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Factors influencing healthcare workers' perceived compliance with infection prevention and control standards, North Bank East region, The Gambia, a cross-sectional study

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Abstract

Background This study evaluated Health Care Workers' (HCWs) knowledge, attitude, perceived compliance, and potential influencing factors related to Infection Prevention and Control (IPC) standards in the North Bank East region of The Gambia.

Method The study was an analytic cross-sectional study, conducted in 2021 using a multistage sampling technique. Thirteen health facilities were sampled from the North Bank East Region of The Gambia. The sample size was calculated using the Cochrane formula, based on a healthcare worker population of 408, with a 95% confidence interval. Adjustments were made for a 10% non-response rate and a compliance level of 50%. A final sample size of 218 was used for the study. Descriptive statistics, chi-square, and logistic regression were done at a 95% confidence limit and an alpha level of 0.05. A p-value of 0.05 was considered statistically significant.

Results Among the 218 healthcare workers, the majority demonstrated adequate knowledge (86.24%) and a positive attitude (78.4%) toward Infection Prevention and Control (IPC). About half (50.5%) of the HCWs did not comply with IPC standards. Good attitude of HCWs [aOR = 3.13, 95%CI: 1.17–8.41, p-value = 0.023], accessibility of Personal Protective Equipment [aOR = 2.34, 95%CI: 1.01–5.38; p-value = 0.046], and monitoring of IPC practice [aOR = 3.95, 95%CI: 1.84–8.45; p-value = < 0.001] were independently associated with HCWs perceived compliance with IPC standards.

Conclusion Although 188 (86.24%) HCWs displayed adequate knowledge of IPC standards, perceived compliance remains insufficient in Gambian healthcare facilities. To address this, the Ministry of Health should prioritize educational campaigns, and regular training to reinforce HCW knowledge, ensure Personal Protective Equipment (PPE) accessibility, and implement ongoing IPC practice monitoring among healthcare workers.

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Keywords Healthcare worker, Knowledge, Compliance, Healthcare-associated infection, Infection prevention and control standards, The Gambia

Introduction

Healthcare-associated infections (HAIs) are a serious global public health issue [1], leading to extended hospital stays, disabilities, increased antibiotic resistance, financial burdens, and higher mortality rates [2, 3]. Infection prevention and control (IPC) measures are crucial for reducing HAIs in healthcare settings [4]. However, adherence to these standards is often poor, contributing significantly to HAI occurrences [5–9].

The Gambia integrates IPC across its healthcare system. The Ministry of Health sets national IPC policies, which are adapted and implemented at regional and facility levels. Health centers and hospitals enforce IPC measures such as hand hygiene, proper use of personal protective equipment, and waste management. During the COVID-19 pandemic, a multi-sectoral National Health Emergency Committee was established to coordinate the response, supported by the WHO Representative in The Gambia [10, 11].

Two key factors influencing compliance with IPC standards are healthcare workers' knowledge and attitudes. Knowledge provides the foundation for proper IPC implementation, while attitudes shape compliance behaviours. Studies across African countries show varying levels of understanding and acceptance of IPC practices. For instance, Desta, et al. [12] found that 84.7% of HCWs were knowledgeable while only 57.3% of respondents demonstrated a good practice on IPC practice. A Nigerian study reported that the median scores for knowledge and attitude toward standard precautions were both above 90%, while the median practice score was lower at 50.8% [13]. A Ghanaian study also found that positive attitudes toward IPC increased compliance with hand hygiene protocols [14]. However, in The Gambia, little is known of the attitude, knowledge and practice of IPC standards among HCWs. Hence, this study sought to assess HCWs' attitude, knowledge and perceived compliance with IPC standards as well as potential influencing factors of perceived IPC compliance among HCWs in rural Gambia (North Bank East Region). Understanding these aspects is essential for developing effective behavioural change programs to improve IPC compliance and reduce the incidence of HAIs.

Methods

Study design

An analytic cross-sectional study was employed to collect data from HCWs such as medical doctors, nurses, public health officers, laboratory personnel and others (orderlies, dental staff, physiotherapists, anaesthetists and laundry workers).

