

Assessing Infection Prevention Adherence and related factors among Health-care Workers in Covid-19 Era at a Regional Health Facility in Ghana; An Institutionalized Based Study

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Abstract

Introduction: The COVID-19 disease is a global problem. Healthcare providers who are at the forefront of caring for, educating and treating the infected patients are at a higher risk of contracting the disease. Effective infection control measures prevent the spread of the disease, especially among medical practioners. This study aimed to determine knowledge, attitudes, and adherence to infection prevention and related factors among healthcare workers in the COVID-19 era at Bono Regional Hospital.

Methodology: A descriptive cross-sectional design was employed and (n=348) respondents were selected using a simple random sampling technique. A validated and structured questionnaire was administered face-to-face to assemble data. the Statistical Package for Social Sciences (SPSS) version 26 (USA) was used to analyze study data. Both descriptive and inferential statistics were conducted and at a 95% level of confidence and an alpha value set at <0.05, the relationship between the outcome and explanatory variables was considered significant statistically.

Results: Respondents' had 52.3% adequate knowledge and 50% adequate attitudes towards infection prevention and 72.1% good adherence to infection prevention practices. Related factors such as diploma education, seminar on infection control and availability of infection prevention protocol significantly predicted providers good adherence to infection prevention and control.

Conclusion: Respondents' adequate knowledge and attitudes significantly contributed to good adherence to infection prevention. Continuous training and seminars on infection prevention and control could help improve respondents' knowledge with a subsequent increase in attitudes and practices towards preventing and controlling infection, especially during a disease outbreak.

Keywords: Adherence, Attitude, COVID-19, Hospital, Infection, Knowledge

1.Introduction

The emergence of COVID-19 became a global public health threat, negatively impacting healthcare professionals [1,2]. Droplet infection and close contact with the infected host can transmit COVID-19 disease from one host to another [3-5]. The outbreak threatened the health of most healthcare practitioners and, as a hospital-acquired infection, patients and relatives were

also at risk of infection [4,6,7-11]. Despite adverse health effects, public health practitioners continued to provide effective services to protect and safeguard the health of populations [6, 8, 12]. Occupational exposure to infectious diseases has been shown to be responsible for 40% of the malaise of healthcare practitioners worldwide and inadequate infection control is responsible for the exposure of three million healthcare practitioners to pathogenic

microbes making hospital-acquired infections a significant threat to most health professionals in low- and middle-income countries due to increased morbidity and mortality [9, 13]. Effective infection prevention and control is one of the most public health interventions globally accepted to decrease the spread of COVID-19, especially in healthcare institutions [9, 14, 15]. To achieve optimal control of infections, healthcare practitioners' knowledge, attitudes and adherence to practices were paramount to protecting and reducing the spread of the COVID-19 disease [15, 16].

In Ghana, the prevalence of nosocomial infections among healthcare practitioners was 6.7% due to inadequate adherence to infection control [15]. This has motivated most health authorities in the country take preventive measures to curb the spread of infectious diseases such as COVID-19. Measures such as social distancing, provision and use of personal protective equipments, medical logistics for effective handwashing, and waste management policies, among others reduce the spread of the disease [17, 18]. Despite these interventions, around 6.5% of the total staff at Bono Regional Hospital contracted the COVID-19 disease, which affected staff performance (Disease Control Unit, 2022). In addition, there is a paucity of data on health service practitioner's knowledge, attitudes and adherence to infection prevention practices in hospitals during the COVID-19 pandemic era. A gap that this study sought to fill. As a result, this study aimed to assess knowledge, attitudes, and related factors for adherence to infection prevention and control among healthcare workers during the era of COVID-19 at Bono Regional Hospital, Ghana.

2.1. Methods and Materials

2.1.1. Study Design

This quantitative study employed a descriptive cross-sectional design which was deemed appropriate for the study because it allowed the investigator to recruit the eligible respondents at a single point in time across sections of clinical staffs recruited into the study.

2.1.2. Study Population

The study was conducted from September 2022 to February 2023 and included healthcare professionals from the hospital that formed the study population. This was deemed appropriate as during the era of the COVID-19 pandemic, they were the frontline health workers exposed to various types of infections and involved in routine infection prevention activities. Eligible and consented respondents were included in the study. Respondents who were on annual leave and those who refused to consent were excluded from participation.

2.1.3. Sample Size

Using the Yamane formulae
with a 5% unresponsive rate, a sample size of 348 was estimated for the study.

2.1.4. Sampling Technique

Eligible and consented clinical staff recruited for the study were stratified into stratum based on their professional affiliation. Each

stratum consisted of clinical staff of fifty or more, working on a rotating basis. Approximately 19-20 eligible respondents were recruited into the study each week. Using staff attendance records as a sampling frame, a simple random sampling technique was used to recruit eligible respondents to the study. Slips of paper were labeled Yes and No and placed in a closed box, which was shaken vigorously to allow the respondent to select one without substitution. Respondents who randomly selected yes was included in the study and questionnaire administered, while those who selected no were thanked and excluded. Participating employees were assigned special identifiers such as codes in order not to recruit them for the subsequent study

3. Data Collection Instrument and Technique

A structured and validated questionnaire was used to gather study data. The questionnaire was structured based on the specific objectives outlined. The questionnaire consisted of four (4) sections: (A) Socio-Demographic Characteristics. Section (B): Knowledge of infection prevention among respondents which comprised ten questions to determine the knowledge of respondents on infection prevention during the COVID-19 era. Section (C): Attitudes of respondents influencing adherence to infection prevention during the COVID-19 era. This section was made up of ten (10) questions that collected data on the attitudes that contribute to infection prevention practices. Section (D): respondents' adherence to practices for infection prevention. The section consisted of fifteen (15) questions on the practices that influence adherence to infection prevention among respondents during the COVID-19 era. The data collection was conducted by the investigators of the study. Individual respondents were interviewed face-to-face separately to ensure confidentiality and privacy. The data collection lasted for 24 consecutive weeks until the estimated sample size of 348 was obtained.

