# Assessing Healthcare Provider's Skills in the Management of COVID-19 Infection at Busia County Referral Hospital, Kenya

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**ABSTRACT**

***Context:*** The zoonotic coronavirus of 2019 (COVID-19) was caused by an enveloped Ribonucleic Acid (RNA) virus from the Coronaviridae family in the Sarbecovirus subgenus and Severe Acute Respiratory Syndrome – Coronavirus – 2 (SARS-Cov-2) organism. The index case was believed to have originated and transmitted from animals (bats) to humans in November 2019 at the Wuhan live market in China, and subsequently, transmissions were among the human race through direct and indirect contact with respiratory droplets from an infected person(s) to the vulnerable person(s), while talking, sneezing, or coughing. World Health Organization (WHO) declared it a pandemic on March 11, 2020, while in Kenya, it was on March 20, 2020, and by June 11, 2021, Busia County had 3,982 infected individuals, with a positivity rate of 3.9%, 157 being health care providers across all cadres were infected and two deaths reported. Busia County Referral Hospital contributed 30% of the total infected healthcare providers across the seven sub-counties due to non-adherence to standard and transmission-based precautions as guided by the World Health Organization.

***Aim:*** The study assesses the healthcare provider's skills in managing COVID-19 infection at Busia County Referral Hospital in Kenya.

***Methods:*** The study utilized a descriptive cross-sectional study design, using a semi-structured questionnaire to collect qualitative and quantitative data from 153 study subjects stratified per cadre. The data collection tool was adapted from the facility readiness assessment questionnaire for COVID-19 (Centre for Disease Control and Prevention) and the risk assessment and management of exposure questionnaire of healthcare workers in the context of COVID-19 (World Health Organization).

***Results:*** The study reveals that respondents who had worked for shorter duration (1 to 3 years) and were taken through shorter training sessions (1 to 2 days) had higher odds 2.3 and 2.1 ($p = 0.03$) and $p=0.04$), respectively to demonstrate good skills in the management of COVID-19, which was statistically significant. Furthermore, knowledge of five moments of hand hygiene had $p=0.007$, with a higher odds ratio on availability of essential commodities such as gloves 2.5 odds, surgical face masks 3.8 odds, thermos-gun 3.8 odds, designated focal person at triage 6.1 odds and screening checklist 3.2 odds with p-value $\leq 0.05$ enhanced good skills required to curb the pandemic.

***Conclusion*:** Frequent shorter periods of training of the health care providers and the availability of essential commodities for managing COVID-19 enhanced good skills to curb the pandemic infection. Knowledge of the five moments of hand hygiene influences good skills to prevent the spread of COVID-19 infection. The study recommended regular drills on appropriate use of personal protective equipment and adherence to five moments of hand hygiene by healthcare providers as key skills in managing COVID-19 infection. It further recommends establishing and disseminating policy on an essential list of health products and technologies required to manage COVID-19. In addition, the study recommends a further in-depth study on the impact of the mitigation strategies put in place to manage the pandemic.

***Keywords:*** Management, COVID-19, health care providers, skills, Busia County referral hospital

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## 1. Introduction

Coronavirus 2019 (COVID-19) infection is a zoonotic viral infection caused by Severe Acute Respiratory Coronavirus 2 (SARSCov2) that was initially detected in the Huanan seafood and animal market in Wuhan, Hubei province in China on December 29, 2019 *(Habibzadeh & Stoneman, (2020).* The infection spreads through droplet infection for the exposed who did not adhere to standard and transmission-based precautions by WHO, and it was identified as an infection of public health concern within a short span *(WHO, 2020a).* There was scanty knowledge on COVID-19 management, transmission mode, and prevention, which exacerbated its spread. The initial investigations named the etiological agent as the 2019 novel coronavirus. Later, it was designated as SARS-CoV-2, and WHO coined the disease to be Coronavirus disease 2019 (COVID-19) *(Hasöksüz et al., 2020b).*

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By March 11, 2020, infected persons were 118,319, and 42,922 deaths were reported across all WHO regions; hence was declared a pandemic *(WHO, 2020c).* Nine days after the WHO declaration, Kenya also declared a pandemic on March 20, 2020 *(Hope, 2020).* The travel bans and curfews across the country hampered economic activities and affected the country's gross domestic product *(Pape et al., 2021).*

Healthcare service provision requires knowledgeable healthcare providers with essential health products and technologies and inadequate resources to cater to the COVID-19 infection demand. Intensive care unit nurses and pharmacists reported these requirements in *Zeenny et al. (2020)* and *Moradi et al. (2021)* studies that revealed compromised service delivery in managing COVID-19 due to inadequacy of the aforementioned resources.

The pandemic hardest hit low and middle-income countries due to scarcity of knowledge, reliance on information from social media, and inadequate supplies. Kenya was the 6$^{th}$ most affected country in Africa, and the leading in East Africa, with 96,678 COVID-19 infections, 1,685 (1.7%) deaths, and 31 of the infections emanated from the community as of January 3, 2021 *(WHO, 2021).* An Israeli study reported that only 61% of physicians adhered to the guidelines issued by their Ministry of Health in the fight against COVID-19 *(Shahrabani et al., 2022).* While in a study conducted in Turkey reported a significant correlation between COVID-19 precautionary measures and overall management of COVID-19 among healthcare providers *(Kabasakal et al., 2021).* Furthermore, a Saudi Arabia study reported that 82% of healthcare providers adhered to facial mask use *(Albeladi et al., 2021).* All these precautionary measures were geared towards containing the spread.