Study setting

The research was conducted among the HCWs in rural Gambia (North Bank East Region). North Bank East Region is one of the seven health regions in The Gambia with Kerewan as its Regional Headquarters. The region stretches from Kerewan to Palodi, covering 75 km. According to the 2013 census, the region had a population of 221,054 with a population density of 98 inh./km^2 [15]. The region has one major health facility, and seven minor health facilities providing both preventive and curative medical services. In addition, there are five community clinics, two service clinics, one NGO and one private clinic. Farafenni General Hospital, the only tertiary facility, serves as a referral point for all minor health facilities within the region. North Bank East region has a staff strength of 408 staff (36, 301, 36 and 35 from Sabach Sanjal, Upper Baddibu, Central Baddibu and Lower Baddibu respectively). The staff include medical doctors, nurses (generals and midwives), public health officers, laboratorians, orderlies, dental staff, physiotherapists, anaesthetists and laundry workers (Fig. 1).

Sample size determination

The assumption of 50% compliance was used to calculate the study's sample size due to the lack of data regarding IPC standards compliance in The Gambia. Cochrane formula [16] was used to calculate the required sample size as follows:

$$\mathrm{n} = \frac{Z^2\left(p\left(1-p\right)\right)}{e^2}$$

Z = 1.96, p = 0.5, e = 0.05.

n = 384.16 = 385.

The formula was adjusted, taking into account the finite study population of 408 healthcare workers as follows: [17]

nf = n / {1+(n-1/N)}

where n is Cochran's sample size recommendation, N is the population size, and nf is the new, adjusted sample size.

nf = 385 / {1+(384/408)} =197.8181 = 198.

After adding 10% of the estimated sample size to cater for the non-response rate, the final estimated sample is 218.

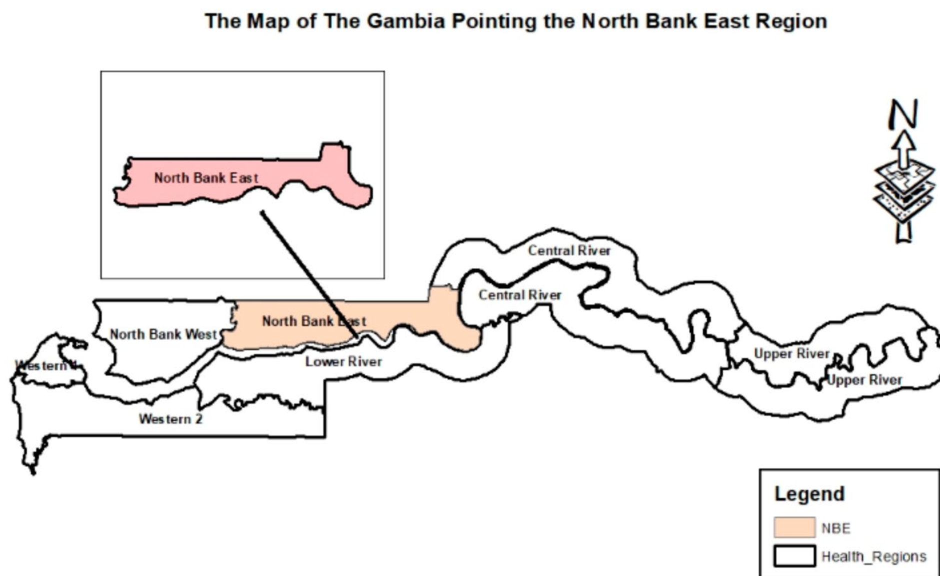

Fig. 1 The map of The Gambia Pointing to the North Bank East Region

Inclusion criteria

Clinical staff and non-clinical staff whose jobs exposed them to blood and other bodily fluids during the cause of their work.

Exclusion criteria

Eligible staff who were on leave and those with work experience of less than 1 year were excluded.

Sampling techniques

A multistage sampling technique was used to sample at the regional, district and hospital levels. The North Bank East region is subdivided into four districts: Sabach Sanjal, Upper Baddibu, Central Baddibu and Lower Baddibu. To minimize bias due to sampling error, HCWs were drawn from each health facility based on the proportion of its size to the target population. As such 19 out of 36, 161 out of 301, 19 out of 36 and 19 out of 35 HCWs were taken from Sabach Sanjal, Upper Baddibu, Central Baddibu and Lower Baddibu respectively. At the district level, all the health facilities in each district were included in the study. At the health facility level, a simple random sample was used to select HCWs. This was achieved by listing the names of eligible staff in each facility on a piece of paper and putting them in a box where the names were randomly picked without replacement.