3.1. Data Analysis

Data were coded, managed and entered into the Statistical Package for Social Sciences (SPSS) version 26, USA. Descriptive analysis was conducted at the Univariate level and findings were presented in frequencies and percentages. A test of association and binary logistics regression was conducted to determine the odds of the relationship between the dependent variable and the independent variable in the multivariate model. A correlational and multilinear regression was conducted between respondents' knowledge, attitude and adherence to infection prevention practices. At a 95% level of confidence, an alpha value < 0.05 was considered significant. The knowledge of respondents was scored by summing all responses of respondents. The mean score of participant's knowledges was 15.63 ± 3.29 , As adequate knowledge (≤ 15.63) and inadequate (≥ 15.63). The average score of respondents' attitudes towards infection prevention was 32.58 ± 5.45 . An adequate attitude if the score is ≤ 32.58 and an inadequate attitude when the score is ≥ 32.58 . The mean score of respondents' adherences to practices was 21.22 ± 5.97 . This was categorised as adequate adherence practices when the score is ≤ 21.22 and inadequate practices when the score was ≥ 22.23 .

3.2.1. Research Ethics

Study ethics was obtained from the Ghana Health Service Ethics Review Committee with ethics review protocol number **GHS-053/09/22**. Data collection commenced after informed consent was obtained from respondents. Respondent's participation in the study was strictly voluntary. Respondents were informed that they have the right to withdraw from the study at any point after their initial acceptance to participate in the study.

4. Results

The study recruited 348 healthcare practitioners and there was a

100% response rate. The mean age of respondents was 31±6 years. About (35.1%) of respondents were between the ages of 26-30 years whilst (25.0%) fell between the age (of 31-35) years. Most (67.0%) of respondents were females compared to males. About (57.8%) of respondents were single while (39.9%) were married. The majority (91.7%) were Christians. Most of the practitioners were nurses/midwives 228(65.5%). About 216(62.1%) of the respondents had a diploma education whilst 105(30.2%) had attained their first degree (table 1).

Variable	Category	Frequency	Percentage (%)
Age (years)			
	20-25years	69.0	19.8
	26-30years	122	35.1
	31-35years	87	25.0
	36-40years	48	13.8
	41-45years	11	3.2
	46-50years	6	1.7
	51-55years	4	1.1
	56-60years	1	0.3
Sex			
	Male	115	33.0
	Female	233	67.0
Years of service			
	1-10 years	300	86.2
	11-20 years	46	13.2
	21-30 years	2	0.6
Marital status			
	Married	139	39.9
	Single	201	57.8
	Co-habiting	8	2.3
Religion			
	Islam	25	7.2
	Christian	319	91.7
	Other	4	1.1
Education			
	Basic education	14	4.0
	Secondary education	5	1.4
	Diploma	216	62.1
	Degree	105	30.2
	Masters	8	2.3
Cadre of staff			
	Nurse/midwife	228	65.5
	Physicians	27	7.8
	Laboratory technician	15	4.3
	Pharmacist	9	2.6

	Public health staff	5	1.4
	Other staff	64	18.4
Presence of IPC protocol in a ward/department			
	Yes	290	83.3
	No	58	16.7
Attends IPC Seminars			
	Yes	193	55.5
	No	155	44.5
Training on infection control			
	Yes	285	81.9
	No	63	18.1
IPC: Infection Prevention and Control			

Table 1: Distribution of sociodemographic characteristics of healthcare practitioners

Most (87.1%) of the respondents agreed that they were aware of COVID-19 prevention practices at the facility. About (68.4%) agreed of the use of gloves is not able to provide complete protection against the transmission of the COVID-19 virus. About (59.5%) of the respondents agreed that the disease-causing organism of healthcare practitioners can be found on the normal and intact patient skin of infected host. Most (88.5%) of respondents indicated, hand washing with soap and water or alcohol-based anti-septic reduces their risk of transmitting hospital-acquired infections. About (67.0%) agreed of applying alcohol-based antiseptics for hand hygiene is as effective as soap and water if hands are visibly soiled. About (77.9%) of respondents agreed

that gloves decrease the contamination of the hand but do not prevent infection. Moreover, about (72.1%) disagreed that there is no need to wash hands before attending to procedures that do not involve bodily fluids. Additionally, 41.1% agreed, and 51.1% disagreed that, there is no need to wear the same pair of gloves for multiple patients as long as there is no visible contamination. Furthermore, about (64.1%) agreed and (21.0%) were not sure of the level of safety boxes should be three-quarters full before closing and sealing. About (85.6%) agreed that there are specific waste disposal buckets according to their level of contamination while 7.5% were not sure (table 2). during the COVID-19 era

Variable	Agree n(%)	Not sure n(%)	Disagree n(%)
I am aware of infection prevention practices at this health facility	303(87.1)	25(7.7)	20(5.7)
The use of gloves cannot provide complete protection against transmitting or acquiring infections such as the COVID-19 virus	238(68.4)	59(17.0)	59(14.7)
Disease-causing organisms of healthcare workers can be found on normal and intact patient skin	207(59.5)	73(21.0)	68(19.5)
Washing hands with soap or alcohol-based antiseptic reduces the risk of transmitting hospital-acquired infections	308(88.5)	21(6.0)	19(5.5)
Applying alcohol-based antiseptics for hand hygiene is as effective as soap and water if hands are not visibly dirty	233(67.0)	50(14.4)	65(18.7)
Gloves decrease the contamination of the hand but do not prevent infection totally	271(77.9)	37(10.6)	40(11.5)
There is no need to wash hands before attending to procedures that do not involve bodily fluids	64(18.4)	33(9.5)	251(72.1)
There is no need to wear the same pair of gloves for multiple patients as long as there is no visible contamination	143(41.1)	27(7.8)	178(51.1)
The level of safety boxes should be three-quarters full before closing and sealing	223(64.1)	73(21.0)	52(14.9)
There are specific waste disposal buckets according to their level of contamination	298(85.6)	26(7.5)	24(6.9)

Table 2: Distribution of knowledge of healthcare practitioners on infection Prevention

About 182 (52.3%) of respondents had adequate knowledge of infection prevention whilst about 166 (47.7%) of respondents had inadequate knowledge of infection prevention (Figure 1).

