Knowledge, attitude, and practices of infection prevention and control among radiographers in a resource constraint setting in Namibia

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Abstract

Background. Radiographers' role as healthcare workers places them at constant risk for hospital-acquired infections. Practical, evidence-based methods are necessary to reduce the transmission of pathogens to and from patients and healthcare workers.

Objective. The main objectives of this study were to determine knowledge, attitude, and practice levels regarding infection prevention and control (IPC) strategies among radiographers in Windhoek and Oshakati, and measure their relationships with other variables.

Method. A quantitative descriptive design was employed. To assess the knowledge, attitude, and practice levels among radiographers, a self-administered questionnaire was used. Twenty-seven radiographers took part in the study, producing a 68% response rate.

Results. The study revealed that the majority of the radiographers showed an appropriate level of overall knowledge and attitude toward infection prevention and control. However, the majority of their practice levels were poor. Pearson rank correlation test revealed that the radiographers' knowledge was significantly associated with attitudes (P= 0.004; r=0.53) and practices (P=0.03; r=-0.41) with a moderate positive and negative correlation, respectively.

Conclusions. In conclusion, the study revealed that radiographers are knowledgeable about IPC strategies, and have good attitudes toward them. However, their practice was poor and inconsistent with the level of knowledge demonstrated. Therefore, it is recommended that healthcare service managers establish efficient and rigorous means of monitoring adherence to IPC strategies and improving practices to reduce incidences of health-acquired infections among radiographers, especially in the age of a pandemic.

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Informed consent: those who agreed to participate in the study signed a written consent form.

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Introduction

Infection prevention and control (IPC) is a significant aspect of the duties of healthcare workers.[1] Radiographers' roles as healthcare workers place them at constant risk for hospital-acquired infections (HAIs). Practical, evidence-based methods are necessary to reduce the transmission of pathogens to and from patients and healthcare workers (HCW). The World Health Organization defines IPC as a *practical, evidence-based approach that prevents patients and healthcare workers from being harmed by avoidable infections*.[2] Infection prevention and control is a functional subdivision of hospital epidemiology that should be practiced in every healthcare environment. It aims to prevent infections from occurring and spreading within healthcare facilities.

Owing to the poor implementation of IPC strategies, HAIs have been recognized as a problem affecting the quality of healthcare and are the principal source of adverse healthcare outcomes worldwide.[3] These HAIs can exacerbate underlying conditions, delay recovery, or adversely affect the patients' quality of life. Furthermore, poor implementation of IPC strategies could significantly worsen the financial burden on hospitals.[4] In imaging departments, the lack of IPC strategies has become a cause for concern, as there is reportedly an increase in numbers of HAIs, particularly during special or interventional radiology procedures – primarily due to high chances of accidental blood and pathogen exposure.[5,6]

Proper implementation of IPC strategies can effectively protect HCWs and patients from communicable diseases, particularly in the age of the COVID-19 pandemic, whereby a growing number of health workers are testing positive for the disease. The COVID-19 pandemic which started in China has since spread across the world

and is considered the largest outbreak of atypical pneumonia since the severe acute respiratory syndrome in 2003.[7] Even though vaccines have been developed, vaccine inequity and hesitancy in some countries are proving to be a challenge in combating the disease's transmissibility. Therefore the correct application of IPC strategies remains a key method of reducing disease transmission.[8]

Normally, the roles of radiographers include working in close proximity to patients and physically handling patients' bodies during anatomical part positioning which directly and indirectly predisposes them to HAIs. As technology advances, the role of radiography evolves from diagnostic to including more interventional procedures. These procedures have an increased risk of HAIs due to the direct and close contact between patients and radiographers. In addition to the direct transmission of pathogens between the patient and the radiographer, diseases can also spread indirectly within the radiology departments (RDs) via aerosol spray, radiology equipment, workstations, and imaging tables.[9] A previous systematic review reported up to 19 different types of pathogens that are linked to HAIs within RDs putting radiographers and patients at risk.[10] Thus, the need to develop and comply with specific IPC protocols within radiology departments has never been more important.