Data collection and tool

Data were collected using an interviewer-administered questionnaire. These questionnaires were administered to 218 randomly selected HCWs in all healthcare facilities in the North Bank East Region. Before data collection, research assistants were recruited, trained, and a questionnaire was pretested among fifteen (15) HCWs in three (3) health facilities in the North Bank West Region which has similar characteristics to the study site to identify any issues with question clarity, format, or flow before the full-scale study. The questionnaire was developed based on the review of relevant literature [18–20] and was divided into three sections:

Section A: captured sociodemographic data such as age, sex, work experience, level of education and staff category.

Section B: individual factors affecting compliance with IPC standards, such as knowledge, IPC practice, level of exposure, and use of personal protective equipment (PPE).

Section C: organizational factors that affect compliance with IPC standards, such as the availability of IPC guidelines, accessibility of PPEs, supportive policies, monitoring IPC practice and workload.

Study variables

The dependent variable, perceived compliance with IPC standards, was measured using eight question items. HCWs reported their perceived compliance to specific IPC practices with responses scored as follows: ‘always’ (2 points), ‘sometimes’ (1 point), and ‘never’ (0 points), for a maximum possible score of sixteen. As previously described by Abalkhail, et al. [18], a score of $<50\%$, 50–79% and $\geq 80\%$ was considered as low, moderate and high respectively. For this study, an individual was considered compliant, when the individual scored at least 80% which is a score of 13 or more while a score less than 13 (low and moderate levels) was considered non-compliant.

For HCWs' attitude toward IPC practice, 4-Likert scale questions were used to assess it. Scores ranged from 0 (strongly disagree) to 3 (strongly agree), with a maximum score of 15. For an individual to be considered to have adequate knowledge, the individual must have at least a score of 80%. As such a score of 12 or above indicated a good attitude, while below 12 was considered a poor attitude [18].

For knowledge level, seven question items on a 4-Likert scale assessed HCWs using respondents' agreement or disagreement with IPC standards. Likert scale was used to assess knowledge in this study because it helps quantify subjective assessments of knowledge, making it easier to analyze and compare results across individuals or groups. It is also easy to complete, which can improve response rates and data quality. Scores ranged from 0 (strongly disagree) to 3 (strongly agree), with a maximum score of 21. For an individual to be considered to have adequate knowledge, the individual must have at least a score of 80%. As such a score of 17 or above indicated adequate knowledge, while below 17 was considered inadequate [18]. These were self-reported by the HCWs.

The independent variables of the study included sociodemographic characteristics such as age, sex, level of education, and work experience; individual factors, for example, knowledge, and attitude level as well as organizational factors, including availability of protocols, access to materials and equipment, supporting policies, assessment, monitoring and supervision, workload, and workforce.

Table 1 Sociodemographic characteristics of healthcare workers in NBER, 2021

Respondent Characteristic	*n*(%)
Age (years)*	31.5(13)
Sex	
Male	111(50.9)
Female	107(49.1)
Age category (years)	
20–29	84(38.5)
30–39	79(36.2)
≥ 40	55(25.3)
Work experience (years)	
1–5	108(49.5)
> 5	110(50.5)
Education level	
Did not attend school.	45(20.6)
Basic	46(21.1)
Tertiary	127(58.3)
Staff category	
Medical Doctor	8(3.7)
Laboratory Professional	13(6.0)
Nurse	90(41.3)
Public Health Officer	25(11.5)
Others	82(37.5)

Data are presented as figures and percentages in parentheses. * is presented as median(IQR). NBER: North Bank East Region

Data management and analysis

Data were entered into Microsoft Excel, cleaned, and analyzed in Stata version 16.0. Descriptive and inferential statistics were run. Chi-square tests assessed associations between categorical variables and perceived compliance with IPC standards. Both crude and adjusted logistic regression were used to identify potential factors influencing perceived compliance with IPC standards among HCWs. Results included crude and adjusted odds ratios, p-values, and 95% confidence intervals, with significance set at 0.05.