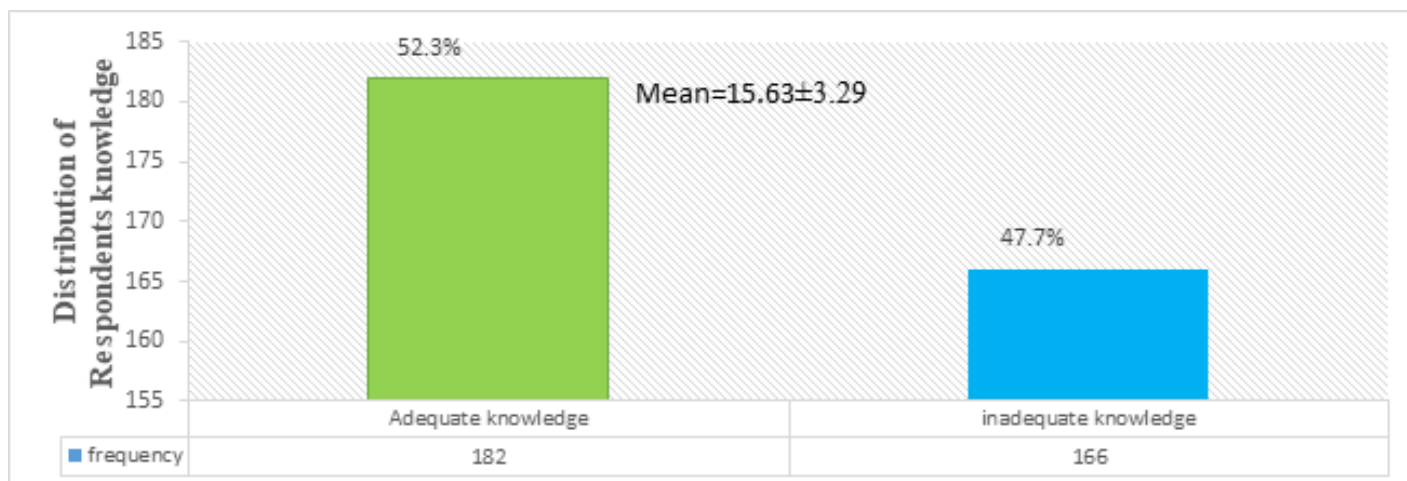


Figure 1: Knowledge of healthcare practitioners on infection prevention during the COVID-19 era.

The majority (92.6%) of respondents agreed that all people in the healthcare system and the community are part of the battle against COVID-19. Again, (91.1%) of the respondents agreed that the early detection of COVID-19 cases through mass testing will facilitate the control of the COVID-19 pandemic. About (52.6%) of respondents disagreed, (28.4%) agreed and (19.0%) were not sure that, people who get infected with COVID-19 were infected as a result of negligence. About (56.3), (29.6%) of respondents agreed and disagreed respectfully that they feel threatened when they come close to a confirmed case or suspected case of COVID-19 patients.

Again, about (38.5%) and (40.5%) of respondents agreed and disagreed respectfully that, COVID-19 is a communicable disease which is been given undue importance. With this, about (36.8%) and (42.0%) agreed and disagreed accordingly, that restricting travel, locking down cities and quarantining all suspected cases are exaggerating the current situation. Additionally, most (62.8%) agreed and (29.3%) were not sure if the country's efforts will succeed in the battle against COVID-19 Era (table 3). during the COVID-19 era

Variable	Agree n(%)	Not sure n(%)	Disagree n(%)
In my opinion, all people in the healthcare system and the community are part of the battle against COVID-19.	322(92.5)	13(3.7)	13(3.7)
Every detection of COVID-19 cases through mass testing will facilitate the control of the COVID-19 pandemic	317(91.1)	18(5.2)	13(3.7)
People who get infected with COVID-19 including healthcare providers were infected due to negligence	99(28.4)	66(19.0)	183(52.6)
I have a feeling of the threat of fear when I become close or provide care to a confirmed COVID-19 patient	196(56.3)	49(14.1)	103(29.6)
I think COVID-19 is a communicable disease which is being given undue importance	134(38.5)	73(21.0)	141(40.5)
Restricting travel, locking down cities and quarantining all suspected cases are an exaggeration of the current situation	128(36.8)	74(21.3)	146(42.0)
The country's efforts will succeed in the battle against COVID-19	218(62.8)	102(29.3)	28(8.0)
I think when the COVID-19 pandemic is over, many benefits and good things will be seen	229(65.8)	71(20.4)	48(13.8)
I adequately prepare to handle patients during the COVID-19 era	244(70.1)	65(18.7)	39(11.2)
I put on the required PPE even if it is uncomfortable	276(79.3)	44(12.6)	28(8.0)
I feel safer using the respirator than the nose mask	141(40.5)	125(35.9)	82(23.6)
I attended to patients in the absence of required PPE	142(40.8)	50(14.4)	156(44.8)
I feel that, regardless of the precautions I take, I am still at risk of acquiring infection in this facility	236(67.8)	57(16.4)	55(15.8)
Reliable, relevant, timely, and accessible information has enhanced effective record-keeping at the bank	207(59.5)	78(22.4)	63(18.1)

I will continue to report for duty if I suspect symptoms of COVID-19	129(37.1)	47(13.5)	172(49.4)
As a health worker, I am not too worried about being infected with COVID-19	83(23.9)	53(15.2)	212(60.9)
I will stay away from work in other to avoid contact with COVID-19	71(20.4)	53(15.2)	212(60.9)
I would resign from my job to avoid contact with COVID-19	44(12.6)	30(8.6)	274(78.7)

Table 3: Distribution of attitudes of healthcare practitioners towards infection prevention

About 174(50%) of respondents had adequate attitudes while 174(50%) also showed inadequate attitudes to infection prevention during the COVID-19 Era (Figure 2).

