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Activity-Based Occupational Health Risk Assessment for COVID-19 Infection among Environmental Health Practitioners in Kitwe District, Copperbelt Province, Zambia

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ABSTRACT

Health care workers being the frontline workers are burdened to combat COVID-19 exposing themselves to different health and safety occupational risks as they are participating in pandemic responses. This study aimed to assess the activity-based occupational health risks for COVID-19 infection among environmental health practitioners (EHPs) in Kitwe District, Zambia. A descriptive cross-sectional study was used in this study. The study period was between June 2021 and November 2021. An activity-based observational checklist was used to categorize activities performed by EHPs as lower, medium, high and very high risk. While adherence to infection prevention and control (IPC) measures, and COVID-19 predisposing factors were used to categorize EHPs as low and high risk of COVID-19 infection. The Statistical Package for Social Sciences (SPSS) was used to analyse data. The study results revealed that the majority of the study participants were females representing 58.6%. The mean age of the study participants was 30 years and the majority of them were undergraduates 68.6% and had a work experience of between 1 and 10 years. The study also revealed that 51.1% of EHPS were not vaccinated putting them at a slightly high risk for COVID-19 infection. The majority of EHPs were provided with gloves, face masks, work suits, and safety shoes representing 55.7%. The study also revealed that the majority of EHPs who participated in the study were also at a lower risk of contracting COVID-19 in their line of duty. We strongly recommend that all the EHPS in the Kitwe district should undergo training regarding COVID-19.

Keywords: Coronavirus Disease 2019, Risk Assessment, Occupational Health, Environmental Health Practitioners, Personal Protective Equipment, Adherence.

INTRODUCTION

On 31st December 2019, the World Health Organization (WHO) informed the world about a cluster of cases of pneumonia of unknown cause detected in Wuhan City, Hubei Province of China [1]. This disease was defined as a novel Coronavirus disease caused by a novel virus which was later renamed by the International Committee on Taxonomy of Viruses as severe acute respiratory syndrome 2 (SARS-COV-2) that causes the 2019 coronavirus disease (COVID-19) [2]. Its outbreak has taken a global pandemic course. Since the first report of confirmed cases of COVID-19, the world has witnessed severe mortality and morbidity due to the rate of spread to the whole world that is because of the ease of travel in the 21st century resulting in serious public health emergencies [3]. The World Health Organization declared the outbreak a Public Health Emergency of International Concern (PHEIC) on 11th March 2020 [4].

From 31st December 2019 to 22nd June 2021, 179,662,365 cases of COVID-19 have been reported including 3,890,970 deaths worldwide. In Africa there were 5,277,120 cases; the five countries reporting the most cases were South Africa (1,832,479), Morocco (526,737), Tunisia (385,428), Egypt (277,797), and Ethiopia (275,318) [5].

Zambia reported its first two cases of COVID-19 in Lusaka on 18th March 2020. The patients were a couple that had travelled to France on holiday and a third case was a man who had travelled to Pakistan [6]. The virus has affected all the provinces in the country and as of 22nd June 2021, Zambia recorded 3,028 new cases and

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53 deaths taking the cumulative number of confirmed cases and deaths to 133,659 and 1,744 respectively. The cumulative number of 111,844 patients had recovered leaving 20,071 active cases, [7]. In Copperbelt province of Zambia, there have been 19,432 cases, where Kitwe district had 87 new cases and 5 deaths on 22nd June 2021 according to the Ministry of Health daily briefing.

Healthcare workers are exposed to different health and safety occupational risks as they participate in pandemic responses, including COVID-19. These risks include exposure to COVID-19 infection, exhaustion from working longer hours and heavy workload, musculoskeletal injury, lengthy work while using personal protective equipment (PPE) which can cause heat stress, skin and mucosal impairment; workplace violence and stigma, and a variety of mental health problems, emotional distress and occupational burn-out [7]. There are reports of COVID-19 infections among healthcare workers across the globe [8]. WHO Pan American Regional Office in Washington reported that 570,000 HCWs were infected and 2500 were dead due to COVID-19 [9]. WHO reported that over 10,000 HCWs in Africa were infected with COVID-19 [10]. Similarly, Ghana Health Service (GHS) reported over 2000 COVID-19 infections among doctors, nurses and other healthcare workers, [11]. In Zambia, the number of health workers affected by COVID-19 is not known as no formal documentation has been released.