Radiologic departments are an integral part of the diagnostic process during patient management, where imaging usually occurs before diagnosis. This poses an increased risk of HAIs among radiographers, especially with highly contagious diseases, such as COVID-19. Therefore, guaranteeing the adequate protection of radiographers is essential to ensuring continuity of care. As a result, the development, implementation, and compliance with IPC strategies depend on the knowledge and attitudes of radiographers.[11] It has been reported that compliance with IPC strategies is affected by several factors, including the attitudes and knowledge of HCWs regarding IPC, increased workload, and poor risk perception.[12,13] In Namibia, the Ministry of Health and Social Services is responsible for developing the IPC guidelines and strategies which are then cascaded to the hospitals for implementation. Hospitals are expected to contextualize the implementation of these guidelines to make them more effective in specific departments. Generally, these guidelines include hand hygiene protocol, handling of patient waste and soiled linen, environmental cleaning and decontamination, and proper usage of PPEs among others. The RDs under study did not have any radiography-specific IPC guidelines to assist radiographers in adhering to and maintaining best IPC practices. Without these provisions, there is a heightened risk of contracting HAIs. Additionally, radiographer knowledge, attitude, and practice (KAP) levels were not known, as the number of radiographers treated for HAIs from the RDs in this study steadily increased. This study aimed to determine and describe the knowledge, attitudes, and practices of radiographers regarding IPC in resource-constrained departments.

Materials and Methods

Ethical considerations

Permission to conduct the study was sought from the Ministry of Health and Social Services Ethics Committee (Ref: 17/3/3WJD). This study followed the ethical principles of the Belmont Report through the application of respect for persons, beneficence, and justice. The study's purpose and objectives were discussed with each participant including the participants' rights to voluntary participation and withdrawal without any consequences. Those who agreed to participate in the study signed a written consent form. Participants' data were anonymized during data collection to ensure confidentiality and were encrypted and stored in a password-protected hard drive.

Study design and setting

A quantitative descriptive cross-sectional design was used to determine the knowledge, attitudes, and practices of radiographers regarding IPC in one tertiary and two secondary hospital departments. This design allowed the researchers to test theories and examine relationships between variables.[14] Data were collected from radiographers working at a tertiary and a secondary hospital in the city of Windhoek and another secondary hospital in the town of Oshakati, Namibia. These three hospitals receive the majority of patient referrals from the 14 different regions in Namibia and are accredited for teaching health sciences students including radiography. Furthermore, they house the biggest public RDs with a variety of imaging modalities and procedures with a total staff complement of 40 radiographers. Radiographers in these departments have reported cases of HAIs in the past though this has not been properly documented. Due to the small population size (40), total population sampling was applied. A total of 27 out of 40 radiographers were conveniently recruited and gave consent to participate in this study. Thirteen participants across the three departments did not give consent to participate in the study citing time and lack of study relevance in their job context. Recruitment of the participants was done via face-to-face and telephonic contact.

Data collection

Data collection took place between April and July 2020 at three RDs. Before data collection, a pilot study was conducted using a self-administered questionnaire on three radiographers, who did not form part of the actual study. A few errors in the questionnaire were identified and addressed to ensure that appropriate data were collected properly.

A self-administered questionnaire, consisting of three sections totaling 36 Likert-type scale questions, was sent by email to each participant for completion. The questionnaire was partially adapted from a similar study conducted in Zambia, by Chitimwango.[15] Five questions under knowledge, seven questions under attitude, and one question under practice were adopted from this study and modified to suit the radiography context. The rest of the questions were developed by the researchers using their contextual knowledge of radiography and infection prevention and control guidelines. The final questionnaire consisted of four sections with the first section having three demographic variables including gender, age, and employment rank. The second section measured knowledge of IPC using 13 variable indicators that were focusing on the prevention and control of HAIs as well as the IPC guidelines. The third section measured attitude towards IPC using 13 indicator variables that were focussing on the prevention and control measures for HAIs. The fourth and last section measured self-reported practice using 10 statements focussing on radiographic practice associated with the prevention and control of HAIs. Knowledge and attitude variables were measured using a 4-point Likert scale, where 1 indicated strongly disagree, 2 disagree, 3 agree and 4 strongly agree. For practice, a 3-point Likert scale was used where 1 indicated yes always, 2 yes sometimes, and 3 no not at all. During data collection, the contact details of each participant, telephone, and email address were first obtained from the HODs of the three radiography departments. Participants were either contacted face-to-face or telephonically depending on their availability on duty. After the discussion about the study and consenting process, questionnaires were then sent via email to each participant for

completion. Completion of the questionnaire was done electronically and the participants emailed back the questionnaires.

Data analysis

Microsoft Excel 2016 was used to clean the data collected from the questionnaire. To test for the reliability of the tool, Cronbach's α coefficients were calculated which were acceptable for the three scopes of the questionnaire (13-item knowledge scale: Cronbach's α=0.64, 13-item attitude scale: Cronbach's α=0.84, and 10-item practices scale: Cronbach's α=0.68).