Busia County included most healthcare workers who were equally affected and infected with the virus globally, occasioned by scanty knowledge about the disease initially. This scanty knowledge instilled fear among them. A study conducted in Korea identified the fear of COVID-19 and the knowledge/awareness about COVID-19 infection as significant factors affecting COVID-19 management among nurses *(Jung & Kim, 2022).*

## 2. Significance of the study

By June 11, 2021, there were 157 COVID-19-infected healthcare providers across the seven sub-counties in Busia County: Bunyala, Samia, Butula, Matayos, Nambale, Teso South, and Teso North. Thirty percent (30%) of the infections were from Busia County Referral Hospital. Two senior healthcare providers in Busia County (an Orthopedic surgeon and a Nurse) succumbed to the disease *(EOC,2021).* The county was among Kenya's top five most affected counties, with 4,980 cases, of which 3.9% were healthcare providers as of June 18, 2021 *(EOC. 2021).*

Being a referral hospital, it received patients from the Busia Border Port Health, who were mostly long-track drivers, patients from the community, and healthcare providers in the hospitals. Some of the patients were managed within the hospital. In contrast, others were managed under Home Based and Isolation Care, based on the Ministry of Health COVID-19 guidelines, once they were assessed and met the home-based and isolation care criteria. Busia County has two official borders (Malaba and Busia), while five Sub Counties border Uganda on land and marine unofficial borders with high traffic to and from East Africa. This location is conducive to COVID-19 cross-border transmission when people interact freely without observing transmission-based precautions (hand hygiene and appropriate face mask use).

Globally, nationally, and in the county, the COVID-19 pandemic has not been fully studied; this provides a lacuna for infodemics from different social media. Gathering information on the evaluation of core skills utilized by healthcare providers in managing COVID-19 was of great importance to dispel rumors and phobias and shape the thinking guided by policy direction and guidelines from authentic sources like the World Health Organization and the Ministry of Health.

The COVID-19 pandemic required each country, county, and health facility to utilize their technical and material resources to contain the infection. Therefore, no country or county was willing to receive referrals of COVID-19-infected patients. Hence, the core precautionary skills (appropriate use of personal protective equipment and adherence to five moments of hand hygiene) were paramount in protecting the health care providers, the patients/clients, and visitors from acquiring the infection, envisaged to provide and strengthen better evidence-based mechanisms to be adhered to and be incorporated in policy document to potentiate the fight against emerging and re-emerging infectious diseases like COVID-19.

Globally, Kenya and Busia County included preventive measures as the only means to curb the spread of COVID-19. The premise necessitated the study to assess the skills required in managing COVID-19 by the healthcare providers in Busia County Referral Hospital.

## 3. Aim of the study

The study aimed to assess the health care provider's skills in managing COVID-19 infection at Busia County Referral Hospital in Kenya.

### 3.1. Operational definitions

*Skills:* Skills critical to preventing COVID-19 from spreading, appropriate use of personal protective equipment, and adherence to five moments of hand hygiene.

*Health Products and Technologies:* These are commodities used to provide healthcare services such as pharmaceuticals, non-pharmaceuticals, and equipment.

## 4. Subjects & Methods

### *4.1. Research Design*

The study adopted descriptive cross-sectional study designs, where data was collected across the stratified cadres to get sampled subjects to provide information that was analyzed and described the performance of the variables.

### 4.2. Study setting

Busia County Referral Hospital was a referral facility for 177 health facilities within Busia County in the Western region of Kenya. The County borders Kakamega (East), Bungoma (North), Siaya (Southeast) counties, Lake Victoria, and Uganda on its west. The hospital had a workforce of 450 technical and non-technical staff (support staff), with 250 beds. Of the technical health care providers (staff) who frequently offer direct healthcare services to COVID-19 patients and come in direct contact with the secretions were 190 (Nurses, medical officers, clinical officers, laboratory staff, and morticians). Less than three kilometers from Kenya Uganda Border Port Health, where all heavy commercial lorries/ trailers pass ferrying goods to East Africa. It has high population interaction that makes it prone to transmission of infectious diseases like COVID-19.

### 4.3. Subjects

All the cadres that frequently come in direct with secretions and offer direct technical care to COVID-19 patients were stratified, and then a simple random sampling method was used to identify study subjects in each of the stratified cadres (Nurses, medical officers, clinical officers, laboratory staff, and morticians) to have representation from all the relevant cadres and 153 study subjects participated in the study.

$$n = \frac{Z^2 pq}{d^2}$$

The sample size was less than 10,000.

$$nf = \frac{n}{1 + \frac{n}{N}}$$

*Cochran, (1963)* formula was used to determine the 153-sample size.

Table 1 below indicates the target subjects for the study and their proportion of contribution to the sample size. The proportion contribution was applied to get the 153 total sample size of interest required for the study.

