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Occupational Exposure to Infectious Diseases among Healthcare Workers in Tertiary Health Facilities in Ebonyi State

Eberechukwu Nwachi[1*], Osmond Chukwuemeka Ene[2], Olaoluwa Samson Agbaje[3]

[1-3]Department of Human Kinetics and Health Education, University of Nigeria, Nsukka

Abstract

The study investigated exposure to infectious diseases, among healthcare workers in the tertiary health facilities in Ebonyi State. Four research questions and three null hypotheses guided the study. The study adopted the cross-sectional survey research design. The population for the study comprised 5,200 healthcare workers in tertiary health facilities in Ebonyi State. The sample size for the study comprised 605 healthcare workers. The multistage sampling procedure was used to draw the sample for the study. The instrument for data collection was Occupational Exposure to Infectious Diseases Questionnaire (OEIDQ). Split-half method with Spearman Brown Correction was used to determine the reliability (internal consistency) of the instrument and a reliability coefficient of .79 was obtained. The data collected were analyzed using Statistical Package for Social Sciences (SPSS Version 25). Frequencies and percentages were used to answer the research questions while Chi-Square test, was used to test the hypotheses at 0.05 level of significance. The findings showed that more than half (53.9%) of healthcare workers were exposed to occupational infectious diseases in the tertiary health facilities in Ebonyi State. There were significant differences in the proportion of healthcare workers exposed to occupational infectious diseases based on age ($p = 0.000$), gender ($p = 0.003$), and marital status ($p = 0.000$). Based on the findings, the authors recommended periodic in-service training on prevention of exposure to occupational infectious diseases for healthcare workers.

Keywords: Exposure, Infection diseases, Healthcare workers.

Introduction

Occupational exposure to infectious diseases is one of the most prevalent public health problems among healthcare workers. Occupational exposure is a major risk for the transmission of infections such as human immunodeficiency virus (HIV), hepatitis B virus (HBV), hepatitis C virus (HCV), tuberculosis (TB), and respiratory illnesses such as corona viruses and influenza (Mengistu et al., 2022). It has been also noted that on every working day, over 59 million HCWs in the world are at risk of getting infected with hepatitis, human immunodeficiency virus (HIV) and tuberculosis by accidental exposure to patient's blood and other body fluid (Adetoun et al., 2021).

The World Health Organization (2022) estimated that annually, about three million healthcare workers (HCWs) are exposed to blood-borne hepatitis B and C and HIV while 2.5 per cent of HIV cases and 40 per cent of HBV and HCV cases among HCWs globally are caused by exposure to such infections.

In sub-Saharan Africa, HCWs are at greater risk of occupational infection from blood-borne pathogens because of high prevalence of blood- borne infections in the general population. A systematic review conducted in 21 African countries showed a high prevalence of occupational exposure to blood and body fluids among HCWs (Auta et al., 2017).

In Nigeria, occupational exposure to infectious diseases among HCWs is a major public health problem. For instance, Enwere and Diwe (2014) had reported that there was a high prevalence of exposure to infectious diseases among HCWs in the tertiary hospitals in

the north-central, south-southern and south-eastern, Nigeria. Adetoun et al. (2021) reported that the risk of blood-borne infections through occupational exposures among HCWs is very high in Nigeria due to high prevalence of these blood pathogens in the community and limited or non- availability of personal protective equipment.

In Ebonyi State, Agboeze et al. (2022) reported an outbreak of Lassa fever (LF) in 2018 and indicated that the Case Fatality Rate (CFR) was 26.2 per cent among the laboratory confirmed cases and five of the deaths occurred among health care workers. This report showed that health care workers in Ebonyi State were susceptible to occupational infectious diseases, with dire consequences.

Occupational exposure has been variously conceptualized in literature. Ma et al. (2019) described occupational exposure as the presence of a substance or risk factor in a work environment external to the worker. According to the authors, occupational exposure includes physical factors, chemicals, biological agents, physical stress and psychosocial stressors (Ma et al., 2019). Abere et al. (2020) viewed occupational exposure as having reasonably skin, eye, mucous membrane or parenteral contact with blood, body fluids or other potentially infectious materials that may result from the performance of one's professional duties.