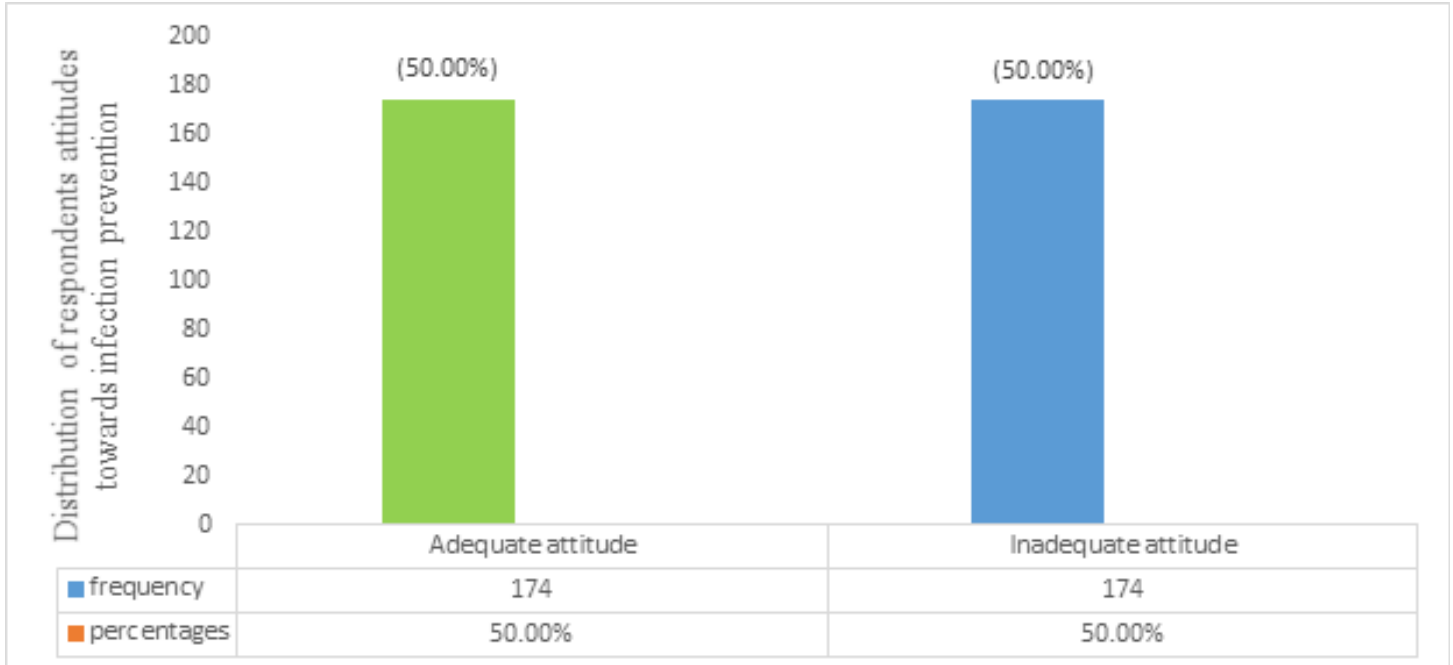


Figure 2: Healthcare Practitioners' attitudes towards infection prevention during the COVID-19 Era

The majority (90.5%) of respondents agreed that, if a close relative develops COVID-19 symptoms, they will recommend such relative to seek medical care. Most (72.4%) of respondents agreed that, when putting on personal protective equipment, they follow the order; suit [mask-Gloves whilst (21.3%) were not sure of following the order. About (74.4%) of respondents agreed to not going outside unless it was necessary during the pandemic while 12.9% were not sure. Most (80.7%) of respondents agreed to dispose personal protective equipments (PPE) and scrub thoroughly after shift work before entering the home. The majority (88.2%) of respondents sanitize their hands with alcohol-based solutions before attending to a patient. The majority (91.1%) of respondents agreed of disposing their PPEs appropriately into colour-coded bins after use. Moreover, 89.1% of respondents agreed of ensuring sanitizing or washing of hands after contact with

patients and or their surroundings. Most (80.7%) of respondents agreed of washing or sanitizing hands properly before procedures. About (84.2%) of respondents agreed of ensuring the steps of hand washing or sanitizing adequately. About (72.7%) of respondents agreed of maintaining a one-meter distance with co-workers during the pandemic to reduce the spread of the disease. Most (81.0%) of respondents agreed to always wearing masks whenever they are inside the hospital environment. About (73.3%) of respondents agreed of keeping masks properly in a separate bag or dustbin after use. About (80.5%) of respondents agreed of sanitizing personal items such as mobile phones, and pens with sanitizer after duty. Furthermore, (85.3%) of respondents agreed to always clean and disinfect equipment that is usually used for multiple patients such as a stethoscope before being used on each new patient (table 4). during the COVID-19 Era

Variable	Agree n(%)	Not sure n(%)	Disagree n(%)
If I or anyone close to me develop any COVID-19 symptoms I will recommend to others to seek medical attention	315(90.5)	17(4.9)	16(4.6)
When I am putting on the PPE, I follow the following order: Suit-Mask-Google-Gloves	252(72.4)	74(21.3)	22(6.3)
I have been careful not to carry my mobile phone /pen inside the COVID-19 ward	259(74.4)	45(12.9)	44(12.5)
I don't go out unless it is necessary	275(79.0)	49(14.1)	24(6.9)
When I finish my shift, I dispose of the PPE and scrub it thoroughly before entering home	281(80.7)	38(10.9)	29(8.3)
I sanitize my hands with alcohol-based solutions before attending to each patient	307(88.2)	22(6.3)	19(5.5)
After using my PPE, I dispose of them in the appropriate colour-coded bins	317(91.1)	18(5.2)	13(3.7)
I ensure that I sanitize or wash my hands after contact with patients and or his/her surroundings	310(89.1)	26(7.5)	12(3.4)
I ensure that I wash or sanitize my hands for at least 20 seconds	281(80.7)	49(14.1)	18(5.2)
I ensure that I follow the steps of hand washing or sanitizing adequately or properly	293(84.2)	38(10.9)	17(4.9)
I maintain at least 1 meter distance with co-workers at the hospital	282(81.0)	41(11.8)	25(7.2)
I always wear a mask whenever I am inside the hospital premises	253(72.7)	62(17.8)	33(9.5)
I keep my mask properly in a separate bag or dustbin after usage	282(81.0)	41(11.8)	25(13.8)
I reuse my PPE during my single-duty shift	113(32.5)	52(14.9)	183(52.6)
I sanitize my items such as mobile phones, and pens with sanitizer after duty	280(80.5)	33(9.5)	35(10.1)
I always clean and disinfect equipment that is usually used for multiple patients such as (a stethoscope) before being used on each new patient	297(85.3)	27(7.8)	24(6.9)