**Table (1): The proportion of contribution to sample size.**

| Cadre | Target population | % Contribution | Sample size Population |
|---|---|---|---|
| Nursing | 122 | 64.2 | 98 |
| Medical officers | 10 | 5.2 | 8 |
| Clinical officers | 28 | 14.7 | 23 |
| Laboratory staff | 26 | 13.7 | 21 |
| Mortician | 4 | 2.1 | 3 |
| **Total** | 190 | | 153 |

*Inclusion criteria*

- All healthcare workers directly and actively managed COVID-19 patients and infection at Busia County Referral Hospital.
- Healthcare providers who were on duty during the interviews.

*Exclusion criteria*

- Healthcare workers who had active comorbidities like diabetes or TB.
- Healthcare workers infected with COVID-19.
- Expectant healthcare workers.

### 4.4. Tools of data collection

The data collection tools were adapted from Facility Readiness Assessment for Coronavirus Disease 2019 and Risk Assessment and Management of Exposure of health care workers in the context of COVID-19 by picking the relevant questions for the study from the two tools to form the questionnaires. All these tools were adapted from the *(CDC, 2020)* and *(WHO, 2020d)* in the English versions, respectively.

Therefore, the tool was able to replicate findings if used elsewhere. Hence, their validity and reliability had been assured. Relevant questions for the study were picked from all the tools to suit the purpose of forming the semi-structured questionnaire that was used to collect both qualitative and quantitative data in the following domains: The sociodemographic data, assessment knowledge on COVID-19, availability of health products and technologies and skill on appropriate use of personal protective equipment and hand hygiene. At the triage, a checklist was used to ascertain the availability of the health products and technologies (commodities) to promote early detection of COVID-19.

#### 4.4.1. Facility Readiness Assessment for Coronavirus Disease 2019 Questionnaire

The purpose of this questionnaire was to assess the preparation capacities for the COVID-19 surge, in addition to assessing the measures needed to protect the vulnerable population (patients and health care providers) from COVID-19 infection and finally to identify service delivery gaps and major areas that require investment and action, develop a readiness improvement plan for long-term care, including triage and screening, and to help hospital managers optimize their preparation capacities for the COVID-19 surge.

This questionnaire encompassed three sections such as:

- The Availability of COVID-19 screening and health products and technologies at the triage: Ascertains the availability of essential health products and technologies (commodities) to promote early detection of COVID-19 and management. The availability of health products and technologies (commodities) was assessed by checking the availability of essential health products and technologies (supplies) for COVID-19 and their appropriate utilization at the service delivery points.
- The availability of hand hygiene supplies: Assess hand hygiene supplies like soap and running water at the hand washing station or alcohol hand rub at service delivery points to promote adherence to five moments of hand hygiene. In this domain of availability of health products and technologies, the scores were based on their availability with two months of supply and were scored 60%, which is considered an adequate supply.

#### 4.4.2. Risk Assessment and Management Questionnaire Regarding Exposure of Healthcare Workers to COVID-19

This questionnaire was adapted from *(WHO, 2020a)* and *(WHO, 2009)*. The purpose was to identify infection prevention and control breaches and define policies to mitigate healthcare providers' exposure. The tool also aids in risk assessment for healthcare providers after exposure to COVID-19.

The main parts of the blended adapted data collection tool started with demographic characteristics captured in the first tool. It gave information about the characteristics of the respondent's age, gender, religion, cadre, workplace, and duration of service. Interaction with COVID-19 patients was assessed through such questions as "Have you ever come in contact with a COVID-19 patient in your line of duty? Training and skills: Have you been trained in COVID-19 management? If yes, how long was the training?"

Knowledge about COVID-19 and required skilled practices were assessed through such questions: "What are **the** signs and symptoms of COVID-19, management of COVID-19, what are the five moments of hand hygiene? How do you protect yourself from COVID-19 droplet infection?"

Skills on appropriate use of personal protective equipment and adherence to the five-moment hand hygiene: Assess the utilization of skills acquired on appropriate use of PPEs and adherence to the five moments of hand hygiene to contain COVID-19 infection. The data collection tool had five open-ended questions and 30 close-ended questions.

*Scoring system*

The questionnaire captured the key areas like sociodemographic, knowledge, and utilization of available health products and technologies resources in COVID-19 patient care. Scored on the appropriate use of personal protective equipment and adherence to hand hygiene were categorized as always recommended practice score 1. The rest scored zero, which was converted to 100%. A score $\geq 60$ was considered a good skill, based on the Nursing Council of Kenya Clinical Practice Evaluation scoring. Five Moments of Hand Hygiene, management of COVID-19 patients and Personal Protective Equipment and waste management. Correct responses were scored 1, and wrong responses scored zero. The scores for each of the four knowledge sub-domains were added from each respondent and expressed as a percentage. 60% and above scores were considered knowledgeable, and less than 60% were not knowledgeable *(Nyangena et al., 2013).*

### *4.5. Procedures*

The tools have been used globally by WHO and CDC; after the tool modification, the validity and reliability were tested and re-tested at Holy Family Hospital Nangina a month apart, which yielded the anticipated results.