Infectious diseases have been variously conceptualized in literature. Infectious diseases are illnesses caused by pathogens outside the body. Seventer and Hochberg (2017) defined infectious disease as an illness due to a pathogen or its toxic product, which arises through transmission from an infected person, an infected animal or a contaminated inanimate object to a susceptible host. In the present study, infectious diseases refer to illnesses caused by pathogenic agents such as bacteria, viruses, parasites and fungi which adversely affect healthcare workers' health. Infectious diseases such as human immunodeficiency virus (HIV), hepatitis B virus (HBV), hepatitis C virus (HCV), tuberculosis (TB), and respiratory illnesses such as influenza are the most prevalent in the healthcare industry (Scott et al., 2023). This study was conducted among health care workers. Healthcare workers are the employees of health facilities whose primary role is to provide health treatment to ill patient in the facilities such as doctors, nurses and supporting staff (Joseph & Joseph 2016). Healthcare workers are used for the present study because they are the most vulnerable when it comes to occupational exposure to infectious diseases because of their close contact with patients when performing their duties in the tertiary health facilities.

Tertiary Health Facilities constitute the highest level of healthcare system in Nigeria. Tertiary health facilities are specialized care facilities that offer services to those patients referred from Secondary care for diagnosis or treatment which is not available in primary or secondary care (International Association for Hospital and Palliative Care [IAHPC], 2022).

Certain factors had been identified to influence occupational exposure to infectious diseases among HCWs. Sociodemographic factors of age, gender and marital status were identified to influence occupational exposure to infectious disease. Nmadu et al. (2016) reported that age correlated with occupational exposure to infectious diseases among healthcare workers. They further reported that occupational exposure was higher in HCW's who more than 40 years of age compared to the younger age group. Nmadu et al. (2016) also reported that occupational exposure to infectious diseases was higher in female compared to male (HCWs. This could be attributed to the fact that there are more female than male HCWs in healthcare settings. Desta et al. (2018) reported that single HCWs had more occupational exposures to infectious diseases compared to married HCWs. They asserted that disease exposure could be attributed to the single HCWs being young and inexperienced with little or no infection prevention control training. However, the study determined the proportion of

healthcare workers exposed to infectious diseases in tertiary health facilities in Ebonyi State based on age, gender, and marital status. It was hypothesized that there is no significant difference in the proportion of healthcare workers exposed to infectious diseases in tertiary health facilities in Ebonyi State based on age, gender, and marital status.

Methods

The study employed the cross-sectional survey research design and the area of the study was Ebonyi State. The population of the study was made up of 5,200 healthcare workers in the Tertiary Health Facilities in Ebonyi State.

The sample size for the study consisted of 605 participants. The multistage sampling procedure was used to draw the sample size. The first stage involved the use of proportionate stratified random sampling technique to draw the proportions of HCWs in each of the tertiary health facilities according to their population. There are three tertiary health facilities in Ebonyi State. Thus, 96.1 percent, 2.9 percent and 0.8 percent of the samples were drawn from Alex Ekwueme Federal University Teaching Hospital, Abakaliki (AE-FUTHA 1 and 2), National Obstetric Fistula Center, Abakaliki and National Virology Center, Ebonyi State respectively. In other words, 558, 17 and 5 healthcare workers were drawn from the Alex Ekwueme Federal University Teaching Hospital, Abakaliki (AE-FUTHA) 1 and 2; National Obsteric Fistula Center, Abakaliki, and National Virology Center, Abakaliki, Ebonyi State respectively.

In the second stage, convenience sampling technique was used to select the healthcare workers using the health facility registers for the study. One instrument was used for data collection in this study. This was the 20-item researcher-designed structured questionnaire known as "Occupational Exposure to Infectious Diseases Questionnaire (OEIDQ). The OEIDQ contains two sections, namely: Sections A and B. Section A contains 10 items that elicited responses on healthcare workers' socio demographic characteristics. Section B of the OEIDQ contains 10 items on exposure to occupational infectious diseases by healthcare workers. The items are assigned a response option of Yes or No.

The face validity of the OEIDQ was established by giving the draft copies of the instrument, the specific objectives, research questions and the hypotheses of the study to five experts in the Department of Human Kinetics and Health Education and two experts in Department of Science Education (Measurement and Evaluation Unit) University of Nigeria, Nsukka.

