



Hand Hygiene: Knowledge and Practice among Healthcare Workers in the Paediatrics and Neonatal Intensive Care Unit of the Cape Coast Teaching Hospital

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Authors' contributions

This work was carried out in collaboration between both authors. Authors PAT and JA designed the write-up, author JA administered the questionnaires and both authors read and approved the final manuscript.

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ABSTRACT

Aims: To assess the knowledge of hand hygiene among health care workers in the Paediatrics Department and Neonatal Intensive Care Unit (NICU) of the Cape Coast Teaching Hospital (CCTH). To determine the hand hygiene practice among health care workers. To determine the barriers to hand washing practices in the Paediatrics Department.

Study Design: A cross-sectional descriptive study design was done.

Place and Duration of Study: Department of Paediatrics between 14th February, 2020 to 12th March, 2020

Methodology: 81 health workers including 31 doctors and 50 nurses (35 working nurses and 15 nursing students) who have direct contact to patients on the wards were included in the study. A

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World Health Organization (WHO) adopted self-administered questionnaire on hand hygiene was used.

Results: From the study, 75.3% of the respondents had fair knowledge on hand hygiene and 24.7% also had poor knowledge. Most doctors generally had a better knowledge of hand hygiene whilst nurses generally had poor knowledge. With a *p*-value of 0.002, a statistical association was found between having received formal education and the performance of routine hand hygiene practices. Some barriers affecting hand hygiene practice included forgetfulness, lack of time and lack of alcohol-based hand rub.

Conclusion: In conclusion, most of the health care workers had a fair knowledge on hand hygiene with a few having poor knowledge. Majority of health care workers reported they routinely use hand washing and alcohol hand rub in their daily practice.

Regular education and practice of hand hygiene are essential to prevention of spread of diseases especially during this time of the Covid-19 pandemic.

Keywords: Hand hygiene; health care workers; paediatrics; neonatal intensive care unit.

ABBREVIATIONS

1. *Hand hygiene - a more common term that encompasses washing one's hand using soap (plain or medicated) and water or performing an antiseptic hand rub procedure with the appropriate agent [1].*
2. *Hand washing - process of applying clean water and plain or antiseptic soap to one's hands with the aim of manually removing dirt and microorganisms from the skin [2].*
3. *Health care workers - They are the individuals who are directly in contact with patients and offer preventive, curative, promotional and rehabilitative health care services to them or indirectly handling items of patients that can spread infection [3]. They may include physicians, nurses, medical and nursing students, emergency medical professionals, laboratory professionals.*
4. *Health care associated infections – when there is evidence of infections which are acquired from the health care settings 48 hours after being on admission or 30 days after visiting a health care facility.*

ACRONYMS

CCTH	- Cape Coast Teaching Hospital
IPC	- Infection Prevention Control
HCWs	- Health Care Workers
HCAI	- Health Care Associated Infections
HAI	- Hospital Acquired Infections
HH	- Hand Hygiene
HW	- Hand Washing
HICPAC	- Healthcare Infection Control Prevention Advisory Committee
NICU	- Neonatal Intensive Care Unit
WHO	- World Health Organization
SDG	- Sustainable Development Goal
CFU	- Colony Forming Unit
CDC	- Center for Disease Control
KBTH	- Korle-Bu Teaching Hospital
KATH	- Komfo Anokye Teaching Hospital

1. INTRODUCTION

Hand hygiene is a common term that encompasses washing one's hand using soap and water or performing an antiseptic hand rub procedure with the appropriate agent [1]. It is done with the aim of manually removing dirt and

reducing the number of microorganisms on the skin. It was practiced many centuries ago. The rationale behind hand hygiene was recognized in the 1840's by Dr. Oliver Wendell Holmes as a way of preventing childbed fever and by Dr. Ignaz Semmelweis, who is known as the father of hand hygiene in the late 1840's as a means of

reducing mortality among women in the maternity wards due to puerperal fever at the Vienna Hospital [4].