The researcher and the research assistants conducted a pilot Study on 20 subjects at Holy Family Mission Hospital in Nangina (level 4 health facility) on the same stratified cadres; they were not included in the main study.

Data was collected from Health Care Providers by three research assistants, who had been trained on COVID-19 infection prevention and control measures and were taken through a two-day training on the data collection tools. They were provided with surgical face masks, portable alcohol hand rubs, and disposable gowns to use while on duty; this was meant to protect them from transmission of infection.

Research Assistants conducted the interviews with 25 participants during the pilot study, cutting across all the relevant stratified cadres using the adapted tools from WHO and Centers for Disease Control and Prevention (CDC). The tools have been tested and used in different healthcare settings across the globe to elicit results for informed decision-making by the two organizations.

The duty roster (sampling frame) for staff on duty each day was used to randomly sample the study participants after stratifying the Health Care Providers into respective cadres.

The data collection took four months to reach all the relevant study subjects from February to June 2022.

The questionnaires were used to collect both qualitative and quantitative data. The data was collected following demographic characteristics of the respondents, their knowledge of COVID-19, critical health products and technologies to contain the pandemic, and adherence to infection prevention and control skills (hand hygiene and appropriate use of personal protective equipment) to curb the spread.

Ethical Consideration: Authority was sought from Masinde Muliro University of Science and Technology Research and Ethics Committee and the National Commission of Science and Technology Institute (NACOSTI) for approval of the study. Authority was granted by the Busia County Department of Health and Sanitation, Holy Family Mission Hospital - Nangina, and Busia County Referral Hospital for access to the study sites and subjects.

Informed consent was sought, and the anonymity of the respondents was upheld. All data and information collected from respondents was confidential and placed under lock and key. The soft copy access had password that the researcher maintained.

The data was processed into information to be consumed by all the beneficiaries, including the author's dissertation for a master's program in nursing.

### *4.6. Data analysis*

Quantitative data was cleaned, coded, sorted, entered into the computer, and analyzed using the Statistical Package for Social Sciences (SPSS) version 27. Descriptive statistics, including determining the means, standard deviations (SD), and range, were performed. At the same time, the associations of independent and dependent variables were tested using bivariate logistic regression, the outcome being skilled practice. Odds Ratio (OR) was used to test the strength of association between independent and dependent variables, and the null hypothesis of no association between independent and dependent variables was rejected if the p-value $\leq 0.05$) at 95% CI.

## 5. Results

Table 2 describes the sociodemographic information of the respondents in terms of gender, age, religion, cadre, and their respective service delivery points. Most respondents were females (59.5%) aged 25–35 years 57.5%, Christian religion 98.7%, and nurses 60.8%, working in the medical inpatient wards (28.1%).

Figure 1 indicates the percentage distribution of the respondents' interaction with COVID-19 patients that the respondents were exposed to and had direct contact with COVID-19 patients and secretions were 82% (126 out of the n=153). The frequency of interaction with COVID-19 patients and secretions were varied. The majority (44%) at least contacted the patient once, while about 18% had not contacted the patients.

Table 3 shows the association between experience, training, and skill level. Respondents who had worked for 1–3 years were more than two times more likely to demonstrate good skills in COVID-19 management, with a p-value of 0.03. The same was true for those trained for 1–2 days with a p-value of 0.04.

Table 4 shows the association between the utilization of knowledge on symptoms, management of COVID-19, and five moments of hand hygiene, personal protective equipment, and waste management and skills levels. Respondents who knew about the five moments of hand hygiene were about three times more likely (OR 2.9) to adhere to appropriate opportunities for hand hygiene, which was statistically significant, represented by a p-value of 0.007.

The health products and technologies at the triage were 89% often available on average, and this enhanced screening of persons entering the hospital for COVID-19 at the triage entrance with two tents with seats (screening and respiratory waiting area). Figure 2 illustrates the availability of supplies for screening clients and patients seeking healthcare services in the facility. The supplies were stationed at the entrance to the hospital. The figure shows that a thermos gun was available (90.9%), a safety box (98.7%), screening at triage was performed in 95.4% of visitors, 91.5% there was a designated person at the triage, and 94.8% there was color-coded waste bin buckets.

Table 5 indicates the knowledge of the availability of respective health products and technologies and their utilization to enhance skills. The presence of the gloves, surgical face masks, thermos-gun, designated person at triage, and screening checklist was statistically significant to promote good skills with a p-value less than 0.05.

Figure 3 shows the percentage distribution of the available supplies required to promote adherence to hand hygiene practice. Alcohol hand rub was 87.6%, liquid soap 83.7%, running water 86.9%, and paper towel 3.9% available at the service delivery points.

Table 6 indicates the core skills assessed based on the opportunity presented: Appropriate wearing and removal of personal protective equipment and adherence to five moments of hand hygiene for those who had come in contact with COVID-19 patients and secretions. Most of the respondents assessed had worn face masks and utilized the gloves appropriately at 98.4% and 84.1%, respectively. Face shields and goggles had 4.8%. The majority adhered to the five moments of hand hygiene, 94.4% after exposure to body fluids, and 89.7% after touching the COVID-19 patients, respectively, as the opportunity presented.