Results

Sociodemographic characteristics of healthcare workers in the North Bank East Region (NBER)

Of the 218 HCWs, most 90 (41.3%) were nurses, while the least 8 (3.7%) were medical doctors. The median age of respondents was 31.5(13) years with a male preponderance of 111 (50.9%). About 50% of the HCWs had worked for more than five (5) years and 58.3% had tertiary education. (Table 1).

Perceived compliance score

Most of the HCWs (73.4%) reported that they always wash their hands with soap under running water. The majority of the HCWs, 74.8%, also alluded that they always wash their hands upon the removal of gloves after contact with patient or body fluids. The study also found that most HCWs, 70.6%, indicated that they always discarded all disposable PPEs after use. About 80.7% confirmed that they always use gloves when handling body fluids. About half (50.9%) of the HCWs sometimes wear goggles and masks when working in clinic and laboratory environments to reduce the risk of contamination and the transmission of infectious agents. Less than half, 47.3%, sometimes wear an apron while on duty, and a little more than a quarter of the HCWs said they never wear an apron while on duty. About 48.1% of the HCWs reported that they always change gloves before attending to another patient, while 45.9% reported that they sometimes change gloves before attending to another patient. The finding of the study also indicated that 50% of the HCWs wash their hands after attending to each patient (Table 2).

Perceived compliance with IPC measures among healthcare workers

The majority 188 (86.24%) of HCWs had adequate knowledge of IPC (Fig. 2A). About three–fourths 171 (78.4%) of the HCWs had good attitudes towards IPC standards

Table 2 Perceived compliance with infection prevention and control standards among the healthcare workers in NBER, 2021

Statement	Always *n*(%)	Some-times *n*(%)	Never *n*(%)
I wash my hands with soap under running water	160(73.4)	58(26.6)	0(0.0)
On removal of gloves, I wash my hands after contact with the patient or body fluids	163(74.8)	53(24.3)	2(0.9)
In my unit, all disposable PPEs are discarded after use	154(70.6)	62(28.5)	2(0.9)
I use gloves when handling body fluids	176(80.7)	38(17.4)	4(1.9)
I wear goggles and a mask to protect myself when in the clinic and laboratory environments	85(39.0)	111(50.9)	22(10.1)
I wear an apron when performing my duties	54(24.7)	103(47.3)	61(28.0)
I change gloves before attending to another patient	105(48.1)	100(45.9)	13(6.0)
I wash my hands after attending to each patient	109(50.0)	94(43.1)	15(6.9)

(Fig. 2B). A little more than half (50.5%) of the HCWs did not comply with IPC standards (Fig. 2C).

Bivariate analysis between predictor variables and perceived compliance with IPC standards

Among the predictor variables analyzed, only knowledge of IPC ($p = 0.002$), attitude of HCWs ($p = < 0.001$), availability of IPC guidelines ($p = < 0.001$), accessibility of PPEs ($p = < 0.001$) and monitoring of IPC practice by management ($p = < 0.001$) were found to be significantly associated with perceived IPC compliance. After controlling for all other variables, attitude of HCWs, accessibility of PPEs, and monitoring of IPC practice were found to be independently associated with perceived compliance with IPC standards. HCWs with good attitude had a 3.13-fold increased odds of perceived compliance to IPC standards [aOR = 3.13, 95%CI: 1.17–8.41, p-value = 0.023] compared to those with poor attitude. HCWs who had access to PPEs also had a 2.34-fold increased odds of perceived compliance [aOR = 2.34, 95%CI: 1.01–5.38; p-value = 0.046] compared to those who had no access to PPEs. Finally, HCWs who were monitored in their IPC practice had 3.95 times increased odds of perceived compliance [aOR = 3.95, 95%CI: 1.84–8.45; p-value = < 0.001] compared to those who were not monitored (Table 3).