To establish the reliability (internal consistency) of the instruments, 20 copies of the questionnaire were administered to healthcare workers in Enugu, Enugu State. The reliability coefficients were determined using the split-half method with Spearman Brown correction formula. The reliability coefficient of .79 was obtained. The instrument was adjudged reliable because the reliability co-efficient was up to .70 and above. This is in line with Zikmud and Babin (2012) assertion that if the reliability co-efficient index of an instrument is up to .70 and above, the instrument should be considered reliable for the study.

To gain access to the healthcare workers in tertiary health facilities in Ebonyi State and co-operation from the respondents, an introductory letter duly signed was collected from the Head, Department of Human Kinetics and Health Education, University of Nigeria, Nsukka, introducing the researcher and explaining the purpose of the study. Three research assistants with a B.Sc. degree in Health Education were briefed on how to collect the data from HCWs. Copies of the OEIDQ were administered to the HCWs at the health facilities by the researcher and research assistants.

Frequencies and percentages were used to answer the research questions while the null hypothesis were tested using chi-square test.

Results

Table 1

Proportion of HCWs Exposed to Infectious Diseases in Tertiary Health Facilities in Ebonyi State (*N* = 520)

S/N	Items	Yes f(%)	No f(%)
	When caring or treating patients in this health facility, have you ever been engaged in:		
1.	Providing direct care to HIV patients	369(71.0)	151(29.0)
2.	Face -to -face contact with HIV patients	396(75.5)	122(23.5)
3.	Providing direct care to tuberculosis (TB) patients	290(55.8)	230(44.2)
4.	Face-to-face contact with TB patients in enclosed environment	237(45.6)	283(54.4)
5.	Direct contacts with the environment where patients with infectious diseases (e.g., HIV, TB, HBV, HCV and influenza or respiratory infections) are kept or isolated	331(63.7)	189(36.3)
6.	Collecting blood or bodily fluids samples from patients with HIV, HBV/HCV and TB	251(48.3)	269(51.7)
7.	Collecting blood or bodily fluids samples from patients with influenza	171(32.9)	349(67.1)
8.	Exposure to blood or bodily fluids (BBF) at intensive care unit (ICU)	179(34.4)	341(656)
9.	Exposure to blood or bodily fluids (BBF) at the emergency department	242(46.5)	278(53.3)
10.	Undergoing self-testing or screened for HBV, HCV, TB and HIV	336(64.6)	184(35.4)
	Overall	**53.9**	**46.1**

Results in Table 1 show that 53.9 per cent of HCWs were exposed to occupational infectious diseases in tertiary health facilities in Ebonyi State.

Table 2

Proportion of HCWs in Tertiary Health Facilities Exposed to Infectious Diseases based on Age (*N*= 520)

S/N	Items	18-24years (n-83)		25-34years (n=77		35-44years (n=149)		≥45years (n-111)	
		Yes f(%)	No f(%)	Yes f(%)	No f(%)	Yes f(%)	No f(%)	Yes f(%)	No f(%)
	When caring or treating patients in this health facility, have you ever been engaged in:								
1.	Providing direct care to HIV patients?	32(38.6) 51(61.4)	126(71.2)	51(28.8)	108(72.5)	41(27.5)	103(92.8)	8(7.2)	
2.	Face -to -face contact with HIV patients?	41(49.4) 42(50.6)	126(71.2)	51(28.8)	127(85.2)	22(14.8)	104(93.7)	7(6.3)	
3.	Providing direct care to tuberculosis (TB) patients?	20(24.1) 63(75.9)	104(58.8)	73(41.2)	83(55.7)	66(44.3)	83(74.8)	28(25.2)	
4.	Face-to-face contact with TB patients in enclosed environment?	13(15.7) 70(84.3)	73(41.2)1	04(58.8)	74(49.7)	75(50.3)	77(69.4)	34(306)	
5.	Direct contacts with the environment where patients with infections disease (e.g., HIV, TB, HBV, HCV and	38(45.8) 45(54.2)	113(63.8)	64(36.2)	105(70.5)	44(29.5)	75(67.6)	36(32.4)	

