nambi Flavia
Principal Investigator

Type: [x] Initial Review
[ ] Expedited
[ ] Protocol Amendment
[ ] Continuing Review
[ ] Other, Specify

Dear Flavia,

RE: RESEARCH APPROVAL - MUREC REF-2603-2026 "FACTORS ASSOCIATED WITH ADHERENCE OF HEALTH WORKERS TO HAND HYGIENE PRACTICES AT LUBAGA HOSPITAL, KAMPALA CITY."

Thank you for submitting this application for approval of the above-referenced protocol to MUREC.

I am glad to inform you that approval is hereby given to conduct the study: this approval is given following your exhaustive responses to initial comments raised by MUREC. The approval is for one year, effective 01 April 2026, and will expire on 01 April 2027.

As Principal Investigator of the research, you are responsible for fulfilling the following requirements of approval:

1. All co-investigators must be kept informed of the status of the research.
2. Changes, amendments, and addenda to the protocol or the consent form must be submitted to the REC for re-review and approval **prior** to the activation of the changes.
3. Reports of unanticipated problems involving risks to participants or any new information that could change the risk benefit ratio must be submitted to the REC.
4. Only approved consent forms are to be used in the enrollment of participants. All consent forms signed by participants and/or witnesses should be retained on file. The REC may Conduct audits of all study records, and consent documentation may be part of such audits.

Location/Correspondence
Mildmay, Uganda
Plot 27, Lweza
P.O.Box 24985, Kampala

Communication
Tel: 0392174236
Email: murec@mildmay.or.ug
WWW.mildmay.or.ug/uganda

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5. Continuing review application must be submitted to the REC **eight weeks** prior to the expiration date of **01 April 2027** in order to continue the study beyond the approved period. Failure to submit a continuing review application in a timely fashion may result in suspension or termination of the study.
6. The REC application number assigned to the research should be cited in any correspondence with the REC of record.
7. You are required to register the research protocol with the Uganda National Council for Science and Technology (UNCST) for final clearance to undertake the study in Uganda.

The following is the List of all documents approved in this application by the Mildmay Uganda REC (MUREC):

SN	Document Title	Language	Version	Version Date
1.	Protocol	English	1	12th March 2026
2.	Informed consent form	English	1	12th March 2026
3.	Questionnaire	English	1	12th March 2026
4.	Risk Management Plan for public Health emergencies	English	1	12th March 2026
5.	Community Engagement Plan	English	1	12th March 2026

Yours sincerely,

Dr. Jane Frank Nalubega.
Chairperson MUREC.

MILDMAY UGANDA RESEARCH ETHICS COMMITTEE (MUREC) APPROVED VALID UNTIL 01 APR 2027 P.O. BOX 24985 KAMPALA, UGANDA

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S2. Institutional Approval For the Study

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125 YEARS OF COMMUNITY AND FAITH ROOTED HEALTHCARE

LUBAGA HOSPITAL

Trustees of the Archdiocese of Kampala

Lubaga Hospital
SCIENTIFIC COMMITTEE
13 APR 2026
APPROVED
P.O. Box 14130, Kamp

13th April, 2026

REF: LHSC/2026/10

Ms. Nambi Flavia,
[illegible],
Kampala, Uganda.

Dear Ms. Nambi Flavia,

RE: LHSC PROTOCOL 2026/10 ADMINISTRATIVE APPROVAL OF: "Factors Associated with adherence of Health Workers to hand hygiene practices at Lubaga Hospital Kampala City."

This is to acknowledge receipt of an introduction letter from Mildmay Research Ethics Committee (MUREC) requesting us if we can accommodate your study.

Now that you have a letter of Approval from the Research Committee, all that you require from Lubaga Hospital Scientific Committee is an administrative clearance. We hereby grant you the Administrative approval, continued approval is conditional upon your compliance to the following requirements:

The Approval period is valid for one year from 13.04.26 to 12.04.2027. Your Study number is LHSC/2026/10. Please be sure to reference either this number and/or the Study title in any correspondence with the LHSC. All conditions for continued approval during the prior approval period remain in effect. These include, but are not necessarily limited to the following requirements:

1. Significant changes to the study site and significant deviations from the research protocol and all unanticipated problems that may involve risks or affect the safety or welfare of subjects or others, or that may affect the integrity of the research must be promptly reported to the LHSC.
2. Any problems or serious or unexpected adverse events, whether related to the study article or not must be reported to the LHSC in a timely manner as specified in the National Guidelines for Research involving Humans as Research Participants 2014 Edition.
3. One of our staff will be a Co- investigator on that study.
4. Please send the report upon completion or termination of the study to the LHSC. The study cannot continue after 12.04.2027 until reapproved by Lubaga Hospital Scientific Committee.

N.B. **Final approval is to be granted by the National Council for Science and Technology**

Please call me if you have any questions about the terms of this approval.

Yours sincerely,

MEDICAL DIRECTOR
Lubaga Hospital
P.O. Box 14130, Kampala
Tel: +256 414 270204

Sr Dr. Grace Namyondo
MEDICAL DIRECTOR
For: CHAIRMAN LHSC

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Figure 2

Figure