Discussion

The study looked at the knowledge, attitude and perceived compliance of IPC among HCWs in The Gambia as well as potential influencing factors to HCWs' perceived compliance with IPC standards. Surprisingly, despite a significant proportion of HCWs having adequate knowledge of IPC standards 188(86.2%), their perceived compliance was low 108 (49.5%). Even though our finding is comparable to a Northern Ugandan study where HCWs demonstrated a high level of knowledge score of IPC standards of 69%; the rate of compliance with IPC was higher (68%) than what was observed in this study [21]. Also, unlike our finding on knowledge level, a pre-COVID-19 pandemic study conducted by Ghadamgahi, et al. [22] in Nigeria found only 28.75% of HCWs with adequate knowledge of infection control. This disparity in knowledge level observed across these studies could be due to increased IPC training and awareness during the COVID-19 pandemic relative to the pre-COVID-19 pandemic era. Additionally, the high compliance recorded in the Northern Ugandan study could be due to the relatively small sample size employed. While this current study recruited 218 HCWs, the Northern Ugandan study used 75 HCWs for their study. It is thus, imperative for pragmatic steps to be established to foster not only the need to improve HCWs' knowledge of the IPC standards but also the need to comply with them in the current study jurisdiction. To that end, proactive initiatives must be put in place to foster a genuine commitment to adhering to IPC standards. One key strategy involves the establishment of comprehensive training programs designed to not only impart knowledge but also instill a sense of responsibility and a culture of compliance to IPC standards within the healthcare delivery system [23, 24]. These programs should be ongoing and regularly updated to keep HCWs abreast of the latest developments in IPC.

The attitude of HCWs remains a key factor in the rolling out of institutional policies. Therefore, the significance of fostering a positive attitude toward infection prevention cannot be overstated in the context of preventing HAI. In this study, more than half 171 (78.4%) of the HCWs had a good attitude towards IPC standards. Similarly, studies in Ghana [25] and Northwest Ethiopia [26] also found more than half of the HCWs 55.1% and 57.2% respectively to have good attitude toward IPC. However, this result contrasts the finding by Unakal, et al. [27] in Trinidad and Tobago who found less than half (46.7%) of HCWs to have a positive attitude towards IPC. As a strong determinant of IPC compliance, cultivating a positive attitude among HCWs toward IPC stands as a critical foundation. Consequently, health authorities must implement systematic and effective measures aimed at enhancing the positive attitude of HCWs toward IPC standards.

Compliance with IPC standards among HCWs has been demonstrated to yield significant benefits for both HCW and potential clients [8, 28]. This study established that HCW's good attitude, accessibility of PPEs, and monitoring of IPC practice were independently