Table 4: Distribution of healthcare practitioners' adherence to infection prevention protocol

Most (72.1%) of respondents adhere to practices as health providers during the COVID-19 Era while about (27.9%) did not adhere to infection prevention practices during the COVID-19 pandemic (Figure 3).

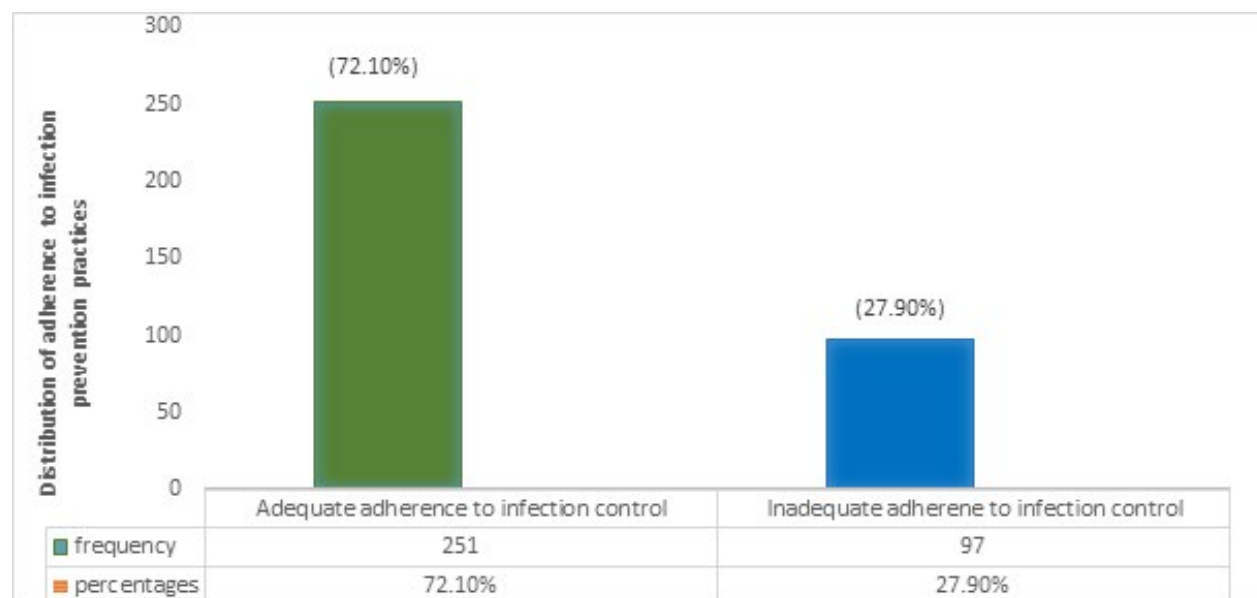


Figure 3: Adherence to infection prevention practices during COVID-19 Era

A binary logistic regression was conducted in the multivariate model to determine the relationship between respondents' dependent and related factors at a 95% confidence level. At a p-value, a relationship between the dependent and independent variables was considered significant statistically. It was found that, respondents with a basic education were less likely to adhere to infection prevention procedures [aOR=0.59 (0.04-0.93), $p=0.004$] as compared to those with master degree. Again, respondents with secondary level of education had a decreased odd of adequately adhering to infection prevention protocols and the difference was statistically significant [aOR=0.61 (0.12-3.17), $p=0.001$].

Respondents with a diploma level of education had greater odds of adequate adherence to infection prevention protocol at the facility [aOR=1.2(0.23-0.65), $p=0.02$]. Further, respondents who had seminar on infection prevention protocols established a higher odd of adequately-adhering to infection prevention protocols as compared to those with those without seminar on infection control. [aOR= 1.50 (0.94-2.35), $p=0.01$]. Respondents who indicated the availability of infection prevention protocols found increased odds of adhering to infection prevention during the era of COVID-19 at the hospital [aOR=2.1(1.13-4.03), $p=0.033$] (table 5). workers

Variable	Adherence to Infection prevention protocol		X ² (P)	aOR (95%CI)
	Adequate adherence, n=251	In-adequate adherence, n=97		
Level of education				
Basic education	14(5.4)	0(0.0)	15.3(.004)*	0.59(0.04-0.93) *
Secondary	4(1.4)	1(1.4)		0.61(0.12-3.17) *
Diploma	178(64.5)	38(52.8)		1.2(0.23-0.65) *
Degree	74(26.8)	31(43.1)		1.1(0.41-1.3)
Masters	7(3.8)	1(0.6)		1b
Attended IP Seminar				
Yes	114(62.6)	79(47.6)	7.9(0.005)*	1.50(0.94-2.35) *
No	68(37.4)	87(52.4)		1b
Availability of IPC protocol				
Yes	237(85.9)	53(70.6)	3.8(0.049)	2.1 (1.13-4.03) *
No	39(14.1)	19(26.4)		1b

Table 5: Factors Associated with Adherence to infection prevention among healthcare

4.1. *(p-value) <0.05; statistically significant, IPC: Infection Prevention Control, IP: Infection Prevention

At the multiple regression model set at a 95% confidence level, an R-square of 0.225 indicated a 22.5% change in the dependent variable (adherence to IPC control) was as a result of Knowledge and attitudes of respondents towards infection prevention and control. It was found that, for every I unit increases in attitudes

towards infection prevention, the dependent variable (adherence to protocol for infection prevention) increased by a beta coefficient of 0.241 and such was statistically significant ($\beta=0.241$, $P=0.0001$). Again, one unit increase in knowledge towards infection prevention and control increases respondent's adherence to infection prevention protocol by 0.339 ($\beta=0.339$, $P=0.0001$) (table 6).