All analyses were performed using SPSS version 26. Descriptive statistics were used to assess individual item responses, and results produced frequency tables. Inferential statistics were used to determine the association of categorical variables. Analysis of Variance was conducted to compare mean rank scores of knowledge, attitude, and practices with demographic variables. The minimum scores were 13 for both knowledge and attitude whilst the maximum was 52 with a range of 39. For practice, the minimum score was 10 and the maximum was 30 with a range of 20. Knowledge and attitude were classified as poor (scores 13-25), average (scores 26-39), and good (scores 40+). For practice, the scores were classified as poor (scores 21-30) and good (scores 10-20).

Fisher's exact test was used to compare the association between knowledge, attitude, and practice levels with demographic variables. The results were considered statistically significant if a two-sided P<0.05. Pearson's correlation coefficient (P<0.01) was used to evaluate the associations between KAP scores.

Results

Of the 27 participants, 9 (33.3%) were male, and 18 (66.7%) were female. Of these, 6 (22.2%) participants were 21-25 years, 9 (33.3%) participants were 26-30 years, 6 (22.2%) participants were 31-35 years, 3 (11.1%) participants were 36-40 years and 3 (11.1%) participants were aged 41 years and older. Of the total respondents, 5 of them were assistant radiographers (18.5%), 16 were radiographers (59.3%), and 6 were senior radiographers (22.2%). There were 5 (18.5%) certificate holders, 9 (33.3%) diploma holders, 11 (40.7%) degree holders, and 2 (7.4%) postgraduate diploma holders. The roles of the radiographers ranged from general, 14 (51.9%), computed tomography, 4 (14.8%), magnetic resonance imaging, 1 (3.7%), and mammography, 8 (29.6%).

Knowledge regarding infection prevention and control

Radiographers rated their knowledge regarding IPC based on a four-point Likert scale. Total knowledge scores ranged from 28 to 50, with a mean score of 37.56±4.74 (CI 95%, 36.67-39.43). The quartiles of the scores were 38 and 41 for the 50th and 75th percentiles, respectively. The average knowledge scores for gender, age group, and rank are shown in Table 1. There was statistical significance between knowledge scores and age groups (P=0.04). Furthermore, 8 (29.6%), 15 (55.6%), and 4 (14.8%) were classified as having a poor, average, and good level of knowledge respectively.

Attitudes toward infection prevention and control

Regarding radiographers' attitudes towards IPC, scores ranged from 20 to 49, with a mean score of 41.00±7.30 (CI 95%, 38.11-43.88). For the 50th and 75th percentiles, the quartiles of the scores were 42 and 47, respectively. The mean attitude scores for gender, age group, and rank are shown in Table 1. There was no statistical significance between radiographers' total attitude scores and gender, age group, and rank. The majority, 21 (77.8%), had a good attitude while 4 (14.8%) and 2 (7.4%) had an average and poor level of attitude respectively.

Practices concerning infection prevention and control

Total radiographers' practice scores concerning IPC ranged from 8 to 26, with a mean score of 17.67±3.80 (CI 95%, 16.16-19.17). The quartiles of the scores were 18 and 20 for the 50th and 75th percentiles, respectively. The mean practice scores for gender, age group, and rank are shown in Table 1. The total practice mean scores were found to be statistically significant with the age groups (P=0.02) and rank of radiographers (P=0.00). Other variables were not found to be significant. The majority, 19 (70.4%), had poor practice while 8 (29.6%) had a good level of practice regarding IPC.

Overall knowledge, attitude, and practice levels

The overall knowledge, attitudes, and practice scores were grouped into three levels (poor, average, and good); the practice scores were grouped into two levels (poor and good). There was no statistical significance found between the KAP levels and the gender, age group, and rank variables. The results were presented in Table 2.

Correlation between knowledge, attitude and practice scores

The Pearson rank correlation test was used to examine the strength and direction of the association between knowledge with attitude and practice. The radiographers' knowledge was found to be significantly associated with attitudes (P=0.004, *r*=0.53) and practices (P=0.03, *r*=-0.41) with a moderate positive and negative

Table 1. Mean of radiographers' knowledge of infection prevention and control and demographic variables.