Dr. Semmelweis realized that the doctors and medical students after leaving the autopsy rooms, though they performed hand washing with soap and water, still carried the cadaveric scent with them to the maternity ward. He therefore made a hypothesis that the particles from the cadaver were transmitted by the hands of the doctors and medical students to the women at the maternity wards and hence caused their puerperal fever. He then recommended that chlorinated lime should be used to scrub the hands, and this was implemented which yielded very good results. It was found that maternal mortality dropped massively to 3% in one facility he studied [5].

Hand hygiene has therefore been given recognition as a single most effective means of preventing hospital acquired infections and infections acquired from the community that would require one to be admitted in the hospital [6]. Hands play a very significant role and serve as a vehicle for transmission of infections in hospitals. This is proven by much scientific research conducted which shows that microbes that spread hospital acquired infections were spread directly to patients by the hands of health care workers [5]. Examples of instances in the paediatric populations where there could be possible transmission include routine neonatal examinations, diaper change, cleaning respiratory secretions and direct skin contacts to mention a few. Hand hygiene practices are very important in reducing the rate of hospital associated infections. Studies from the WHO suggest that over 1.4 million people in the world acquire infections from health care facilities [7] of this, the paediatric and most importantly the neonatal populations are susceptible to these infections due to their immature immune system. This has led to an increased morbidity and mortality among this population.

The importance of HH has become more appreciable in this time of global crisis from the COVID-19 [8]. The mode of transmission is believed to be via droplet infection. The infection prevention control measures are one sure way to prevent one from contracting the disease or spreading it as currently there is no cure [9]. Hand hygiene has become much more relevant in these few months to prevent person to person transmission. Thoroughly washing one's hand or

using alcohol hand rub for at least 20-30 seconds have become the order of the day.

2. METHODOLOGY

2.1 Study Design

This was a cross-sectional descriptive study designed to help in the analysis of data collected from different groups of health care workers by using a questionnaire on HH adopted from the WHO. This study design was employed so that the knowledge and practice of hand hygiene together with the barriers of HH of health care workers could be assessed. Frequencies and tables were then drawn from the data.

2.2 Study Area

In this study, HCWs in the Paediatric Unit including the NICU of the Cape Coast Teaching Hospital were assessed. It included 81 health workers out of a total of 102 in the department who took part in the study i.e., 31 doctors and 50 nurses (35 working nurses and 15 nursing students). This population was chosen because they had direct contact to patients on the wards per their job description.

2.3 Exclusion Criteria

Workers in the Paediatric Department who did not come into direct physical contact with patients and those who were unwilling to participate in the study were excluded from the study.

2.4 Sampling Method

Convenience sampling method was used to select the health care workers in this study. This was used to ensure that the willing and available HCWs were included.

2.5 Sample size

The sample size to be used was based on a 95% confidence interval and a 5% error of margin. The minimum sample size of 81 health workers was then calculated out of a population size of 102 health workers in the Paediatrics Department.

Using the formula:

$$n = N \cdot X / (X + N - 1), [10]$$

where

$$X = Z_{\alpha/2}^2 * p*(1-p) / MOE^2$$

And $Z_{\alpha/2}$ is the critical value of the normal distribution at $\alpha/2$ (for a confidence level of 95%, α is 0.05 and the critical value is 1.96), MOE is the margin of error, p is the sample proportion (50%) and N is the population size.

Using the formula, the sample size was calculated to be 81.

2.6 Instrument

The questionnaire was adopted from the WHO knowledge and practice of HH among health care workers questionnaire [11]. However, some modifications were made to suit the purpose.

2.7 Data Collection Procedures

Consent from the workers was sought first and confidentiality assured. The self-administered questionnaires were handed to HCWs in the paediatric department including those in the NICU to assess their knowledge and practice of HH. The administration of the questionnaires was done in the morning and collected by the end of the day. After which the data was recorded from the filled questionnaires. The data was collected from the 14th of February, 2020 to 12th March, 2020.