**Table (2): The frequency and percentage distribution of demographic characteristics of the respondents (n=153).**

| Variables | No. | % |
|---|---|---|
| **Gender** | | |
| Male | 62 | 40.5 |
| Female | 91 | 59.5 |
| **Age in completed years** | | |
| 25 – 35 | 88 | 57.5 |
| 36 – 45 | 56 | 34.6 |
| 46 – 55 | 6 | 3.9 |
| Above 56 | 6 | 3.9 |
| **Religion** | | |
| Christian | 151 | 98.7 |
| Muslim | 2 | 1.3 |
| **Cadre** | | |
| Nurse | 93 | 60.8 |
| Medical Officer | 8 | 5.2 |
| Clinical Officer | 24 | 15.7 |
| Laboratory staff | 25 | 16.3 |
| Mortician | 3 | 2.0 |
| **Service delivery point** | | |
| Outpatient | 36 | 23.5 |
| Maternal child health | 8 | 5.2 |
| Inpatient medical | 43 | 28.1 |
| Inpatient surgical | 5 | 3.3 |
| Maternity | 28 | 18.3 |
| Laboratory | 24 | 15.7 |
| Others (mortuary, admin, billing) | 9 | 5.9 |

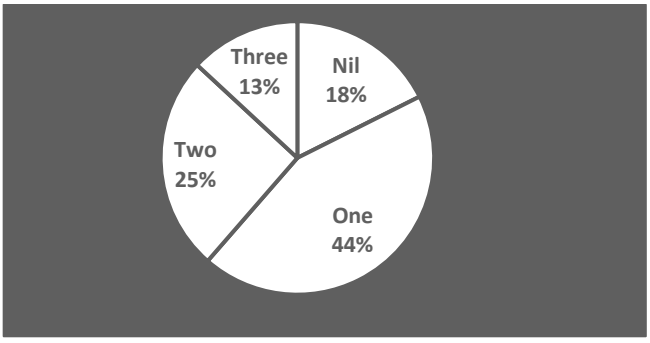


**Figure (1): Percentage distribution of respondents' interaction with COVID-19 patients.**

**Table (3): Association between training and skills among the studied respondents (n=153).**

| Independent variables | n | Skills | | OR | 95% CI | P-Value |
|---|---|---|---|---|---|---|
| | | Good >60% | Poor < 60% | | | |
| **Duration in service delivery in years** | | | | | | |
| 1–3 | 70 | 74.3 | 25.7 | 2.3 | 1.1–4.9 | 0.03 |
| ≥4 | 56 | 55.4 | 44.6 | | | |
| **Trained on recognition of COVID-19 Symptoms** | | | | | | |
| Yes | 113 | 67.3 | 32.7 | 1.8 | 0.6–5.6 | 0.36 |
| No | 13 | 53.9 | 46.1 | | | |
| **Length of training in days** | | | | | | |
| 1–2 | 74 | 73.0 | 27.0 | 2.1 | 1.0–4.5 | 0.04 |
| ≥3 | 52 | 55.8 | 44.2 | | | |

**Table (4): Association between knowledge of COVID-19 and required skilled practices (n=153).**

| Independent variables | n | Skills | | OR | 95% CI | P-value |
|---|---|---|---|---|---|---|
| | | Good ≥60% | Poor <60% | | | |
| **Knowledge of signs and symptoms of COVID-19** | | | | | | |
| Yes | 37 | 70.3 | 29.7 | 1.3 | 0.6–3.0 | 0.50 |
| No | 89 | 64.0 | 36.0 | | | |
| **Knowledge of management of COVID-19** | | | | | | |
| Yes | 19 | 57.9 | 42.1 | 0.7 | 0.2–1.8 | 0.43 |
| No | 107 | 67.3 | 32.7 | | | |
| **Knowledge of Five Moments hand hygiene** | | | | | | |
| Yes | 59 | 78.0 | 22.0 | 2.9 | 1.3–6.3 | 0.007 |
| No | 67 | 55.2 | 44.8 | | | |
| **Knowledge of PPEs and waste management** | | | | | | |
| Yes | 55 | 61.8 | 38.2 | 0.7 | 0.3–1.5 | 0.40 |
| No | 71 | 69.0 | 31.0 | | | |