Risk assessment is a multi-disciplinary designed method to recognise, assess and control health risks at work related to exposure to hazards. The core drive of risk assessment is to recommend control measures that seek to safeguard the workers, people, the environment, the public and property including ensuring business continuity, and it is also a vital part of occupational safety and health management systems (OSHMS) (African Union, 2020). Occupational health risk assessment for EHPs is essential because environmental health practitioners have played a vital role since the initial response to COVID-19 in sub-Saharan Africa (SSA), leading the rapid implementation of controls at the border posts (for example traveller screening, implementation of quarantining rules, isolation of cases and contact tracing through their role in port and community health management) and at community levels (for example contact tracing, disinfection of public premises, health promotion, legal enforcement and monitoring compliance to laws about COVID-19 control) [12].

The study in Italy focused on risk assessment at work and prevention strategies for COVID-19 [13]. Another study conducted in Ghana focused on healthcare workers' exposure risk assessment: a survey among frontline workers in designated COVID-19 treatment centres in Ghana [14]. A study was conducted in the Amhara Region of Ethiopia on the assessment of exposure risks to COVID-19 among frontline healthcare workers [15]. To the best of the researcher’s knowledge, no study focusing on the occupational health risk assessment for COVID-19 infection among EHPs has been conducted in Zambia. Therefore, collecting occupational health risk assessment data among EHPs will be useful to inform prevention, control and mitigation measures during the pandemic. The study’s main objective was to assess the activity-based occupational health risks for COVID-19 infection among environmental health practitioners in the Kitwe District of Zambia. At the end of this study, the following research questions were answered;

1. What are the demographic characteristics and the population distribution of EHPs in Kitwe District?

2. What are activity-based occupational health risks for COVID-19 infection among EHPs in Kitwe District?

3. Do EHPs adhere to IPC measures during service delivery?

MATERIALS AND METHODS

Study Area

Kitwe district is located in the north-western part of Zambia with a population of 714,407 according to the Kitwe district health information office. It lies in the heart of the industrial core of the republic of Zambia, the Copperbelt Province and measures approximately 341 km2. Kitwe District was chosen as the study area because it is the second district with the highest number of environmental health practitioners in Zambia.

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Methods

A descriptive cross-sectional study design assessed the occupational health risk for COVID-19 infection among EHPs in Kitwe District, Zambia. This study used a census sampling technique to select the study participants. The sample size comprised all the environmental health practitioners in the Kitwe district, giving a total population of 80 EHPs.

An activity-based observational checklist was used to conduct an activity-based risk assessment, and all the EHPs in the Kitwe district, who were the target respondents, filled in a structured self-administered questionnaire. Two research assistants were engaged to help with data collection and were oriented on the content and administration of the data collection tools. The tools were adopted and modified into the local context from the WHO risk assessment tool Interim Guidance [16].

Notes taken from the observation were coded and analysed immediately after the end of every activity. The returned questionnaires were coded and properly cross-checked for completeness and adequacy of information; copies that did not have adequate information were discarded. The data master sheet and computer were used. The responses were coded and the statistical package for social sciences version 26 (SPSS) was used for data analysis. The descriptive statistics namely frequencies expressed as percentages were used to acquire information and presented as tables and histograms.

RESULTS

The socio-demographic characteristics of the study participants represent the environmental health practitioners in the Kitwe district. A total of 70 EHPs were enrolled in the study representing an 87.5% response rate, Figure 1. Shows the age of the study participants where 58 participants responded and 12 were missing, the mean age of the study participants was 30 years, with the minimum and maximum ages of 18 and 46 years respectively. Figure 1. Shows the socio-demographic characteristics of the study participants where the majority of the study participants were females 41 (58.6%)—table 1. Shows the socio-demographic factors that included education level, work experience and constituency in which they work, the findings indicated that 33 (47.1%) were undergraduates and 48 (68.6%) had a work experience of between 1 and 10 years. A large proportion 21 (30.0%) of the study participants worked in Nkana Constituency.

