KAMUZU COLLEGE OF NURSING

FACTORS THAT PREDISPOSE NURSES AND MIDWIVES TO BIOLOGICAL OCCUPATIONAL HEALTH HAZARDS AT KAMUZU CENTRAL HOSPITAL IN MALAWI

A Thesis submitted to Faculty of Nursing, University of Malawi in partial fulfillment for the award of

MASTER OF SCIENCE IN COMMUNITY HEALTH NURSING

BY

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(BSc Nursing)

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Declaration

I the undersigned declare that this thesis is indeed my own work and to the best of my knowledge has never been presented for the award of an academic certificate at any institution of higher learning. Acknowledgements have been made where other people's work have been used.

OWEN GANGATA

…….. **……**

Signature **Date**

Certificate of approval

We the undersigned certify that this thesis represents the student's own effort. It has been submitted under our approval.

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Dedication

I dedicate this work to my family and relatives for the encouragement and prayers throughout the period of study.

Acknowledgement

In the first place, I would like to thank the Almighty God who gave me strength and courage to complete this study. He deserves glory and honour.

I would also like to appreciate and express my sincere thanks to the following people and institutions that contributed much to make this study a success

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Abstract

Nursing and midwifery personnel experience a higher rate of workplace hazards exposure than other health care workers because nurses perform more bedside procedures. Not much was known about the extent of exposure to biological health hazards among nurses and midwives and the preventive measures put in place to avoid or minimize this exposure in Malawi. The study aimed at investigating factors that predispose nurses and midwives to biological occupational health hazards. A quantitative approach was adopted using a descriptive cross-sectional design. A self- administered structured questionnaire was used to collect data from a random sample of 160 nurse midwives. Ethical approval was sought from the College of Medicine Research and Ethics Committee (COMREC) and permission to conduct the study was obtained from the Hospital Director of Kamuzu Central Hospital. The data was analyzed using Statistical Package for Social Sciences (SPSS) version 20.0. The study was conducted from October 2016 to April 2017. The study has revealed that 93.42% of the respondents were exposed to biological occupational health hazards. The number one leading factor to predispose respondents to occupational hazards was inadequate personal protective equipment (98%, n = 158), followed by workload (97.5%, n = 156) and poor hand washing practices (93.75%, n = 150). The study findings imply that knowledge of infection prevention, good sanitation in the working environment, adequate workload and adherence to hand-washing practices have proven to be some of the significant preventive measures to biological hazard exposure. The study recommends provision of adequate personal protective equipment, frequent in-service trainings on occupational hazards to be conducted and ensuring adequate nurse – patient ratio.

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LIST OF ABBREVIATIONS

COMREC - College of Medicine Research and Ethics Committee

HCP - Health Care Professionals

HCW - Health Care Workers

HBV - Hepatitis B Virus

HCV - Hepatitis C Virus

HDU - High Dependency Unit

KCH -Kamuzu Central Hospital

KMC -Kangaroo Mother Care

NSI - Needle Stick Injury

OPD - Out-Patient Department

OSHA - Occupational Safety and Health Administration

PTB - Pulmonary Tuberculosis

TB - Tuberculosis

WHO -World Health Organization

OPERATIONAL DEFINITIONS

Occupational illness – A condition that results from exposure in a workplace due to a physical, chemical or biological agent to the extent that the normal physiological mechanisms are affected and the health of the worker is impaired.

Biological Occupational exposure – Reasonably anticipated skin, eye, mucous membrane, or parenteral contact with blood or other potentially infectious materials that may result from the performance of an employees' duties.

Blood and body fluid exposure – A specific eye, mouth, other mucous membrane, non-intact skin, or parenteral contact with blood or other infectious materials that result from the performance of one's duties.

Needle-stick injury/exposure – An injury sustained at work and related to work involving any kind of needles.

Sharp injury exposure – An injury sustained at work related to work involving any kind of medical sharp objects including blades, needles, glass item and/or any other sharps.

Nurse- is a person who has successfully completed a nursing education programme and is duly licensed to work towards promotion of health, prevention of illness, restoration of health, rehabilitation of the disabled and care of the dying people.

Midwife- is a person who has successfully completed a midwifery education programme and is duly licensed in the country where it is located to assist women in childbirth

Chapter One

1.0 Introduction

Nurses and midwives are exposed to many hazards that can adversely affect their health and well-being in their work place. There are many types of hazards namely physical, ergonomic, chemical, psycho-social and biological which can cause harm or adverse effects. (Amosu, Degun, Atulomah, Olanrewju, & Aderibigbe, 2011). Physical hazards are factors within the environment that can harm the body without necessarily touching it. Examples include radiation, constant loud noise, extreme temperatures and high exposure to sunlight/ultraviolet rays. Ergonomic hazards occur when the type of work, body positions, and working conditions put strain on the body. Chemical hazards occur when a worker is exposed to any chemical preparation in a form of liquid, solid or gas (Alberta, 2011). Psychosocial hazards cause either stress or strain on the worker and examples include: work demands, workplace violence and social relations. Biological hazards are associated with working with clients in hospitals, laboratories, and nursing homes and examples include: bacteria, viruses, fungi and parasites that may be present in blood and any other body fluid. (McAdams, 2011).