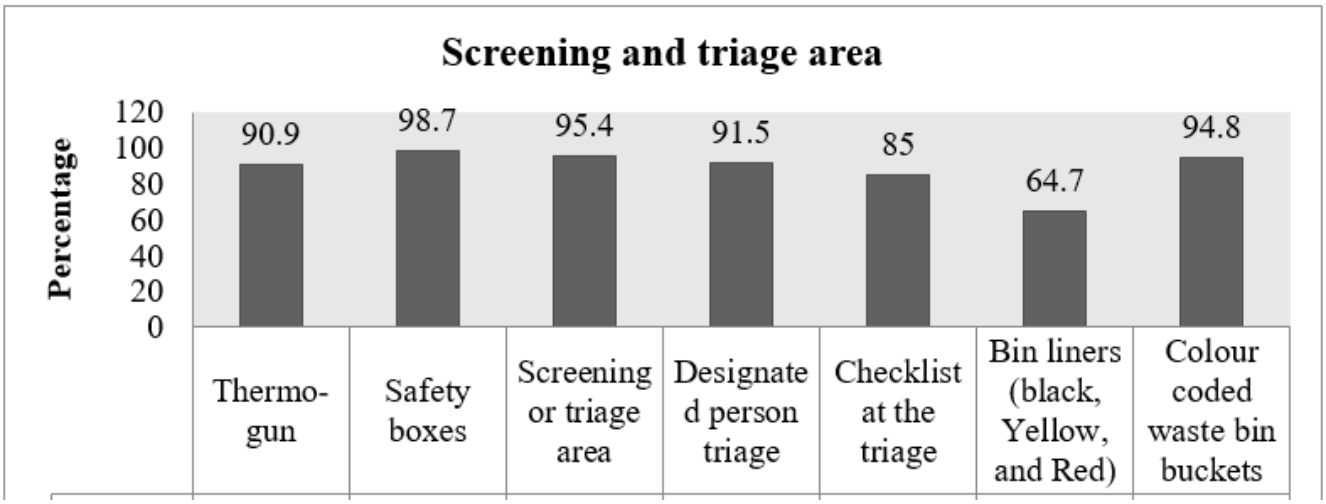


**Figure (2): Percentage distribution of the availability of COVID-19 screening and triage supplies.**

**Table (5): Association between availability of health products and technologies and skills (n=153).**

| Independent variable | n | Skills | | OR | 95% CI | P value |
|---|---|---|---|---|---|---|
| | | Good ≥60% | Poor <60% | | | |
| **Gloves** | | | | | | |
| Yes | 34 | 79.4 | 20.6 | 2.5 | 1.0–6.3 | 0.05 |
| No | 92 | 60.9 | 39.1 | | | |
| **Gown** | | | | | | |
| Yes | 78 | 67.9 | 32.1 | 1.3 | 0.6–2.7 | 0.53 |
| No | 48 | 62.5 | 37.5 | | | |
| **Apron** | | | | | | |
| Yes | 63 | 63.5 | 36.5 | 0.8 | 0.4–1.7 | 0.57 |
| No | 63 | 68.3 | 31.7 | | | |
| **Goggles** | | | | | | |
| Yes | 44 | 65.9 | 34.1 | 1.0 | 0.5–2.2 | 0.99 |
| No | 82 | 65.9 | 34.1 | | | |
| **Surgical face mask** | | | | | | |
| Yes | 115 | 68.7 | 31.3 | 3.8 | 1.1–13.9 | 0.04 |
| No | 11 | 36.4 | 63.6 | | | |
| **Sanitizer** | | | | | | |
| Yes | 115 | 67.6 | 32.4 | 1.8 | 0.6–5.4 | 0.27 |
| No | 11 | 53.3 | 46.7 | | | |
| **Liquid soap** | | | | | | |
| Yes | 107 | 67.3 | 32.7 | 1.5 | 0.6–4.1 | 0.43 |
| No | 19 | 57.9 | 42.1 | | | |
| **Jik** | | | | | | |
| Yes | 111 | 68.5 | 31.5 | 2.5 | 0.8–7.4 | 0.09 |
| No | 15 | 46.7 | 53.3 | | | |
| **Thermo-gun** | | | | | | |
| Yes | 115 | 68.7 | 31.3 | 3.8 | 1.1–13.9 | 0.04 |
| No | 11 | 36.4 | 63.6 | | | |
| **Screening triage** | | | | | | |
| Yes | 120 | 67.5 | 32.5 | 4.1 | 0.7–23.7 | 0.18 |
| No | | 33.3 | 66.7 | | | |
| **Designated person at triage** | | | | | | |
| Yes | 115 | 69.6 | 30.4 | 6.1 | 1.5–24.3 | 0.008 |
| No | 11 | 27.3 | 72.7 | | | |
| **Screening checklist at the triage** | | | | | | |
| Yes | 105 | 70.5 | 29.5 | 3.2 | 1.2–8.3 | 0.01 |
| No | 21 | 42.9 | 57.1 | | | |