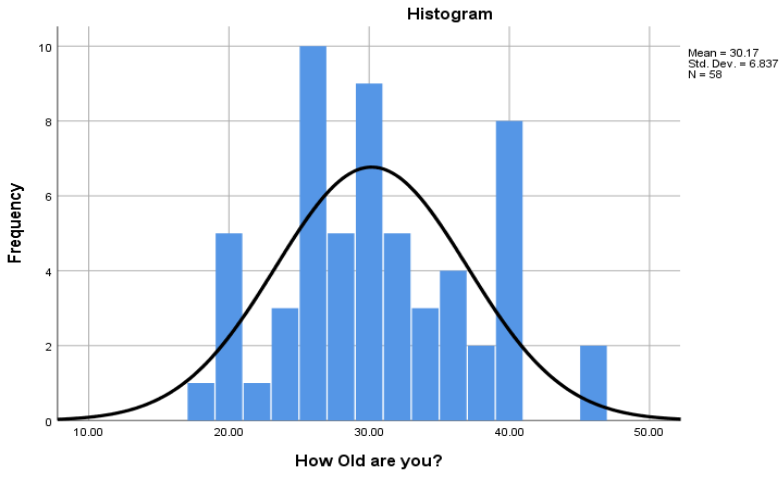

Figure 1: Shows the age of the study participants

Table 1: Shows the gender, education level, work experience and constituency (Total = 70)

FACTORS	N	(%)
Gender		
Male	29	41.1

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Female	41	58.6
Education		
High School	1	1.4
Diploma	28	40.0
Undergraduate	33	47.1
Postgraduate	6	8.6
Work Experience		
1 – 10 Years	48	68.6
11 – 20 Years	11	15.7
>21 Years	9	12.9
Constituency		
Chimwemwe	9	12.9
Nkana	21	30.0
Kwacha	16	22.9
Wusakile	12	17.1
Kamfinsa	11	15.7

Table 2: Vaccination for COVID-19

		Frequency	Per cent	Valid Percent	Cumulative Percent
Valid	Yes	34	48.6	48.6	48.6
	No	36	51.4	51.4	100.0
	Total	70	100.0	100.0	

The study findings revealed that the majority of the study participants are not vaccinated against COVID-19 representing 36 (51.4%), and 34 (48.6%) were vaccinated against COVID-19. Refer to Table 2 for more details. These results suggest a very high risk of COVID-19 infection among EHPS because acceptance of the COVID-19 vaccine can play a key role in fighting the pandemic. The low vaccine acceptance may result in broader negative consequences and is attributed to concerns such as the safety of the vaccine, effectiveness of the vaccine, the speed of vaccine development and the speed of vaccine approval. Similarly, a study conducted in the United States on COVID-19 vaccine acceptance among healthcare workers revealed that 36% of the respondents were willing to take the vaccine as soon as it became available while 56% were not sure or would wait to review more data, and 8% of HCWs did not plan to get the vaccine [17].

The study revealed that 65.7% of study participants did not have any condition, refer to Table 3 for more details. The EHPs who had severe underlying health conditions are at risk of developing severe COVID-19 illness. Reports from China and Italy suggest that risk factors for severe disease include older age and the presence of at least one of the several underlying health conditions [18, 19]. The report from the United States indicated that the percentage of COVID-19 patients with at least one underlying health condition or risk factors was higher among those requiring intensive care unit (ICU) admission (358 of 457, 78%) and those requiring hospitalization without ICU admission (732 of 1,037, 71%) than that among those who were not hospitalized

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(1,388 of 5,143, 27%).