Model	Unstandardized Co-efficient		Standardized Coefficient	Confidence interval			
	Beta	Standard		Beta	T-test	p-value	Lower
Constant	0.692	0.098		7.028	0.0001	0.498	0.885
Attitude	0.262	0.054	0.241	4.826	0.0001	0.155	0.369
Knowledge	0.299	0.044	0.339	6.793	0.0001	0.213	0.386

Table 6: Predicting Knowledge and attitudes on the adherence to IPC among respondents

4.1.2. Dependent Variable: Adherence to Infection Prevention and Control Protocol

5. Discussion

Effective adherence to infection prevention and control, particularly during the COVID-19 era, acted as a barrier between a susceptible host and a pathogenic organism, reducing the risk of health practitioner's exposure to microbial organisms [19, 11, 15]. In

this present study, the investigator assessed knowledge, attitudes, and related factors related to adherence to infection prevention protocols among healthcare practitioners at the period of the COVID-19 pandemic. It was found that 52.3% of the respondents had adequate knowledge and 50% of the respondents developed an adequate attitude towards following infection prevention protocols. It was also found that most (72.1%) of the respondents adhered infection prevention protocols well. Respondents with

diploma education, infection prevention seminar, and infection prevention availability protocol have a significant impact on adherence to infection control practices. Additionally, it was found that respondents' adequate knowledge and attitudes predicted their adherence to infection prevention practices. Previous reports have found that 52.3% (15), 51% (20), 50% (13), and 51.3% have knowledge of infection control, and these related well with the current reports of knowledge of infection prevention and adherence practices [19]. However, a higher knowledge of 62.7% (21), 86.4% (22), 72.2% (23), 57% (11) and 70.0% (4) on infection prevention were documented and the results were inconsistent. Fifty percent of respondents had appropriate attitudes towards infection prevention and control dissociated with reports of 72.1% (24), 70% (20), 76% (22), 61.5% (23), 57% (11) and 64.2% (25) of healthcare provider attitudes to infection prevention controls and adherence practices during disease outbreaks. The similarities in results could be attributed to the different infection prevention training provided, access to infection prevention and control information during the COVID-19 period, regular education and workshops for health practitioners. The differences in the results may be due to the discrepancies in the methods of previous cited studies. Healthcare providers have been the key workforce battling the spread of COVID-19 during the outbreak, putting them at increased risk of contracting the disease. therefore, their adequacy in following infection prevention protocols was paramount. This recent study found that 72.1% of respondents were following infection prevention protocols well during the period of COVID-19. A lower prevalence of 48.3% (13), 42% (11), 57% (27), and 57.4% (25) of adherence to infection prevention and control and reporting did not correlate well. Increasing knowledge by holding infection prevention seminars and providing infection prevention protocols that are easily accessible and readable would not only encourage positive attitudes or beliefs that encourage positive behaviors, but to guide effective interventions to reduce risk and spread of COVID-19 among staff, patients and relatives [15, 19, 28]. Adopting hygiene practices such as washing hands with soap and running water, using personal protective equipment, and disposing of waste safely, among other things through knowledge of and adherence to infection prevention practices, breaks the chain of transmission of pathogenic microbes and thereby reduces the chance of contagion of a disease [5, 9, 26, 30]. Improving respondents' knowledge and attitudes through sharing information about infection control in healthcare settings, particularly during disease outbreaks, implies a positive indication of staff willingness to adhere to infection prevention practices , thereby reducing infection-related morbidity and mortality and adherence to standard infection prevention protocols that reduce the pathogenicity and contagiousness of the COVID-19 virus, thereby protecting the health of physicians and the public and reducing the cost of patient care [31, 13, 9, 15, 32, 35].

Additionally, it was found that respondents who had attended an infection prevention protocol seminar significantly influenced appropriate compliance. The outcome of a cross sectional study showed that respondents with primary and secondary education

had lower chances of adequately following infection prevention protocols. However, professionals with diploma education reported a higher likelihood of adhering to infection protocols. A similar report on higher education correlated with adequate adherence to infection prevention protocols [20]. This could be attributed to respondents' increased knowledge of adhering to infection control procedures during the time of COVID-19 [1, 11, 20, 32]. Again, dissemination of information through media and academic forums, particularly among practitioners may account for similarities in findings [21]. The availability of infection prevention protocols strictly informs healthcare providers that they must adhere to infection prevention practices during caregiving and serves as a reminder for healthcare professionals to adhere to and follow proper infection prevention practices [34, 36, 37]. Therefore, the effectiveness of measures to reduce disease transmission during the COVID-19 epidemic is enhanced by healthcare providers' commitment to infection prevention and control [38]. The implementation of infection prevention procedures, which are critical to improving patient safety and health outcomes in healthcare settings, is facilitated by the availability of infection prevention protocols [34]. As a result, health care practitioners who follow infection prevention and control procedures improve patient safety, reduce patient care costs, maintain patient health, and increase productivity. During the COVID-19 period, health professionals with advanced degrees participated in a number of intervention programs. They have been active in educating and educating the general public on infection prevention and control compliance. As a result, they had the knowledge and skills needed to comply with protocols and stop the spread of infection throughout the COVID-19 era. Therefore, positive behavioral approaches to reducing the threat of healthcare associated infections are facilitated through education and the development of a positive attitude towards adherence to infection prevention practices. This suggests that through higher education, healthcare professionals working in a healthcare setting are better informed about the behaviors and lifestyles that are critical to preventing transmission of infection during the COVID-19 pandemic. A health professional with a high level of education had easier access to COVID-19-related information and followed infection control procedures more diligently during the pandemic, which helped with a range of preventive measures. In order to avoid transmission of infection during the COVID-19 era, it is necessary to actively support behaviors that make people aware of infection control rules and carefully follow them.