Variables	Knowledge		Attitude		Practices	
	Mean±SD	P	Mean±SD	P	Mean±SD	P
Sex	0.68		0.32		0.29	
Male	37.00±3.31		39.00±7.84		16.56±5.38	
Female	37.83±5.38		42.00±7.03		18.22±2.73	
Age groups		0.04*		0.39		0.02*
20-30	37.67±4.55		39.10±8.72		16.73±3.73	
31-40	36.33±3.77		44.67±3.84		20.44±2.51	
41-50	36.00±2.8		38.50±3.54		15.00±1.41	
Rank		0.24		0.42		0.00*
Assistant Radiographers	38.00±3.08		39.40±3.91		13.40±4.83	
Radiographers	38.50±4.63		41.13±6.87		17.88±2.58	
Senior Radiographers	34.67±5.64		42.00±10.94		20.67±2.73	

correlation, respectively. The knowledge correlation coefficient between attitudes and practices was beyond the value of -0.4 and +0.4 thus indicating a moderate correlation between the variables.[16] These results are a reaffirmation of the relationship (Figures 1 and 2) between knowledge attitude and practice with infection control measures.

Discussion

Effective application of IPC guidelines has always been a central point in preventing HAIs among healthcare workers, especially during the COVID-19 pandemic.[8] For HCWs to effectively prevent HAIs, a good understanding of pathogenic transmission, and IPC strategies, accompanied by a compliance and correct attitude toward IPC are crucial.[17] Additionally, where all infection prevention equipment is available, the onus is on the HCW to ensure the prevention and control of HAIs.

The majority of participants in this study were female (66.7%), which is consistent with the gender variations of the entire radiographer population in Namibia. Similarly, studies in Singapore and Saudi Arabia align with this observation.[18,19] This is due to health professions being female-dominated, because of their caring attribute.[20] Most of the participants in this study (33.3%) were young (21-25 years) recently employed graduates, with less than two years of experience. This could have affected their knowledge and compliance regarding the IPC strategies of the employer. Correspondingly, most of the participants (59.3%) served as basic radiographers, which is a rank consistent with low-level experience. The assessment of pre-existing knowledge regarding IPC among radiographers plays a vital role in the success of prevention and control strategies, as it informs the educational programs for HCW, regarding IPC.[6] This study revealed that the majority of participants (55.6%) had average knowledge regarding IPC. This observation was reported in similar studies conducted in Malawi and Sri Lanka, where the level of knowledge was also found to be average.[5,6] This could be attributed to radiography training focusing mainly on the diagnoses of the diseases, with limited emphasis on pathogenesis.[6] In this study, only female participants showed a good level of IPC knowledge. This may be attributed to gender differences. Gender differences are a fundamental part of society which translates into the working environment.[21] Studies have shown that women play a more nurturing role in their homes and this includes cleaning the house and washing.[21,22] Due to gender segregation, women tend to do more housework than men which leads to women possessing good hygiene competence. This systemic difference between gender results in a difference in pre-existing knowledge of IPC.[21] This is in line with another IPC study that reported female HCWs having had better preventive behaviors than their male counterparts.[23] Although the study showed that a majority of radiographers were aware of IPC guidelines, there was

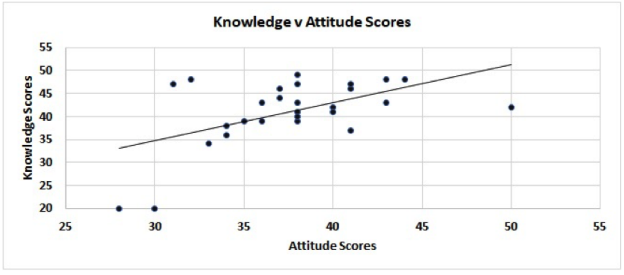

Figure 1. Scatter plot with a fit line of total attitude scores by knowledge scores.

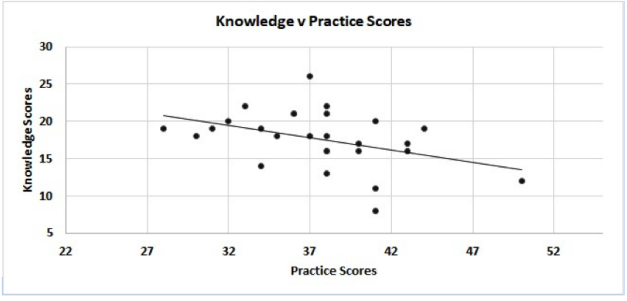

Figure 2. Scatter plot with a fit line of total practice scores by knowledge scores.

Table 2. Overall knowledge, attitude and practice levels.