2.8 Data Management

All questionnaires were assigned identification codes. Once they were filled and retrieved, they were thoroughly inspected. All questionnaires were filled appropriately. Data was then coded using the IBM Statistical Package for Social Sciences (SPSS) version 20 prior to entry. All answered questionnaires were kept in a separate folder per the dates they were administered.

2.9 Data Processing and Analysis

Data from the study was analyzed with the IBM Statistical Package for Social Sciences (SPSS) version 20 and Microsoft Excel. The descriptive statistical method using SPSS and Microsoft Excel were used to analyze frequencies, correlations and means. In addition, Pearson's chi-square and Fischer tests were used to analyze cross tabulation between variables and association with significance level at ($p < 0.05$).

3. RESULTS AND DISCUSSION

A total number of 81 HCWs responded to the 13 structured questions of the questionnaires that

were administered at the Paediatric Department of the Cape Coast Teaching Hospital. The health workers included 31 doctors and 50 nurses (i.e., 35 working nurses and 15 nursing students).

3.1 Knowledge of Hand Hygiene

The Fig. 1, shows that according to 49.4% of the HCWs, the main source of transmission of microorganisms between patients in the facility was "Health care workers hands when not clean".

3.1.1 Most regular source of germs responsible for HCAs

From the Fig. 2, 76.5% of respondents chose the hospital environment as being the regular place where germs are present.

3.1.2 Actions preventing transmission of germs

From Table 1, all respondents agreed to the fact that HH will prevent transmission of germs to themselves "after touching a patient" and "immediately after a risk of body fluids exposure".

3.1.3 Time needed for HH

Majority of respondents i.e. 37% chose using at least 20 seconds for the performance of alcohol hand rub.

From Table 2, majority of participants said yes to the first three options that says "wearing of jewellery, damaged skin and artificial fingernails" are more likely contexts where microorganisms can be colonized.

3.1.4 Overall knowledge

From Table 3, majority of health care workers accounting for 75.3% had a fair knowledge of hand hygiene. 24.7% had poor knowledge.

As shown in Table 4, there is therefore a relationship (association) between HCWs and their knowledge of Hand Hygiene ($X^2 = 8.98$, p -value = 0.0027).

3.1.5 Association between receiving formal education and knowledge of hand hygiene

From the Table 5, the p value = 0.128. There is therefore no association between having received formal education in the past three years and the knowledge of HCWs.

3.1.6 Practice of Hand Hygiene

This shows the self-reported practice of HH by the HCWs.

84% of respondents said they routinely use hand washing and alcohol hand rub in their daily practice.

3.1.7 Factors preventing hand hygiene

From Table 7, it is observed that more than half of respondents i.e., 55.6% explained that their busy schedules coupled with lack of time

prevented them from effectively practicing hand hygiene.

3.1.8 Association between the professional categories and routine practice

From table 8, it is observed that all the doctors responded in the affirmative of their routine use of hand hygiene practices in their daily work.

3.1.9 Association between having formal education and hand hygiene

From Table 9, majority of respondents who had received formal education reported they routinely use hand hygiene practices.