	influenza or respiratory infections) are kept or isolated?							
6.	Collecting blood or bodily fluids samples from patients with HIV, HBV/HCV and TB?	16(19.3) 67(80.7)	90(50.8)	87(49.2)	73(49.0)	76(51.0)	72(74.9)	39(35.1)
7.	Collecting blood or bodily fluids samples from patients with influenza?	5(6.0) 78(94.0)	46(26.0)	131(740)	64(34.0)	85(57.0)	56(50.5)	55(49.5)
8.	Exposure to blood or bodily fluids (BBF) at intensive care unit (ICU)	11(13.3) 72(86.7)	59(33.3)	118(66.7)	48(32.2)	101(67.8)	61(55.0)	50(45.0)
9.	Exposure to blood or bodily fluids (BBF) at the emergency department?	28(33.7) 55(66.3)	82(46.3)	95(53.7)	64(43.0)	85(57.0)	68(61.3	43(38.7)
10.	Undergoing self-testing or screened for HBV, HCV, TB and HIV?	37(44.6) 46(55.4)	93(52.5)	84(47.5)	105(70.5)	44(29.5)	101(91.0)	10(9.0)
	Overall	**29.1 71.0**	**51.5**	**48.5**	**56.2**	**42.9**	**73.1**	**27.9**

Results in Table 2 show that overall, HCWs ≥ 45years (73.1%), 35-44years (56.2%) and those aged 25-34years (51.5%) were exposed to infectious diseases more than those aged 18-24years (29.1%). The results imply that older healthcare workers were exposed to infectious diseases more than the younger healthcare workers.

Table 3

Proportion of HCWs in Tertiary Health Facilities Exposed to Infectious Diseases based on Gender (N=520)

		Male (n = 192)		**Female (n = 328)**	
S/N	**Items**	**Yes**	**No**	**Yes**	**No**
When caring or treating patients in this health facility, have you ever been engaged in:					
1.	Providing direct care to HIV patients?	158(82.3)	34(17.7)	211(54.3)	117(35.9)
2.	Face -to -face contact with HIV patients?	155(80.7)	37(193)	243(74.1)	85(25.9)
3.	Providing direct care to tuberculosis (TB) patients?	122(63.5)	70(36.5)	168(51.2)	160(48.8)
4.	Face-to-face contact with TB patients in enclosed environment?	107(55.7)	85(44.3)	130(39.6)	198(60.4)
5.	Direct contacts with the environment where patients with infections disease (e.g., HIV, TB, HBV, HCV and influenza or respiratory infections) are kept or isolated?	137(714)	55(28.6)	194(59.1)	134(40.9)
6.	Collecting blood or bodily fluids samples from	144(59.4)	78(40.6)	137(41.8)	191(8.2)

	patients with HIV, HBV/HCV and TB?				
7.	Collecting blood or bodily fluids samples from patients with influenza?	77(40.1)	15(59.9)	94(28.7)	234(71.3)
8.	Exposure to blood or bodily fluids (BBF) at intensive care unit (ICU)	93(48.4)	99(516)	86(26.2)	242(73.8)
9.	Exposure to blood or bodily fluids (BBF) at the emergency department?	118(61.5)	74(38.5)	124(37.8)	204(62.2)
10.	Undergoing self-testing or screened for HBV, HCV, TB and HIV?	142(74.0)	50(26.0)	194(59.1)	134(40.9)
	Overall	**63.7**	**36.3**	**48.2**	**51.8**

Results in Table 3 show that overall, male HCWs (63.7%) were exposed to infectious diseases than female HCWs (48.2%). The results suggest that male HCWs are more exposed to infectious diseases more than female HCWs in the health facilities.

Table 4

Proportion of HCWs in Tertiary Health Facilities Exposed to Infectious Diseases based on Marital Status (*N*= 520)