Table 3: Self-reported conditions

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No underlying condition	46	65.7	65.7	65.7
	Asthma	8	11.4	11.4	77.1
	Cancer, Asthma & Cardiovascular Disease	1	1.4	1.4	78.6
	Cancer, Obesity, Lung Disease, Asthma, Cardiovascular Disease	1	1.4	1.4	80.0
	Cystic Fibrosis	1	1.4	1.4	81.4
	Diabetes	3	4.3	4.3	85.7
	HIV/AIDS	2	2.9	2.9	88.6
	Hypertension	2	2.9	2.9	91.4
	Liver Disease	1	1.4	1.4	92.9
	Obesity	1	1.4	1.4	94.3
	Pregnant	3	4.3	4.3	98.6
	Pulmonary Tuberculosis	1	1.4	1.4	100.0
	Total	70	100.0	100.0	

The findings revealed that 94.3% of the study participants were provided with PPE while 5.7% were not provided with PPE, and the type of PPEs provided to the EHPs depended on the type of activities they were performed thus the difference in the type of PPEs provided to each EHP. Refer to takes 4 and 5 respectively.

Table 4: Provision of PPE

		Frequency	Per cent	Valid Percent	Cumulative Percent
Valid	Yes	66	94.3	94.3	94.3
	No	4	5.7	5.7	100.0
	Total	70	100.0	100.0	

Table 5: PPE Provided

		Frequency	Per cent	Valid Percent	Cumulative Percent
Valid		1	1.4	1.4	1.4
	Face Mask	6	8.6	8.6	10.0

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	Face Mask, Work Suit & Safety Shoes	2	2.9	2.9	12.9
	Glove & Face Masks	1	1.4	1.4	14.3
	Gloves, Face mask, Work Suit & Safety Shoes	5	7.1	7.1	21.4
	Gloves, Face mask, Work Suit, & Safety Shoes	39	55.7	55.7	77.1
	Gloves, Face mask, Work Suit, Glasses & Safety Shoes	3	4.3	4.3	81.4
	Glove, Work Suit & Face Mask	1	1.4	1.4	82.9
	Medical face mask & Face Shield	1	1.4	1.4	84.3
	Work Suit & Safety Shoes	11	15.7	15.7	100.0
	Total	70	100.0	100.0	

The activity-based observational checklist was used to assess the activity-based risk among EHPs as they carry out their duties. The WHO risk assessment tool in **Table 6** was adopted. For each activity, one of the four risk levels, lower risk to very high risk, is assigned and guidance on protective measures is provided. Those activities that can potentially aerosolize the virus are deemed the highest risk. Figure 2 shows that out of the 70 EHPs who participated in the study, observations were conducted concerning the observational Checklist the tool which was adopted and modified into the local context from WHO Interim Guidance [16]. Identifying the rating to be Lower Risk, Medium Risk, High Risk and Very High Risk. The results showed that EHPs were at 8.3% medium risk of contracting COVID-19 infection in their line of duty, while they were at 25% high and very high risk when executing some duties. Most of the activities that EHPs conducted were putting them at a lower risk of contracting COVID-19 representing 41.7%. The findings indicated that there is a lower risk of EHPS contracting COVID-19 in the line of duty where as there is a thin line between contracting the infection and moving from Lower Risk to High Risk and Very High Risk.

Table 6: World Health Organisation Risk Assessment Tool

Risk level	Examples of activities	Ranking
Lower risk	Jobs or tasks without frequent, close contact with the public or others and that do not require contact with people known or suspected of being infected with SARS-CoV-2	1
Medium risk	Jobs or tasks with close frequent contact with patients, visitors, suppliers and co-workers but that do not require contact with people known or suspected of being infected with SARS-CoV-2	2
High risk	Jobs or tasks with high potential for close contact with people who are known to be or suspected of being infected with SARS-CoV-2 or contact with objects and surfaces possibly contaminated with the virus.	3
Very high risk	Jobs and tasks with risk of exposure to aerosols containing SARS-CoV-2, in settings where aerosol-generating procedures are regularly performed on patients with COVID-19 or working with infected people in indoor, crowded places without adequate ventilation.	4