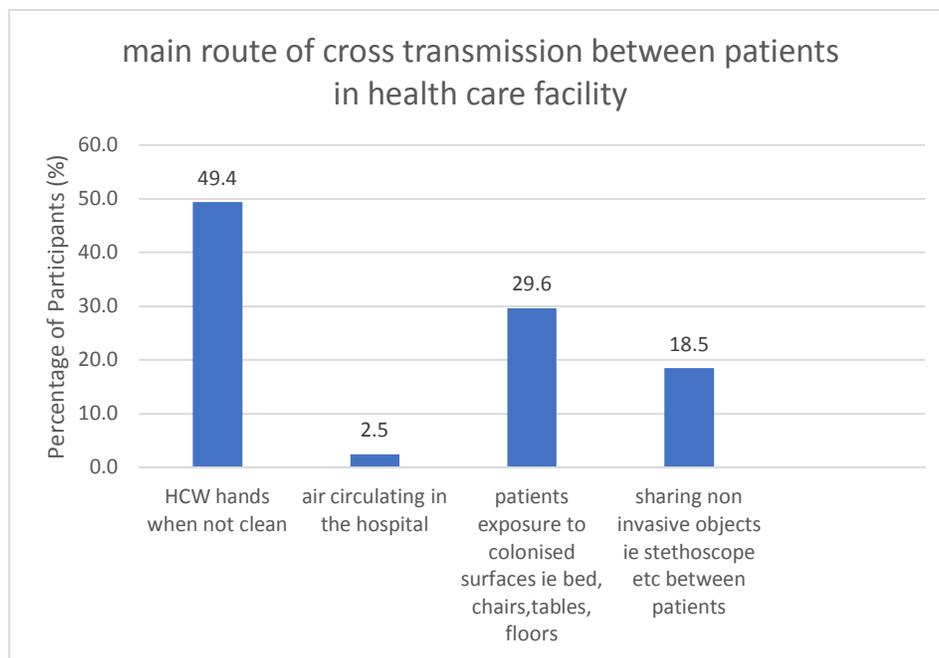


Fig. 1. HCWs knowledge on main source of transmission of microbes to patients in a health care facility

Table 1. HH actions that prevent transmission of germs to the HCW

Procedure (recommended option in bracket)	Opportunity for hand hygiene	Opportunity for hand hygiene
	YES	NO
“After touching a patient”	81 (100%)	0
“Immediately after a risk of body fluid exposure”	81 (100%)	0
“Immediately before a clean/ aseptic procedure”	71 (87.7%)	9 (11.1%)
“After exposure to the immediate surroundings of a patient”	78 (96.3%)	3 (3.7%)

Usage of alcohol-based hand rubs and hand washing

Table 2. Likelihood of hand colonization by dangerous microbes

Likelihood of hand colonization	Yes	No
Wearing jewellery	77 (95.1%)	4 (4.9%)
Break in skin	76 (93.8%)	5 (6.2%)
Artificial fingernails	79 (97.5%)	2 (2.5%)
Regular use of hand cream	38 (46.9%)	43 (53.1%)