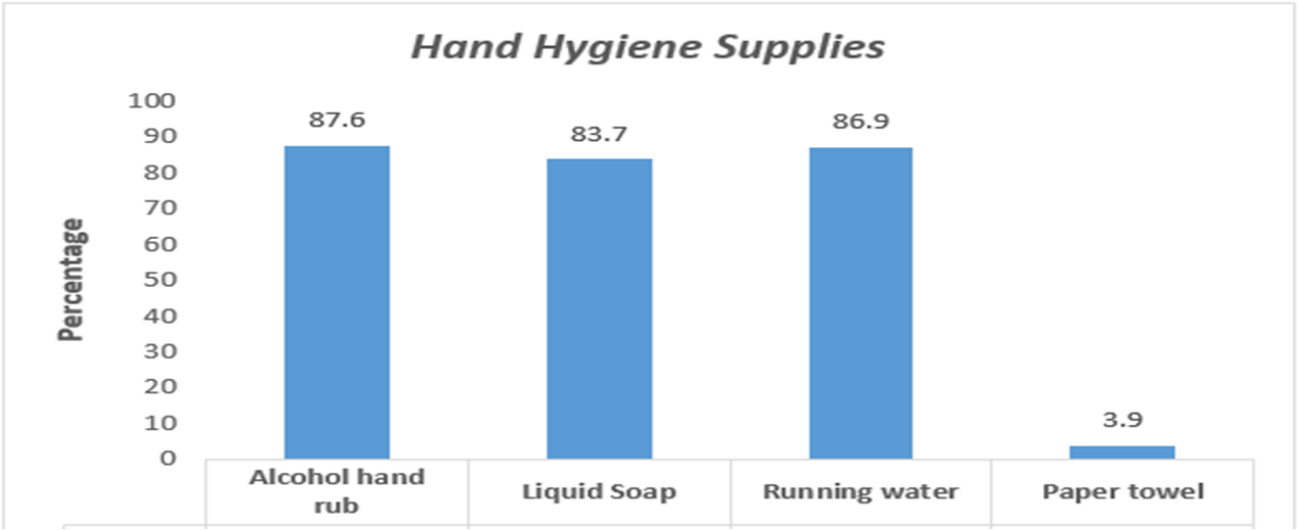


**Figure (3): Percentage distribution of the availability of hand hygiene supplies.**

**Table (6): Percentage distribution of skills on appropriate use of personal protective equipment and adherence to the five-moment hand hygiene.**

| Skills | Adherence score |
|---|---|
| Wearing personal protective equipment | 98.4 |
| Wearing a single-use glove (examination glove) | 84.1 |
| Wearing a medical surgical face mask | 96.8 |
| Wearing face shield/goggles/protective glasses | 4.8 |
| Wearing disposable gown | 8.7 |
| Removing and replacing Personal Protective Equipment according to the protocol | 62.7 |
| Hand hygiene before touching COVID-19 patient(s) | 77 |
| Hand hygiene before cleaning or aseptic procedure (insertion cannula, catheterization, intubation) | 79.4 |
| Hand hygiene after exposure to body fluid(s) | 94.4 |
| Hand hygiene after touching the COVID-19 patient | 89.7 |
| Hand hygiene after touching the COVID-19 patient(s) surrounding(s) (bed, door handle, drip stand) | 72.2 |

## 6. Discussion

COVID-19 is a zoonotic communicable infectious disease. The World Health Organization (WHO) Infection and Prevention Control (IPC) standards *(WHO, 2019)* recommended that IPC should be in place at the level of the health care system right from the National to Facility level, to offer minimum protection and safety to healthcare workers, patients, and visitors. These recommendations were anchored on the WHO core components for IPC programs, including strategies to control the outbreak, such as early recognition, source control, and taking necessary standard and transmission-based precautions *(WHO, 2020b).* So, this study aims to assess the healthcare provider's skills in managing COVID-19 infection at Busia County Referral Hospital in Kenya.

Concerning demographic characteristics of the studied respondents, it was revealed that the female gender aged 25 to 35 years from the Christian faith in the nursing cadre was the majority, with more than fifty-seven point two percent. This finding was proportionate to the population of the health workforce, where nurses of the female gender were the majority, and the facility has a huge Christian faith populace. Most of the opportunities presented were at the medical wards, followed by outpatients, maternity, and laboratory. This service delivery point has a high human traffic flow seeking healthcare services or coming to check on their loved ones admitted to the hospital.

The pandemic has affected many people across the globe whom healthcare providers were managing. The study agreed with more than two-thirds of the respondents who reported interacting with COVID-19 patients in their line of duty. COVID-19 virus does not walk; it is transmitted through respiratory droplets from the infected person to the vulnerable person, who can be a patient/client or healthcare provider. It was mandatory to observe standard and transmission-based precautions. Those who did not comply got infected *(Wang et al., 2020).*

This study reveals that healthcare providers who had been in service for 1 to 3 years and trained for two days or less on COVID-19 demonstrated good skills in COVID-19 management. Capacity building of healthcare providers through short-term training improves their competency and the right attitude to fight the menace; this was confirmed by a study in China where healthcare providers trained for 16 hours demonstrated good skills in fighting COVID-19 *(Zhang et al., 2020)*. On the flip side, the knowledge deficit perpetuates phobia amongst healthcare providers, resulting in increased infection rates, as was realized with increased incidents during the initial phases of COVID-19 infection in 2020 *(WHO, 2021).*

This study finding reveals that most respondents with knowledge of five moments of hand hygiene and interacted with COVID-19 patients were two point nine times more likely to demonstrate adherence to good hand hygiene skills where health products and technologies were available. Knowledge and practical exposure to real life-threatening condition(s) improved adherence to good skills such as appropriate use of face mask and sticking to the five moments of hand hygiene to curb the pandemic and save lives. Furtherance the good skills cannot be achieved without the availability of essential health products and technologies to synergies the knowledge acquired and enhance adherence to five moments of hand hygiene and appropriate use of personal protective equipment, as was confirmed by a study conducted in Siera Leone, where 98.8% of knowledgeable health care providers adhered to five moments of hand hygiene, and practice regular hand hygiene in the fight against the pandemic successfully *(Kanu et al., 2021).*