	Knowledge N(%)			Attitude N(%)			Practices N(%)	
	Poor	Average	Good	Poor	Average	Good	Poor	Good
Total	8(29.6)	15(55.6)	4(14.8)	2(7.4)	4(14.8)	21(77.8)	19(70.4)	8(29.6)
Rank								
Assistant Radiographer	1(12.5)	4(26.7)	0(0)	0(0)	2(25)	3(14.3)	4(21.1)	1(12.5)
Radiographer Senior	4(50)	9(60)	3(75)	1(50)	2(25)	13(61.9)	12(63.2)	4(50)
Radiographer	3(37.5)	2(13.3)	1(25)	1(50)	0(0)	5(23.8)	3(15.8)	3(37.5)
P		0.67			0.37		0.50	
Sex								
Male	2 (25)	7(46.7)	0 (0)	1(50)	1 (25)	7(33.3)	7(36.8)	2(25)
Female	6 (75)	8(53.3)	4 (100)	1(50)	3 (75)	14(66.7)	12(63.2)	6(75)
P		0.21			1.00		0.68	
Age group								
20-30	4(50)	9(60.0)	2(50)	2(100)	3(75)	10(47.6)	12(63.2)	3(37.5)
31-40	3(37.5)	5(33.3)	1(25)	0(0)	0(0)	9(42.9)	4(24.1)	5(62.5)
41-50	1(12.5)	1(6.7)	0(0)	0(0)	1(25)	1(4.8)	2(10.5)	0(0)
51+	0(0)	0(0)	1(25)	0(0)	0(0)	1(4.8)	1(5.3)	0(0)
P		0.67			0.32		0.23	

Fisher's Exact Test (P<0.05).

still a number of those who were not. This study revealed a statistical significance between mean knowledge scores and age groups. This may be attributed to the fact that as HCWs age, they tend to advance their knowledge through experience. This is in line with findings of similar research studies conducted on HCWs in North-Western Nigeria and North-West Ethiopia.[24,25]

Good knowledge and understanding of IPC guidelines are a prerequisite to creating positive attitudes and practices. A good attitude towards IPC was observed in the present study among the majority of the participants. This could be linked to a similar score in the knowledge variable. The participants had a positive attitude toward hygiene and handwashing, indicating the expectation for them to wash their hands before they begin. Although participants revealed that there are IPC policies, they indicated that these were not readily available in the department. Participants believed cleaning surfaces, workstations, and imaging receptors will reduce the risk of spreading infections. Nearly half of the participants indicated that they do not have to adhere to all policies and procedures for infection control. This observation is similar to another study that reported a positive attitude level towards IPC but acknowledged that there were HCWs who did not comply with IPC guidelines and needed to change their attitudes.[26] The results in the present study showed a significant positive correlation between knowledge and attitude, which is similar to previous studies.[27,28] Despite good knowledge and attitude levels, it was concerning to discover poor practice levels regarding IPC among the majority of the radiographers. The lack of proper IPC practices can compromise the efforts of IPC strategies in hospitals. In this study, the poor level of IPC practice could be due to a lack of consistent training on IPC and the lack of IPC manuals, inaccessibility of PPE, or work pressure.[23,26] Radiographers in this study indicated a keen interest in attending regular training focused on IPC. This highlights the need to establish regular training programs to upgrade the radiographers' knowledge and improve practices concerning IPC, which is in line with recommendations from a similar study.[15] To ensure best practice levels, radiographers in the departments must have adequate IPC manuals and PPE that are accessible and available to them.[29] Being under pressure and understaffed at work were previously reported as causes of poor IPC practices.[30] The need for a high patient turnover creates pressure that could result in reduced adherence to IPC guidelines. The total practice mean scores were found to be statistically significant with the age groups and rank of radiographers which is in line with reports from a previous study.[24] This study showed that radiographers over the age of 31 were more likely to practice good IPC when compared to the younger ones. These good practices could be a result of experience gained with age.[24,31,32] Concurring with a previous study, the seniority in the rank of radiographers could have influenced IPC practices due to the level of responsibility that comes with it.[33]

Limitations

The population size of the study was small, limiting the external generalizability of the findings. The study findings are based on self-reported questionnaires with a potential for self-preservation bias during reporting of practice.

Conclusions

In conclusion, the study revealed that radiographers are knowledgeable about IPC strategies, and have good attitudes toward them. However, their practice was poor and inconsistent with the level of knowledge demonstrated. It is recommended that continuous IPC education be considered to keep radiographers abreast with the latest knowledge on IPC to enhance their practices. This will further translate to positive impacts on knowledge and attitudes. Moreover, mechanisms to rigorously monitor practice and enhance IPC compliance are recommended to reduce the occurrence of HAIs.

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