6. Conclusion and Recommendations

Adequate knowledge and attitudes of health practitioners have significantly influenced adequate adherence to hospital infection prevention and control protocol during the COVID-19 pandemic era. Associated factors such as diploma education, frequent attendance at infection prevention seminars, and availability of infection prevention protocols predicted adequate adherence to infection prevention and control by healthcare providers. Therefore, influence caregivers to mitigate actions that reduce their susceptibility to infectious microbes and contaminants. It is

therefore appropriate that existing infection prevention protocols are revised and adapted to current infection prevention measures in the work environment. Regular and in-service infection prevention workshops should be offered to all healthcare provider cadres, especially during times of disease outbreaks. Further studies are needed to examine the challenges faced by caregivers in adhering to effective infection prevention protocols in the hospital setting.

7. Limitation of Study

There is a possibility of recall bias as caregivers have had to rely on their experience of infection prevention practices during the time of COVID-19.

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References

1. Apisarnthanarak, A., Apisarnthanarak, P., Siripraparat, C., Saengaram, P., Leeprechanon, N., & Weber, D. J. (2020). Impact of anxiety and fear for COVID-19 toward infection control practices among Thai healthcare workers. *Infection Control & Hospital Epidemiology*, 41(9), 1093-1094.
2. Al Maskari, Z., Al Blushi, A., Khamis, F., Al Tai, A., Al Salmi, I., Al Harthi, H., ... & Al Blushi, Z. (2021). Characteristics of healthcare workers infected with COVID-19: A cross-sectional observational study. *International Journal of Infectious Diseases*, 102, 32-36.
3. Amato, A., Caggiano, M., Amato, M., Moccia, G., Capunzo, M., & De Caro, F. (2020). Infection control in dental practice during the COVID-19 pandemic. *International journal of environmental research and public health*, 17(13), 4769.
4. Asemahagn, M. A. (2020). Factors determining the knowledge and prevention practice of healthcare workers towards COVID-19 in Amhara region, Ethiopia: a cross-sectional survey. *Tropical medicine and health*, 48(1), 1-11.
5. Cheng, H. C., Chang, Y. J., Liao, S. R., Siewchaisakul, P., & Chen, S. L. S. (2021). The impact of COVID-19 on knowledge, attitude, and infection control behaviors among dentists. *BMC Oral Health*, 21(1), 1-11.
6. Lotfinejad, N., Peters, A., & Pittet, D. (2020). Hand hygiene and the novel coronavirus pandemic: the role of healthcare workers. *The Journal of hospital infection*, 105(4), 776.
7. Magnavita, N., Tripepi, G., & Di Prinzio, R. R. (2020). Symptoms in health care workers during the COVID-19 epidemic. A cross-sectional survey. *International journal of environmental research and public health*, 17(14), 5218.
8. Bielicki, J. A., Duval, X., Gobat, N., Goossens, H., Koopmans, M., Tacconelli, E., & van der Werf, S. (2020). Monitoring approaches for health-care workers during the COVID-19 pandemic. *The Lancet infectious diseases*, 20(10), e261-e267.
9. Alhumaid, S., Al Mutair, A., Al Alawi, Z., Alsuliman, M., Ahmed, G. Y., Rabaan, A. A., ... & Al-Omari, A. (2021). Knowledge of infection prevention and control among healthcare workers and factors influencing compliance: a systematic review. *Antimicrobial Resistance & Infection Control*, 10(1), 1-32.
10. Ejeh, F. E., Saidu, A. S., Owoicho, S., Maurice, N. A., Jauro, S., Madukaji, L., & Okon, K. O. (2020). Knowledge, attitude, and practice among healthcare workers towards COVID-19 outbreak in Nigeria. *Heliyon*, 6(11), e05557.
11. Bayleyegn, B., Mehari, A., Damtie, D., & Negash, M. (2021). Knowledge, attitude and practice on hospital-acquired infection prevention and associated factors among healthcare workers at university of gondar comprehensive specialized hospital, northwest Ethiopia. *Infection and drug resistance*, 259-266.
12. Ehrlich, H., McKenney, M., & Elkbuli, A. (2020). Protecting our healthcare workers during the COVID-19 pandemic. *The American journal of emergency medicine*, 38(7), 1527.
13. Jemal, K., Gashaw, K., Kinati, T., Bedada, W., & Getahun, B. (2020). Clean and safe healthcare environment: knowledge, attitude, and practice of infection prevention and control among health workforce at north showa zone Oromiya region. *Journal of environmental and public health*, 2020.
14. Emmanuel, U., Osondu, E. D., & Kalu, K. C. (2020). Architectural design strategies for infection prevention and control (IPC) in health-care facilities: towards curbing the spread of Covid-19. *Journal of environmental health science and engineering*, 18, 1699-1707.
15. Alhassan, A. R., Kuugbee, E. D., & Der, E. M. (2021). Surgical healthcare workers knowledge and attitude on infection prevention and control: A case of tamale teaching hospital, Ghana. *Canadian Journal of Infectious Diseases and Medical Microbiology*, 2021.
16. Limbu, D. K., Piryani, R. M., & Sunny, A. K. (2020). Healthcare workers' knowledge, attitude and practices during the COVID-19 pandemic response in a tertiary care hospital of Nepal. *PloS one*, 15(11), e0242126.
17. Adom, D., Mensah, J. A., & Osei, M. (2021). The psychological distress and mental health disorders from COVID-19 stigmatization in Ghana. *Social sciences & humanities open*, 4(1), 100186.
18. Adjorlolo, S., & Egbenya, D. L. (2020). A twin disaster: Addressing the COVID-19 pandemic and a cerebrospinal meningitis outbreak simultaneously in a low-resource country. *Global Health Action*, 13(1), 1795963.
19. Lobo, D., Sams, L. M., & Fernandez, S. L. (2019). Correlation between health professionals' knowledge, attitude and practice about infection control measures. *Journal of Medical & Allied Sciences*, 9(1), 26-31.
20. Asaad, A., El-Sokkary, R., Alzamanan, M., & El-Shafei, M. (2020). Knowledge and attitudes towards Middle East respiratory syndrome-coronavirus (MERS-CoV) among health care workers in south-western Saudi Arabia. *Eastern Mediterranean Health Journal*, 26(4), 435-442.
21. Mandona, E., Obi Daniel, E., & Olaiya Abiodun, P. (2019). Assessment of knowledge, attitude and practice of infection prevention among health care providers in Chibombo District