S/N	Items	Single (n=193)		Married (n=297)		Divorced (n=11)		Widowed (n=19)	
		Yes f(%)	No f(%)	Yes f(%)	No f(%)	Yes f(%)	No f(%)	Yes f(%)	No f(%)
When caring for or treating patients in this health facility, have you ever been engaged in:									
1.	Providing direct care to HIV patients?	106(54.9)	87(45.1)	241(81.1)	56(18.9)	8(72.7)	3(27.3)	14(73.7)	5(26.3)
2.	Face -to -face contact with HIV patients?	111(57.5)	82(42.4)	258(86.9)	39(13.1)	11(100.0)	0(0.0)	18(94.7)	1(53)
3.	Providing direct care to tuberculosis (TB) patients?	72(37.3)	121(62.7)	195(65.7)	102(34.3)	8(727)	3(27.3)	15(78.7)	4(21.1)
4.	Face-to-face contact with TB patients in enclosed environment?	46(23.8)	147(76.2)	168(56.6)	129(43.4)	8(72.7)	3(27.3)	15(78.9)	4(21.1)
5.	Direct contacts with the environment where patients with infections disease (e.g., HIV, TB, HBV, HCV and influenza or respiratory infections) are kept or isolated?	108(56.0)	85(44.0)	201(67.7)	96(32.3)	11(100.0)	0(0.0)	11(57.9)	8(42.1)
6.	Collecting blood or bodily fluids samples from patients with HIV, HBV/HCV and TB?	73(37.8)	120(62.2)	163(54.9)	134(45.1)	8(72.7)	3(27.3)	7(36.8)	12(632)
7.	Collecting blood or bodily fluids samples from patients with influenza?	30(15.5)	163(84.5)	122(41.1)	175(58.9)	4(36.4)	7(63.6)	15(78.9)	4(21.1)
8.	Exposure to blood or bodily fluids (BBF) at intensive care unit (ICU)	55(28.5)	138(71.5)	105(35.4)	192(64.6)	4(36.4)	7(63.6)	15(78.9)	4(21.1)
9.	Exposure to blood or bodily fluids	82(42.5)	111(57.5)	141(47.5)	156(52.5)	8(72.7)	3(27.3)	11(57.9)	8(42.1)

	(BBF) at the emergency department?								
10.	Undergoing self-testing or screened for HBV, HCV, TB and HIV?	89(46.1)	104(53.9)	218(73.4)	79(26.6)	11(100.0)	0(0.0)	18(94.7)	1(5.3)
	Overall	**40.7**	**60.0**	**61.0**	**39.0**	**73.6**	**26.4**	**73.1**	**26.9**

Results in Table 4 show that overall, the divorced (73.6%) and widowed (73.1%) HCWs were exposed to infectious diseases more than the single (39.9%) and married (61.0%) HCWs in tertiary health facilities in Ebonyi State.

Hypothesis one:

There is no significant difference in the proportion of tertiary health facility health care workers exposed to infectious diseases in Ebonyi State based on age.

Table 5

Summary of Chi-Squared Test Showing Difference in the Proportion of Tertiary Health Facility Healthcare Workers Exposed to Infectious Disease based on Age (N=520)

			Infectious Disease Exposure				
			Yes	No			
Variable	**Group**		**N O (E)**	**O(E)**	**df**	x^2	
P-val.							
Age							
	18-24 years	83	29 (57.9)	54(25.1)			
	25-34years	177	128 (123.6)	49 (53.4)	3	72.070	
0.000							
	35-44years	149	105 (104.0)	44 (45.0)			
	45years & above	111	101 (77.5)	10 (33.5)			
	Total	**520**					

Note. *O = Observed frequency; E = Expected frequency; df = Degree of freedom*

Table 5 shows the results of Chi-Square test conducted to examine difference in the proportion of HCWs exposed to infectious diseases based on age. The table further shows that there is a significant difference in the proportion of HCWs exposed to infectious diseases based on age, x^2 (3) = 72.070, p = 0.000. Since the p-value is less than 0.05 level of significance, the null hypothesis was rejected. Thus, HCWs of different age groups differed in their exposure to occupational infectious diseases in health facilities.

Hypothesis two:

There is no significant difference in the proportion of tertiary health facility health care workers exposed to infectious disease in Ebonyi State based on gender.

Table 6

Summary of Chi-Squared Test Showing Difference in the Proportion of Tertiary Health Facility Healthcare Workers Exposed to Infectious Diseases in Ebonyi State based on Gender (N=520)

		Infectious Disease Exposure					
		Yes		No			
Variable	**Group**	**N**	**O (E)**	**O(E)**	**df**	**x^2**	**P-value**
Gender							
	Male	192	149(134.0)	43(58.0)			
	Female	328	214(229.0)	144(99.0)	1	8.779	0.003
	Total	520					

Note. *O = Observed frequency; E = Expected frequency; df = Degree of freedom*
Significant at $p < 0.05$

Table 6 shows that results of Chi-Square test performed to assess difference in the proportion of HCWs exposed to infectious diseases based on gender. The table further shows that there is a significant difference in the proportion of HCWs exposed to infectious diseases based on gender, x^2 (1) = 8.779, p = 0.003. Since the p-value is less than 0.05 level of significance, the null hypothesis was rejected. The results suggest that male and female HCWs were exposed to infectious diseases. In other words, male and female HCWs' exposure to infectious diseases varied in tertiary health facilities in Ebonyi State.