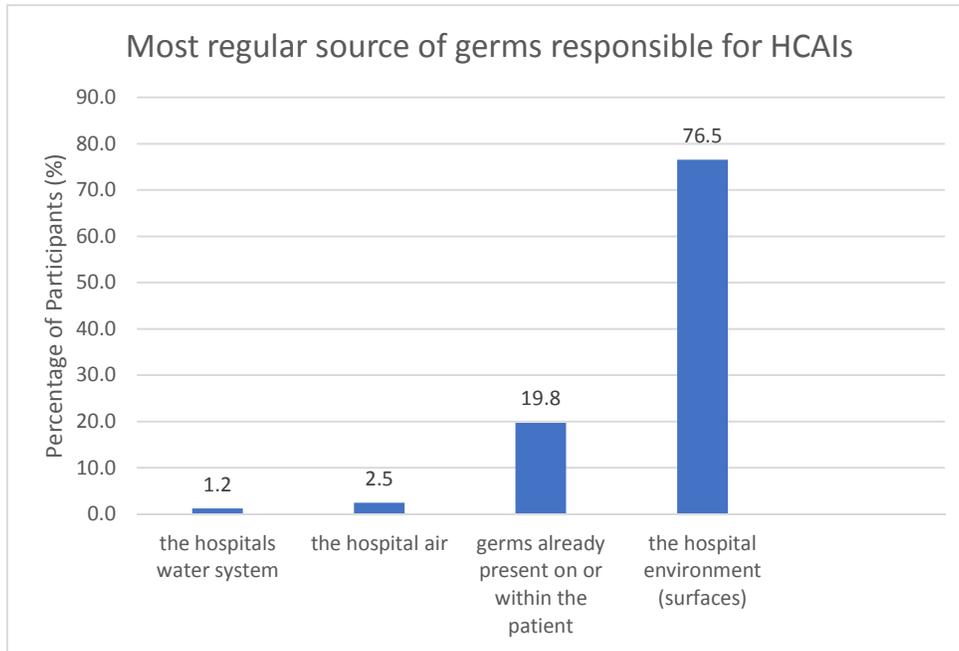


Fig. 2. Most regular source of germs responsible for HCAs

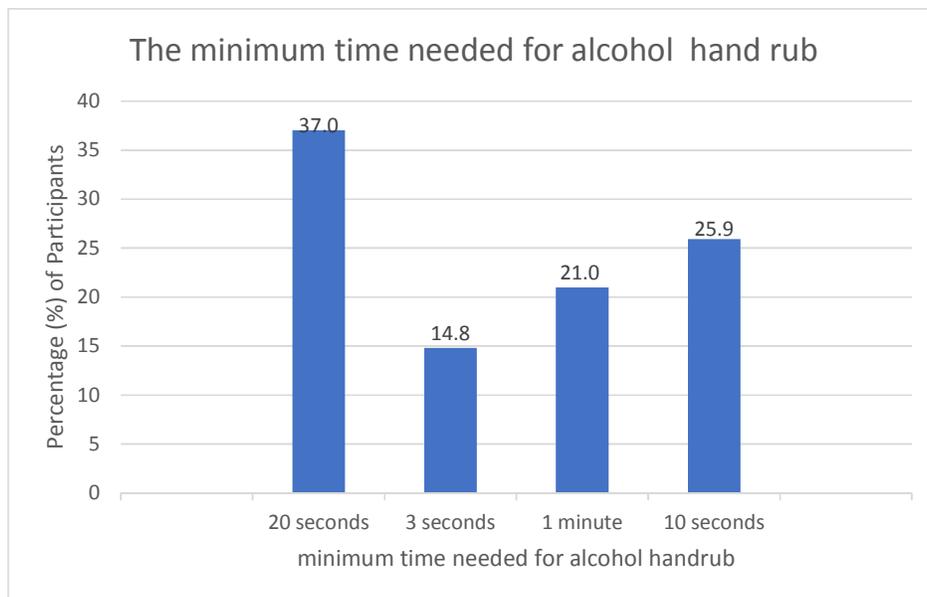


Fig. 3. Minimum time for alcohol-based hand rub to kill most germs on the hands

Table 3. Overall knowledge of the health care workers

Knowledge	Absolute Frequency	Cumulative Percentage (%)
Good (≥ 70%)	0	0
Fair (50 - 69.9%)	61	75.3
Poor (< 50%)	20	24.7
Total	81	100.0

Table 4. Cross tabulation between the categories of HCWs and their Knowledge of Hand Hygiene

Categories	Fair (50-69.9%)	Poor (< 50%)	Total
Nurses	32	18	50
Doctors	29	2	31
Total	61	20	81

$\chi^2 = 8.98, p\text{-value} = 0.0027$

Table 5. Cross tabulation between receiving education in the past 3 years and the knowledge of HCWs

		Knowledge		Total
		Fair (50-69.9%)	Poor (<50%)	
Participants receiving any formal training on hand hygiene in the last 3 years	Yes	52	14	66
	No	9	6	15
	Total	61	20	81