The triage area was dedicated to screening all persons entering the health facility; this provided an opportunity for early detection of COVID-19 via symptoms and signs, then referring the suspected client(s) or patient(s) to a clinician for further investigation and confirmation of the diagnosis. Almost all of the supplies required at the triage were always available, and most persons visiting the health facility, whether as patients, clients, or health care providers, had to be screened for the disease at the triage. Early disease detection makes it easier to conduct defaulter tracing to contain the spread from the source and save the vulnerable population. Therefore, Countries need to focus on early detection of the outbreak at the triage and filling attestation forms to minimize contamination *(Hanvoravongchai et al., 2010).*

This study finding demonstrates that the availability of gloves, surgical face masks, thermal guns, having a designated person at triage, and screening checklists were significantly associated with good skills. Triage was manned

by a COVID-19-trained healthcare provider equipped with essential supplies to pick up COVID-19 signs and symptoms early and refer them as appropriate to clinicians. Hence, appropriately quantifying and forecasting these essential supplies for COVID-19 was paramount to minimize the spread and promote good practice and skills. To curb COVID-19 infection, healthcare providers were provided with portable alcohol hand rubs and face masks on a need basis to protect them from spreading the virus by observing transmission-based precautions like the use of face masks and adherence to five moments of hand hygiene. This finding was confirmed in a study conducted in Sierra Leone *(Kanu et al., 2021),* wherein the availability of supplies promoted good skills.

Contrary to this approach, inadequate supplies of health products and technology (HPTs) compromise COVID-19 management *(Zeenny et al., 2020).* This finding echoed live science, where inadequate medical facilities and supplies to manage the COVID-19 pandemic surge of severe and critically ill patients compounded the skills required to mitigate its spread *(Aubree, 2020).* Some countries like New Zealand, Germany, Hong Kong, and South Korea reported lower case fatalities than Europe and the United States, attributed to early detection, many testing population samples, and swift preventive measures *(Worldmeter, 2020).*

Hand hygiene has been the best strategy to contain most communicable infections like COVID-19. The availability of critical supplies like alcohol, hand rub, soap, running water, and paper towels is of paramount importance to promote adherence to the five moments of hand hygiene. The study finds that most supplies were within reach in the health facility at the service delivery point, apart from a paper towel only in the tuberculosis clinic. WHO emphasizes hand hygiene to prevent COVID-19 infection as a standard precaution *(CDC, Guideline for Hand Hygiene in Healthcare Settings, 2002)*. This finding was emulated in a Malaysian study, where 87.8% successfully practiced proper hand hygiene in the fight against COVID-19 *(Azlan et al., 2020).*

There was no treatment for COVID-19; patients had to be managed symptomatically, adhering to precautionary measures such as appropriate use of personal protective equipment and five moments of hand hygiene. This study identified that most of the respondents had personal protective equipment in their respective service delivery points, while around three-fourths of them adhered to hand hygiene to facilitate reducing its spread. It was important for healthcare workers to be equipped with the right knowledge, attitude, and health products and technologies to facilitate adherence to the standard and transmission-based precautions in the pandemic battle. Hence, strict adherence to contact and airborne precautions by the Health Care Providers caring for the infected patients were the key measures to be observed (WHO, 2020). Therefore, skills in the appropriate wearing of personal protective equipment and adherence to five moments of hand hygiene were and still are important in the fight against COVID-19.

However, the study conducted in Wuhan, China, reported 31% infected HCPs in the general ward, 17.5% in the emergency department, and 5% in Intensive Care Unit (ICU) in a non-communicable disease health facility, during the initial outbreak, due to poor adherence to hand hygiene and inappropriate consistent use of personal protective equipment *(Wang et al., 2020).* According to the *MOH (2010),* Infection Prevention and Control strategies to prevent or limit transmission in healthcare care settings include the establishment of an infection prevention and control committee, triage and source control of the suspected COVID-19 patients, five moments of hand hygiene, appropriate use of personal protective equipment. It is, therefore, imperative to adhere to the guidelines *(MOH, 2021).*

## 7. Conclusion

Frequent COVID-19 on-the-job mentorship, coaching, Continuous Medical Education, and training improve knowledge and skills that promote good skills. The availability of essential COVID-19 Health Products and Technologies enhances adherence to good skills. Consistent good skills in adherence to five moments of hand hygiene and appropriate utilization of personal protective equipment curb the pandemic spread (COVID-19 infection). This study rejected the null hypothesis that there was no relationship between knowledge, health products, technologies, and good skills in the management of COVID-19 by healthcare providers in Busia County Referral Hospital.

## 8. Recommendations

- The Ministry of Health national training team should incorporate more time on drills to improve and sustain skills and adherence to standard and transmission-based precautions on COVID-19 management.
- The Ministry of Health should develop a list of essential health products and technologies required to manage COVID-19 and disseminate it to all counties.
- Kenya and Busia County should invest in Vocational Training Centre and Technical Universities to make their own medical and personal protective equipment.
- The Department of Health and Sanitation–Busia County should customize policies on mitigation strategies and operationalize and share them with healthcare providers in their respective service delivery units.
- Further in-depth study on the impact of mitigation strategies in managing COVID-19.

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