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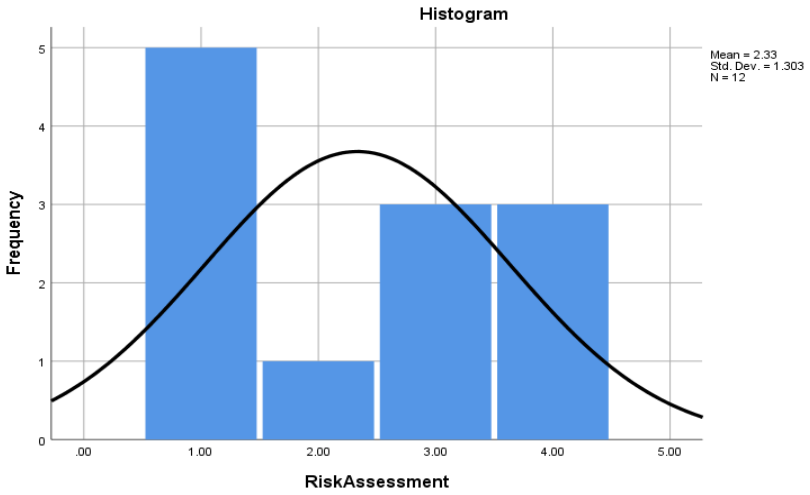

Figure 2: shows the findings of the activity-based risk assessment.

Table 7 shows that 88.6% of the study participants wear their PPEs during service delivery, while 11.4% do not wear their PPEs during service delivery. This finding suggests that the majority of EHPs understand the importance of wearing PPEs during service delivery which is to prevent the spread and transmission of COVID-19. Wearing of PPE coupled with adherence to other IPC measures minimizes the risk of COVID-19 infections among EHPs.

Table 7: Self-reported PPE use

		Frequency	Per cent	Valid Percent	Cumulative Percent
Valid	Yes	62	88.6	88.6	88.6
	No	8	11.4	11.4	100.0
	Total	70	100.0	100.0	

Table 8 shows the findings on how often PPE is used where 44.3% of study participants indicated that they always wear PPE as recommended, 18.6% indicated most of the time, 15.7% indicated occasionally, and 18.6% indicated rarely. The findings suggest the majority of EHPs are at a lower risk of contracting COVID-19 because they are always protected during service delivery.

Table 8: Frequency of PPE items use

		Frequency	Per cent	Valid Percent	Cumulative Percent
Valid	Always, as Recommended	31	44.3	45.6	45.6
	Most of the time	13	18.6	19.1	64.7
	Occasionally	11	15.7	16.2	80.9
	Rarely	13	18.6	19.1	100.0
	Total	68	97.1	100.0	
Missing	System	2	2.9		
Total		70	100.0		

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Table 9 shows that 62(88.6%) of the study participants removed and replaced their medical mask if it became wet while 7(10%) did not and 1(1.4%) did not indicate anything. WHO recommends removing and replacing medical masks when they become wet to minimize disease transmission. The findings of this study indicate that the majority of EHPs have good practices in this infection prevention and control measure.

Table 9: Percentage of Respondents who remove and replace medical masks when wet

		Frequency	Per cent	Valid Percent	Cumulative Percent
Valid	Yes	62	88.6	89.9	89.9
	No	7	10.0	10.1	100.0
	Total	69	98.6	100.0	
Missing	System	1	1.4		
Total		70	100.0		

Table 10 shows that the majority of EHPs did not take any training regarding COVID-19 representing 37(52.9%) and 32(45.7%) EHPS have taken training regarding COVID-19. Training of EHPs regarding COVID-19 is one of the crucial strategies for the prevention and control of COVID-19 because officers will be updated with the current data and trends regarding COVID-19. The findings of this study entail that EHPs are at a higher risk of contracting COVID-19.

Table 10: COVID-19 training among respondents

		Frequency	Per cent	Valid Percent	Cumulative Percent
Valid	Yes	32	45.7	46.4	46.4
	No	37	52.9	53.6	100.0
	Total	69	98.6	100.0	
Missing	System	1	1.4		
Total		70	100.0		

DISCUSSION

The EHP's were preferred because they were the front liners and particularly at high risk of contracting COVID-19. The presence of not adhering to the IPC raises the chances of acquiring COVID-19 infection. Most EHPs could be living with COVID-19 without them knowing and could be a potential risk to about 714,407 people in Kitwe (Kitwe District Health Information Office HMIS 2018). The death of these persons due to not adhering to IPC measures constitutes a vital economic burden as several productive years and investments in education and training will be lost. Significantly most people in this age group are still in their youthful age.