Table 6. Chi square test

	Value
Pearson Chi-Square	2.320
No. of Valid Cases	81

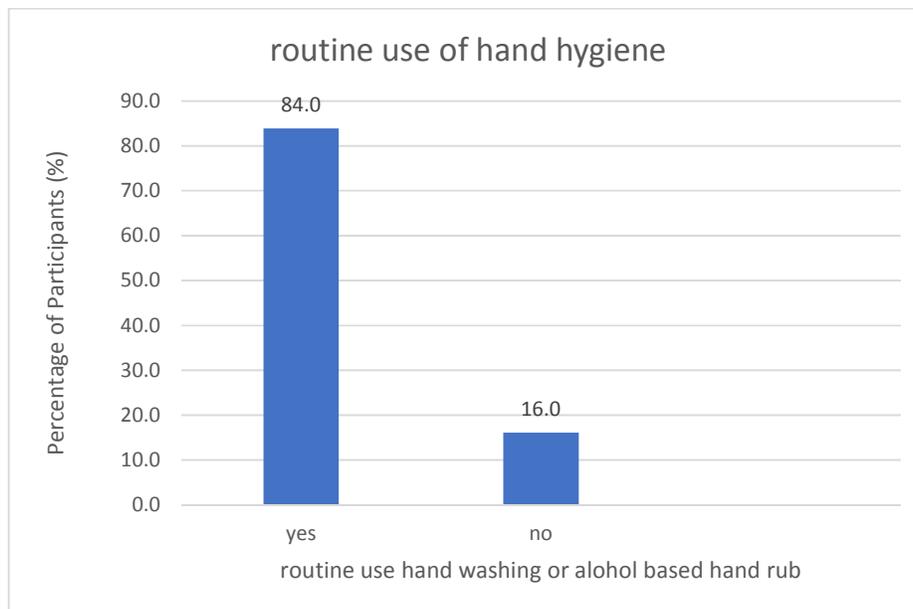


Fig. 4. Responses of HCW on routine use of hand hygiene methods

Table 7. Showing the factors that prevent health care workers from performing hand hygiene

	Yes	No
Lack of time/ too busy due to work load	45 (55.6%)	36 (44.4%)
Forgetfulness	42 (51.9%)	39 (48.1%)
Short patient contact	21 (25.9%)	60 (74.1%)
It is not important	1 (1.2%)	80 (98.8%)

Table 8. Cross tabulation between the professional categories and the routine use of hand hygiene methods

		Regular use alcohol-based hand rub and hand washing for HH		
		yes	no	Total
Profession	nurse	37	13	50
	doctor	31	0	31
Total		68	13	81

Table 9. Cross tabulation between receiving formal education in HH in the last 3 years and routinely using hand hygiene methods

		Routine use alcohol-based hand rub and hand washing for HH		
		Yes	No	Total
did you receive formal training in hand hygiene in the last 3 years	yes	60	6	66
	no	8	7	15
Total		68	13	81

p-value is = .002. there is therefore a statistical association or relationship between receiving formal education 3 years ago on HH and routinely using HH practices

Table 10. Chi-square test for the relationship between receiving formal education in HH in the last 3 years and routinely using hand hygiene methods

	Value
Pearson Chi-Square	12.808 ^a
No. of Valid Cases	81

4. DISCUSSION

Hand Hygiene is a cheap and effective method that has been in existence for centuries to prevent hospital associated infections. This topic has become more relevant in this period of the COVID- 19 pandemic during which effective hand hygiene practices have become a major IPC measure to avert and control distribution of infection.

81.5% of HCWs had received formal training on HH in the past 3 years. 18.5% recorded they had not received any formal training. This observation was similar to that found in other studies conducted in Naivasha District Hospital, Kenya [7]. To build the capacity of HCWs, training from school and regular training during the years of working are essential in increasing the compliance to hand hygiene. A study done at

the Erasmus University Medical Centre, Netherlands showed that education greatly increased the rate of compliance to hand hygiene among HCWs in the NICU by 26.3% [12]. With the current health crises in the world due to the COVID-19 pandemic, the importance, and the role of education on HH in the fight of the disease cannot be over emphasized. Teaching the general population and not just health workers on how to properly wash hands or use alcohol hand rub have become very vital in the management of this disease [8].

With the assessment of the knowledge of HCWs on hand hygiene, when asked about the main source of cross transmission of microorganisms between patients in the facility, 49.9%, representing almost half of the HCWs chose health workers hands when not clean as was the recommendation by the WHO [5]. Although

hands play a vital role, half of the respondents were not in favor of that being the main route of cross transmission. It is established that in almost every patient encounter one needs to perform an activity or the other with the hands in a bid to care for the patient [13]. From the study, hospital environment was chosen by majority of the respondents as the “most common source of germs responsible for HCAs”. This was contrary to the recommendations made by the WHO as they affirmed it was germs already present on or within the patient [14].