- Zambia. *World Journal of Public Health*, 4(4), 87-95.
22. Gezie, H., Leta, E., Admasu, F., Gedamu, S., Dires, A., & Goshiye, D. (2019). Health care workers knowledge, attitude and practice towards hospital acquired infection prevention at Dessie referral hospital, Northeast Ethiopia. *Clin J Nurs Care Pract*, 3, 059-063.
 23. Abalkhail, A., Al Imam, M. H., Elmosaad, Y. M., Jaber, M. F., Hosis, K. A., Alhumaydhi, F. A., ... & Mahmud, I. (2021). Knowledge, attitude and practice of standard infection control precautions among health-care workers in a University Hospital in Qassim, Saudi Arabia: a cross-sectional survey. *International Journal of Environmental Research and Public Health*, 18(22), 11831.
 24. Kassie, B. A., Adane, A., Abebe Kassahun, E., Ayele, A. S., & Kassahun Belew, A. (2020). Poor COVID-19 preventive practice among healthcare workers in Northwest Ethiopia, 2020. *Advances in Public Health*, 2020, 1-7.
 25. Yazie, T. D., Sharew, G. B., & Abebe, W. (2019). Knowledge, attitude, and practice of healthcare professionals regarding infection prevention at Gondar University referral hospital, northwest Ethiopia: a cross-sectional study. *BMC research notes*, 12(1), 1-7.
 26. Kumar, A., Keri, V. C., Khan, M. A., Ranjan, P., Rastogi, N., Sahu, M., & Wig, N. (2021). Assessment of healthcare worker's hand hygiene and infection prevention practices of their personal belongings in a healthcare setting: a survey in pre COVID-19 era and literature review on standard disinfection practices. *Journal of Preventive Medicine and Hygiene*, 62(1), E104.
 27. Desta, M., Ayenew, T., Sitotaw, N., Tegegne, N., Dires, M., & Getie, M. (2018). Knowledge, practice and associated factors of infection prevention among healthcare workers in Debre Markos referral hospital, Northwest Ethiopia. *BMC health services research*, 18(1), 1-10.
 28. Zhang, M., Zhou, M., Tang, F., Wang, Y., Nie, H., Zhang, L., & You, G. (2020). Knowledge, attitude, and practice regarding COVID-19 among healthcare workers in Henan, China. *Journal of Hospital Infection*, 105(2), 183-187.
 29. Assefa, J., Diress, G., & Adane, S. (2020). Infection prevention knowledge, practice, and its associated factors among healthcare providers in primary healthcare unit of Wogdie District, Northeast Ethiopia, 2019: a cross-sectional study. *Antimicrobial Resistance & Infection Control*, 9(1), 1-9.
 30. Feng, W., Sae-Sia, W., & Kitrungrote, L. (2022). Knowledge, attitude, and practice of surgical site infection prevention among operating room nurses in southwest China. *Belitung Nursing Journal*, 8(2), 124-131.
 31. Moodley, S. V., Zungu, M., Malotle, M., Voyi, K., Claassen, N., Ramodike, J., ... & Mlangeni, N. (2021). A health worker knowledge, attitudes and practices survey of SARS-CoV-2 infection prevention and control in South Africa. *BMC Infectious Diseases*, 21, 1-9.
 32. Mbachu, C. N. P., Azubuike, C. M. C., Mbachu, I. I., Ndukwu, C. I., Ezeuko, A. Y. A., Udigwe, I. B., ... & Orji-Ifeanyi, E. N. (2020). COVID-19 infection: Knowledge, attitude, practices, and impact among healthcare workers in a South-Eastern Nigerian state. *The Journal of Infection in Developing Countries*, 14(09), 943-952.
 33. McGriff, J. A., & Denny, L. (2020). What COVID-19 reveals about the neglect of WASH within infection prevention in low-resource healthcare facilities. *The American journal of tropical medicine and hygiene*, 103(5), 1762.
 34. Lee, M. H., Lee, G. A., Lee, S. H., & Park, Y. H. (2019). Effectiveness and core components of infection prevention and control programmes in long-term care facilities: a systematic review. *Journal of Hospital Infection*, 102(4), 377-393.
 35. Nguyen, L. H., Drew, D. A., Graham, M. S., Joshi, A. D., Guo, C. G., Ma, W., ... & Zhang, F. (2020). Risk of COVID-19 among front-line health-care workers and the general community: a prospective cohort study. *The Lancet Public Health*, 5(9), e475-e483.
 36. Asemahagn, M. A. (2020). Factors determining the knowledge and prevention practice of healthcare workers towards COVID-19 in Amhara region, Ethiopia: a cross-sectional survey. *Tropical medicine and health*, 48(1), 1-11.
 37. Jemal, S., Zeleke, M., Tezera, S., Hailu, S., Abdosh, A., Biya, M., & Abduljelil, S. (2019). Health care workers' knowledge, attitude and practice towards infection prevention in Dubti referral hospital, Dubti, north East Ethiopia. *Int J Infect Dis Therapy*, 3(4), 66.
 38. Jin, Y. H., Huang, Q., Wang, Y. Y., Zeng, X. T., Luo, L. S., Pan, Z. Y., ... & Wang, X. H. (2020). Perceived infection transmission routes, infection control practices, psychosocial changes, and management of COVID-19 infected healthcare workers in a tertiary acute care hospital in Wuhan: a cross-sectional survey. *Military Medical Research*, 7, 1-13.

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