As indicated above the study enrolled 70 EHPs in Kitwe district, the male-female ratio of respondents being 1:2. Females representing (41) more than Males being (29). In the current study, the mean age of the study participants was 30 years. And they had a work experience of between 1 and 10 years 48 (68.6%). Similarly, a study conducted in Ethiopia showed that the mean age of participants was 33 years [15].

It was evident from the results obtained from this study that COVID-19 transmission and prevention was

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slightly high. The findings agree with those vaccinated against those not vaccinated (48.6% and 51.4% respectively). Misconceptions about COVID-19 transmission could affect the ability of EHPs to protect themselves from contracting COVID-19, this diminishes the perception of risk of contracting COVID-19 among EHPs and poses a vulnerability to those infected.

The study revealed COVID-19 vulnerability in diseases and conditions among EHPs was low. This conclusion was made because the majority of EHPs had no underlying condition(s) that put them at a higher risk of contracting COVID-19. The capacity to protect oneself from COVID-19 was assessed by asking respondents about the provision of PPE. All respondents felt that PPE was reliable. This is the major reason why a large proportion of respondents were provided with PPE. The reason why PPE is often provided is because it is the only method at the moment that prevents transmission of COVID-19. The results from this study showed that the majority of the study participants were given PPE once a year representing 41.4%, 18.6% indicated upon request, 18.6% were always provided with PPE, 14.3% Weekly, 4.3% after 6 Months and 1.4% were never provided with PPE.

Frontline EHPs are at higher risk of becoming infected with COVID-19 since they provide direct care to COVID-19 patients. The study results exposed a Lower level of exposure to COVID-19. The translation of EHP exposure to COVID-19 patients into COVID-19 infection has been reported in earlier studies. The high exposure to COVID-19 in this study was not expected since the study conducted was among EHPs. This further supports the point that EHPs are at penetrating risk for COVID-19 infection in their place of work. The risk of exposure of EHPs to COVID-19 can be alleviated by relentless training on IPC protocols joined with a regular supply of PPEs. The majority of EHPs who participated in this study were at a lower risk of contracting COVID-19 in their line of duty. This is similar to the findings of a study conducted in Ghana in COVID-19 centres where the majority of healthcare workers were at low risk of COVID-19 infection, and another previous study conducted in Conakry, Guinea reported that a vast majority of healthcare workers were at low risk of Ebola viral infection in a treatment centre (Ashinyo et al, 2020, Savini, 2017). The lower risk for contraction of PPE in their line of duty can be attributed to the availability of appropriate PPE during screening and testing for COVID-19, monitoring for compliance to COVID-19 public health guidelines of churches, provision of COVID-19 health education to the public, and disinfection of schools.

EHPS were at 25% high and very high risk of contracting COVID-19 when performing activities such as preparation of burial permits, disinfection of hospitals and clinics, spraying of public premises and attending to clients in the offices. These findings may be a hint of non-adherence to IPC measures which could minimize the risk of COVID-19 infection among EHPs. The higher risk for COVID-19 infection can also be attributed to inadequate ventilation in the offices, overcrowding, and gaps in the supply of appropriate PPE to EHPs. These findings can be ascribed to EHPs thinking that those activities are putting them at low risk thus they become less cautious thereby increasing their probability of being exposed and infected with COVID-19. Similarly, a study conducted in Ghana among HCWs revealed that healthcare workers who thought they would not be exposed to COVID-19 were nearly ten times more likely to be infected with COVID-19 compared to healthcare workers who perceived they would be exposed to COVID-19 (Atnafie et al, 2021). Possibly COVID-19 infection can be lowered by training EHPs on the IPC measures coupled with a good system of supply of appropriate PPEs then followed by adherence to IPC protocols.

An analysis of factors independently associated with IPC revealed that 66 respondents wear their protective equipment representing 94.3%, this implies that the EHPs can also feel free to be involved in service delivery because of the protection of oneself with PPE as shown by this study. The EHPs were found to be less likely to adhere to IPC. This could be because the EHPs did not feel committed to the status quo since it wasn't mandatory. Educational status was also associated with IPC measures where the study participants with Diplomas were less likely to adhere to IPC measures than those who are undergraduates and Postgraduates. This implies that education about COVID-19 and IPC measures should start early. Those who indicated how often PPE is used responded as follows; 31 said always as recommended representing 44.3% while 13 said most of the time, 11 said occasionally, and 13 said rarely representing 18.6%, 15.7%, and 18.6% respectively.