Hypothesis three:

There is no significant difference in the proportion of tertiary health facility health care workers exposed to infectious disease in Ebonyi State based on marital status.

Table 7

Summary of Chi-Squared Test Showing Difference in the Proportion of Tertiary Health Facility Healthcare Workers Exposed to Infectious Diseases in Ebonyi State based on Marital Status (N=520)

		Infectious Disease Exposure					
		Yes		No			
Variable	**Group**	**N**	**O (E)**	**O(E)**	**df**	x^2	**P-value**
Marital status							
	Single	193	104(134.7)	89(58.3)			
	Married	297	236(207.3)	61 (89.7)	3	37.143	0.000
	Divorced/Separated	11	8 (7.7)	3(3.3)			
	Widowed	19	15(13,3)	4(5.7)			
	Total	520					

Note. *O = Observed frequency; E = Expected frequency; df = Degree of freedom*
Significant at $p < 0.05$

Table 7 shows the results of Chi-Square test of independence conducted to examine difference in the proportion of HCWs exposed to infectious diseases based on marital status. The results indicate that there is a significant difference in the proportion of HCWs exposed to infectious diseases based on marital status, x^2 (3) = 37.143, p = 0.000. Since the p-value is less than 0.05 level of significance, the null hypothesis was rejected. Thus, HCWs of different marital status differed in their disease's exposure.

Discussion

Findings in Table 1 showed that more than half of the healthcare workers were exposed to occupational infectious diseases in tertiary health facilities in Ebonyi State. This was not surprising due to HCWs nature of work and work environment which place them at high risk of occupational infectious diseases. This is in line with Abere et al. (2020) also reported that a higher proportion of their respondents were exposed to occupational infectious diseases.

Findings in Table 2, revealed that a high proportion of older HCWs were exposed to infectious diseases while low proportion of young HCWs were exposed to occupational infectious diseases. The findings of the study was similar to that of Nmadu et al. (2016) who reported that age was associated with occupational exposure to infection diseases. Also

findings from hypotheses 1 tested, indicated that there was significant differences in the proportion of HCWs exposed to infectious diseases based on age.

The findings in table 3 showed that a high proportion of male HCWs were exposed to occupational infectious disease while moderate proportion of female healthcare workers were exposed to infection diseases. Male HCWs were more vulnerable to infectious disease than female HCWs in the health facilities. This finding was in line with Desta and Colleagues (2018) who reported that male HCWs were exposed to occupational infections than the female HCWs. Also findings from hypothesis 2 indicated that there was significance difference in the proportion of HCWs exposed to the infectious diseases based on gender. The findings of the study was similar to that of Ma et al. (2019) who reported that HCWs gender influenced their exposure to infectious diseases.

The findings in table 4 showed that a high proportion of married, divorced HCWs and widowed HCWs were exposed to occupational infectious diseases while low proportion of the single HCWs were exposed to occupationally to infectious diseases similar to the findings of Julius and colleagues (2021). Also the findings from hypothesis 3 indicated that there was significant difference in the proportion of HCWs exposed to infectious diseases based on marital status. This is similar to the findings of Shi et al. (2020) who reported that married, divorced and widowed HCWs were more exposed to infectious disease than the single HCWs.

CONCLUSION

Based on the findings of the study, the following conclusions were drawn:
More than half of the healthcare workers in the tertiary health facilities in Ebonyi State (53.9%) were exposed to infectious diseases. The older healthcare workers were more exposed than younger ones. The male HCWs were more exposed to infectious diseases than the female HCWs. The divorced and widowed HCWs were more exposed to infectious diseases than the married and single HCWs.

RECOMMENDATION

Based on the conclusion of the study, the following recommendations were made:

1. There should be periodic in-service training for all healthcare workers in the tertiary health facilities on the prevention of exposure to occupational infectious diseases.
2. More research should be conducted by the public health researchers in order to explore organizational factor that may influence the occurrence of exposure to occupational infectious diseases.
3. The government and administrators of tertiary health facilities should provide adequate Personal Protective Equipment (PPE) in order to reduce exposure to infectious diseases.

4. Regular Seminar and worship should be organised for male and older HCWs by the administrators of tertiary health facilities in order to update their knowledge on the current infection prevention and control practice.

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