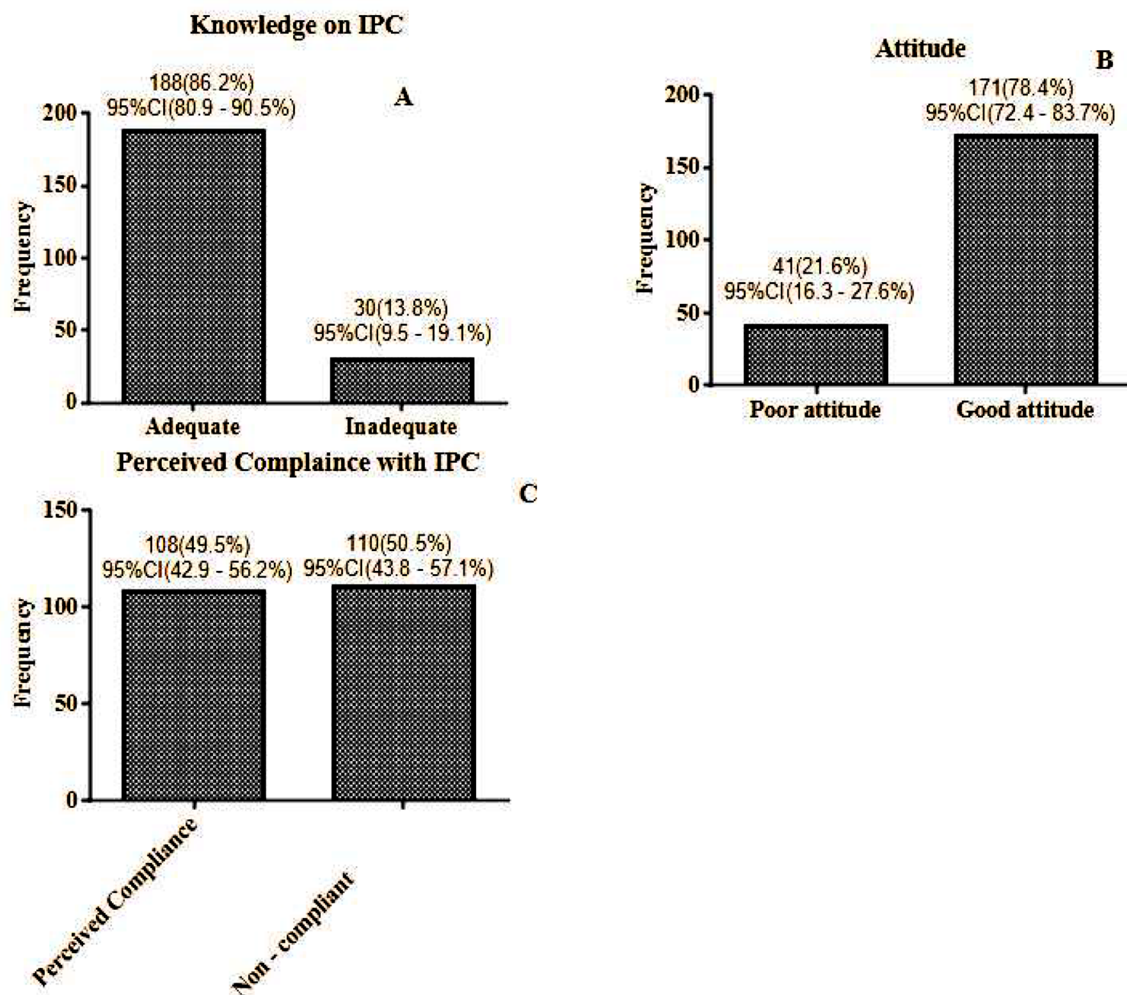

Fig. 2 Descriptive statistics on the Knowledge, attitude, and perceived compliance with IPC standards among HCWs in the North Bank East Region (NBER), 2021

associated with perceived compliance with IPC standards. Regarding HCWs' attitude, this study found that HCWs with good attitudes were about three times more likely to comply with IPC standards. Consistently, existing evidence points to the fact that compliance with IPC standards is often attributed to good attitudes among HCWs [29–31].

More so, according to Boeker, et al. [32], monitoring IPC practice is a way to enhance compliance to IPC standards. This observation forms a fine basis for the current study finding where HCWs who were monitored in their IPC practice were more likely to comply with IPC standards compared to those who were not monitored. Therefore, a continuous and rigorous monitoring system for IPC practices among HCWs should be in place. It should be conducted regularly and in a non-punitive manner, focusing on identifying areas for improvement and providing feedback to HCWs. This approach will not only help identify compliance gaps but also encourage HCWs to consistently follow IPC standards.

Finally, this study like the Ethiopian study [33], observed that HCWs who had access to PPEs were more likely to comply with IPC standards than those who did not have PPEs readily accessible. This observation underscores the critical role of PPEs in enabling and sustaining IPC compliance. Essentially, IPC protocols often necessitate the use of PPEs, and the recurrent unavailability of such essential protective gear could potentially demoralize previously compliant staff members, leading to lapses in compliance. Thus, adequate provision and distribution of PPEs should be a priority in healthcare facilities in the study jurisdiction.

Conclusion

The study found that the level of knowledge about IPC was high, but HCWs' perceived compliance with IPC was low. Furthermore, individual-level factors associated with

Table 3 Chi-square test of association of independent variables and perceived compliance with IPC among HCWs in NBER, 2021