The difference in number between those provided with PPE and the reason for not adhering to the IPC show a thin margin showing how much work needs to be done. The study revealed that 66 EHPs wear PPE

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representing 88.6% and 58 EHPs have no reason for not adhering to IPC measures representing 82.9%. A previous study revealed that decontamination of hospital surroundings significantly reduces infection rates among health professionals. The dearth of control of environmental decontaminants and insufficient infection control and prevention measures could be attributed to infection (WHO, 25 January 2020). The current study also revealed that the majority 62 (88.7%) EHPs did not decontaminate high-touch surfaces putting them at a high risk of contracting COVID-19. Similarly, a study conducted in Ghana revealed that health professionals who haven't had a habit of decontamination of high-touch areas were 2.5 more likely to be infected with COVID-19 as compared to healthcare workers who had a habit of decontamination of high-touch areas [15].

The minority of the study participants thought that they were personally at risk of contracting COVID-19. The factors that were independently associated with being at risk of contracting COVID-19 were non-adherence to IPC measures and not taking training regarding COVID-19. This finding supports that of Carter and Harry (1997) who indicated that many people who are at risk of contracting SARS-MeV think they face little risk and are not motivated to adopt IPC measures.

CONCLUSION

The researcher was able to establish the socio-demographic characteristics and the population of EHPs in the Kitwe district where the mean age of the EHPs was 30 years, the majority of the study participants were females representing 58.6%, while males were represented by 41.1%. Most EHPs in Kitwe are undergraduates (47.1%) and have a working experience of between 1 and 10 years (68.6%). The study also revealed that the majority 30% of EHPs are working from the Nkana Constituency. Further, the activity-based occupational risk assessment for EHPs in the control of COVID-19 was conducted and it revealed that EHPs are at a lower risk of contracting the disease when conducting most of the activities like monitoring for compliance to COVID-19 public health guidelines of public premises and screening and testing for COVID-19. They are at high and very high risk of contracting COVID-19 when performing activities such as preparation of burial permits, disinfection of hospitals and clinics, spraying of public premises and attending to clients in the offices. Furthermore, adherence to IPC measures by EHPs during service delivery was determined and 88.7% of the EHPs wear PPE, 44.3% of those who wear said they wear PPE always as recommended, 88.6% of the EHPs remove and replace medical masks if they become wet, only 75.7 EHPs dispose wet PPE in the waste bin, and 82.9% perform hand hygiene procedure after removal of PPE. However, 88.7% of EHPs said they do not decontaminate high-touch surfaces. The findings of this study suggest that most EHPs adhere to most of the IPC measures which is a good thing but the number of those not adhering can be reduced if only all the EHPs take this pandemic seriously and realise that prevention is better and cheaper than cure.

The findings of this study are important as they are an insight into the factors associated with risk assessment for EHPs in the control of COVID-19. This study illustrates that despite the existence of these measures and regulations, transmission of COVID-19 still occurs. It is also evident from the results of this study that decisions to adopt measures of IPC are complex and extend beyond the question of personal vulnerability. It is also necessary to promote appropriate communication, even for risk perception, and actions are to be undertaken to contrast social stigma [13].

Given the findings of the study, the following recommendations are made;

i. EHPs' perception of IPC measures regarding COVID-19 should be improved and adhered to if it is to be used successfully and consistently to prevent the spread.
ii. EHPs should be trained regarding COVID-19.
iii. An in-depth qualitative study should be undertaken on a large scale to gain insight into cultural and social influences, which promote the risk. This could be the starting point of fighting the COVID-19 epidemic.

Limitations of the study

The study targeted 80 environmental health practitioners in Kitwe however, only 70 EHPs took part in the

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study as some were on leave during the duration of this study while others did not want to take part in the study. The study might be subjected to response set bias from the study participants. A descriptive cross-sectional study design was used and largely depended on self-reported assessment, under or over-reporting is very likely.

Conflict of interest

No conflict of interest.

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