All the respondents said they performed HH prior to touching a patient and 91.4% said that after exposure to the immediate surroundings of a patient. All respondents agreed to the fact that HH will prevent transmission of germs to themselves after touching a patient. This showed that HCWs were concerned about patient safety and their safety as well. This was consistent with a study done by Pittet who showed that HCW keeping their hands clean in their line of duty protected both the patients and themselves [15]. However some other studies reporting a contrary view, showed that HCWs were more concerned about transmission of germs to themselves rather than transmitting germs from their hands to the patients [7].

The minimal time needed to perform hand washing or alcohol hand rub according to the WHO is between 20 – 30 seconds [16]. From the results, 37% of the respondents chose the recommended time, making the minority as compared to the rest of the 63% who chose the other options. Though majority of HCWs had received formal training, they were not able to choose the recommended time for performing hand hygiene. The CDC estimates that on an average, HCWs do not perform HH half of the time as they should and in addition as showed by the WHO, HCWs do not mostly adhere to recommended time [5,17]. New guidelines recommend the use of alcohol hand rub when the hands are not visibly soiled due to its availability. However, this does not mean hand washing has been replaced. The reason is that some facilities do not frequently have running water and also may have faulty sinks [16].

In this study, HCW reported the use of HH at the various points of patient care. This is consistent with studies done in other tertiary institutions [18].

From the study, majority of HCWs making up 75.3% of respondents had fair knowledge on

hand hygiene similar to findings in Ethiopian and Iranian studies [19,20,21].

From the chi square/Fischer test, it was found that there was a significant association between the categories of HCWs and their knowledge of HH. Hence the doctors generally had a better knowledge of hand hygiene than the nurses. For many other studies, the trend was similar as most doctors had good to fair knowledge with majority of nurses having poor knowledge [7,18]. From the analysis, it was also observed that there was no statistical association between having received formal training and one's knowledge of hand hygiene. Although there was no significant association, most of the health care workers who had received some form of formal training had fair knowledge.

From this study, more doctors as compared to nurses reported the routine use of hand hygiene. On the contrary a study done in one hospital in the United Kingdom showed that when it came to observed practices of hand hygiene as opposed to self-reporting, the nurses performed hand hygiene most of the time as opposed the doctors since the nurses had more exposure time with patients on the wards and hence routinely practiced hand hygiene [2]. In this study however it was self-reported. An observational study would have given more insight to their practice and how well it was being done.

In most developing countries, lack of facilities and tools for hand hygiene increases the risk of an individual becoming infected with diseases like COVID-19. Across the globe, it is estimated that 2 out of 5 health facilities are not adequately equipped with hand hygiene tools and facilities [9].

Most of the respondents agreed that the lack of time due to their busy schedule prevented them from adequately performing hand hygiene. This was seen in other studies as they reported that the workload prevented them from practicing hand hygiene effectively [20,3].

From the chi square test analysis, there was an association between having received formal training 3 years ago and the routine practice of hand hygiene. Majority of people who had some form of formal training 3 years ago reported higher practice of the routine use of hand hygiene.

We therefore recommend that managers of healthcare institutions should support and openly

promote hand hygiene. Hand hygiene posters must be exhibited at points of care as reminders. Each HCW must receive education at regular intervals on hand hygiene. Each health facility should make alcohol-based hand rub always available at each point of care.

5. CONCLUSION

Most of the health care workers had a fair knowledge on hand hygiene with a few having poor knowledge. Majority of health care workers reported they routinely use hand washing and alcohol hand rub in their daily practice.

Regular education and practice of hand hygiene are essential to prevention of spread of diseases especially during this time of the Covid-19 pandemic.

CONSENT AND ETHICAL APPROVAL

Both authors declare that 'written informed consent was obtained from the respondents for publication of this article. Copies of the written consent are available for review by the Editorial office/Chief Editor/Editorial Board members of this journal.'

Ethical clearance was sought from the University of Cape Coast Institutional Review Board and the Cape Coast Teaching Hospital Ethical Review Board. Consent was sought verbally from the Health Care workers before the questionnaire was administered to them. Copies of the ethical clearance letters are available for review by the editors.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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