Variables	Perceived Compliant	Non-compliant	*p*-value	cOR (95%CI)	*p*-value	aOR (95% CI)	*P*-value
Sex			0.280				
Male	51 (46.0)	60 (54.0)		-	-	-	-
Female	57(53.3)	50 (46.7)		-	-	-	-
Age (years)			0.920				
20–29	42 (50.0)	42 (50.0)		-	-	-	-
30–39	40 (50,6)	39 (49.4)		-	-	-	-
≥40	26 (47.3)	29 (52.7)		-	-	-	-
Work experience (years)			0.890				
1–5	54 (50.0)	54 (50.0)		-	-	-	-
>5	54 (49.1)	56 (50.9)		-	-	-	-
Education level			0.451				
Did not attend school	23 (51.1)	22 (48.9)		-	-	-	-
Up to Secondary	19 (41.3)	27 (58.7)		-	-	-	-
Tertiary education	66 (52.0)	61 (48.0)		-	-	-	-
Staff category			0.887				
Medical Doctor	5(62.5)	3 (37.5)		-	-	-	-
Laboratory Professional	6(46.2)	7(53.8)		-	-	-	-
Nurse	43(47.8)	47(52.2)		-	-	-	-
Public Health Officer	14(56.0)	11(44.0)		-	-	-	-
Others	42(51.2)	40(48.8)		-	-	-	-
Knowledge			**0.002**				
Inadequate	7(23.3)	23(76.7)		1		1	
Adequate	101(53.7)	87(46.3)		3.81 (1.56–9.32)	**0.003**	1.38 (0.44–4.31)	0.567
Attitude			**<0.001**				
Poor	9(19.1)	38(80.9)		1		1	
Good	99(57.9)	72(42.1)		5.81 (2.64–12.76)	**<0.001**	3.13 (1.17–8.41)	**0.023**
Availability of IPC guidelines			**<0.001**				
Not Available	18(29.5)	43(70.5)		1		1	
Available	90(57.3)	67(42.7)		3.21 (1.70–6.05)	**<0.001**	1.87 (0.84–4.14)	0.123
Accessibility of PPEs			**<0.001**				
Not accessible	14 (21.2)	52 (78.8)		1		1	
Accessible	94 (61.8)	58 (38.2)		6.02 (3.07–11.82)	**<0.001**	2.34 (1.01–5.38)	**0.046**
Monitoring of IPC practice			**<0.001**				
Monitored	95 (62.5)	57 (37.5)		1		1	
Not Monitored	13 (19.7)	53 (80.3)		7.86 (3.94–15.67)	**<0.001**	3.95 (1.84–8.45)	**<0.001**
Workload			0.890				
High	57 (50.0)	57 (50.0)		-	-	-	-
Not high	51(49.0)	53 (51.0)		-	-	-	-

aOR: adjusted Odd Ratio, cOR: crude Odd Ratio. P-value is significant at <0.05. NBEWR: North Bank East Region

perceived compliance with IPC include the attitude of HCWs towards IPC practice. Organizational-level factors associated with perceived compliance with IPC standards include accessibility of PPEs and monitoring of IPC practice among staff by management.

Limitation

In this study, we relied on HCWs' subjective self-assessment. Therefore, the responses might have not accurately reflected the true knowledge and compliance with IPC standards. Since this study relied on recall of past behaviours, the information may be prone to recall bias. Furthermore, the information obtained from HCWs was not validated through direct observation.

Abbreviations

ABHS	Alcohol-Based Hand Sanitizer
AIDS	Acquired Immune Deficiency Syndrome
CDC	Center for Disease Control and Prevention
GBoS	Gambia Bureau of Statistics
HAI	Healthcare-Associated Infections
HBV	Hepatitis B Virus
HCV	Hepatitis C Virus
HCW	Healthcare Workers
HIV	Human Immunodeficiency Virus
ICU	Intensive Care Unit
ILO	International Labor Organization
IPC	Infection Prevention and Control

MRC Medical Research Council
NBER North Bank East Region
NGO Non-Governmental Organization
PEP Post Exposure Prophylaxis
PPE Personal Protective Equipment
WHO World Health Organization

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Author contributions
SMKD conceptualized the study, collected data, analyzed and produced a draft of the manuscript. HAB provided expert guidance from conceptualization to drafting of manuscript, supported by EK. SADO and GEK provided high quality review of the manuscript from the draft of the manuscript to the final review. AK, and NF designed questionnaires and assisted in data collection. MN, KS, DD and AEY assisted in analysis and interpretation of data. All authors read and approved the final manuscript.

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Data availability
The data that support the findings of this study are not openly available due to reasons of sensitivity and are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate
Ethical approval (R021039) was obtained from The Gambia Government/MRC Joint Ethics Committee through the Research and Publication Committee of The University of The Gambia (Republic). The Director of Health Services granted permission for data collection. An official latter was sent to the Director of Health Services for his approval, a copy of which was sent to both the region and the hospital. Informed consent was also obtained from participants after explaining the purpose of the study and what was expected of them.

Consent for publication
Not Applicable.

Competing interests
The authors declare no competing interests.

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