Occupational hazards among nurses are well documented in western developed countries. The common hazards impacting this work force include needle-stick injuries, workplace violence, and musculoskeletal injuries related to patient handling (Nelson, 2006). According to the Bureau of Labor statistics, American hospitals recorded 253,700 work-related injuries and illnesses in 2011, representing 6.8 work-related injuries and illnesses for every 100 full-time employees. The

injury and illness rate in hospitals is higher than the rates in construction and manufacturing – two industries that are traditionally thought to be relatively more hazardous (Occupational Safety and Health Administration, 2014).

Evidence from sub-Saharan Africa indicates that healthcare workers are frequently exposed to chemical, biological, physical, and psychosocial occupational hazards (Tinibu, Mbada, Oyeyemi, & Fabunmi, 2010). Nurses and midwives are constantly in contact with patients that expose them to infections and thus require proper protective measures to reduce their risk of acquisition of disease. Not much was known about the extent of exposure to biological health hazards among nurses and midwives and the preventive measures put in place to avoid or minimize this exposure in Malawi. This study therefore investigated factors that predispose nurses and midwives to biological occupational health hazards at Kamuzu Central Hospital.

1.1 Background

The healthcare workforce, 35 million people worldwide, represents 12% of the working population (World Health Organization, 2012). The occupational health of this significant group has long been neglected both organizationally and by governments. A misconception exists that the health care industry is “clean” and without hazard, when in fact the hazards encountered can be career-and life ending (Lipscomb, 2005).

Health care workers face a wide range of hazards on the job; including needle-stick injuries, back injuries, latex allergy, violence, and stress. Although it is possible to prevent or reduce healthcare worker exposure to these hazards, nurses and midwives continue to experience injuries and

illness in the workplace. Cases of non-fatal occupational injury and illness among healthcare workers are among the highest of any industrial sector.

Globally, healthcare workers (HCW's) sustain 2 million needle-stick injuries (NSIs) per year that results in infections with Hepatitis B and C and HIV. About 40% of the hepatitis B and C infections and 2.5% of the HIV infections among HCW's are attributable to exposure at work (World Health Organization, 2012). While 90% of the occupational exposures occur in the developing world, 90% of the reports of occupational infection are from the United States and Europe (Centre for Disease Control, 2008). This implies that few studies on exposure to occupational health hazards in developing countries have been done.

Approximately 16,000 Hepatitis C viral infections, 66,000 Hepatitis B viral infections, and 1,000 HIV infections occur every year worldwide in Health Care Workers (HCW) from needle-stick injuries (Pruss-Ustun, Rapiti, & Hutin, 2005). About one million accidental needle-stick injuries have been reported every year in China, translating into one Health Care Worker getting a needle stick injury every 30 seconds (Yao, 2010).

Health Care Workers sustain injuries from sharp objects such as needles, scalpels and splintered bone during execution of their healthcare duties. In addition, Health Care Worker's mucosa may be exposed to droplets or splashes of blood, saliva and urine thus predisposing them to infectious diseases (Frijstein, Hortensius, & Zaaijer, 2010). Frijstein et al. (2011) further state that patients showing erratic behavior may inflict bite and scratch wounds on Health Care Workers. The bites and scratches carry the risk of transmission of infectious agents of which HIV, Hepatitis B and C

viruses are the most relevant. Manyele, Ngonyani and Eliakimu (2008) agree that in the context of hospital settings, the most common exposures are needle-stick injuries and splashes with body fluids, blood being the most potent of all.

Globally, needle stick injuries (NSIs) are the most common sources of occupational exposure to blood and the primary cause of blood-borne infections of Health Care Workers (Center for Disease Control, 2010). Of all healthcare workers, nurses are at most risk of needle-stick incidents. In fact, nurses tend to be exposed 4.27 times more often than physicians (Frijstein et al., 2010). A study in Vietnam revealed that 38% of physicians and 66% of nurses reported sustaining a needle-stick injury (NSI) in the previous nine months (Hanoi, 2008). In South Africa, 91 % of junior doctors reported sustaining a needle-stick injury in the previous 12 months, and 55% of these injuries came from patients who were HIV-positive (Rabbits, 2008).

Nurses and midwives are prone to occupational hazards and injuries in the course of their day to day activities in the health care settings (Center for Disease Control, 2010). Given the nature of nursing working environment, responsibilities and duties, nurses and midwives are on the frontline of numerous occupational hazards such as biological/infectious diseases, chemical risks, environmental/mechanical risks, physical risks and psychosocial risks (Senthil et al., 2014).

Nursing and midwifery personnel experience a higher rate of workplace hazards exposure than other health care workers because they perform more bedside procedures than other health care professionals (Dajar & Daghdi, 2013). These hazards can lead to sick-offs and persistent medical

problems or job changes. Hignet (2006), indicates that work-related injuries and illnesses due to occupational health hazards among nursing personnel are costly problems in terms of both worker's pain and suffering as well as medical expenses and loss of working days for organizations.

Reports from African studies in some developing countries indicate that nurses and midwives are exposed to biological health hazards due to lack of resources. For example, in Tanzania, child birth attendants were reported to be using plastic bags to deliver babies due to lack of gloves. Similarly, latex gloves being in short supply were rinsed and hung to dry for reuse in other developing countries (World Health Organization, 2012).

Biological occupational health hazards among others contribute to work force shortages through sick-off which may prompt nurses to leave the profession (Stone, Clarke, Cimiotti, & Correa, 2004). The morbidity of HCWs related to occupational exposure has a negative impact on the work-force, and as a result on access to good health care for clients. A global shortage of nurses has emerged due in part to poor working conditions, including exposure to deadly infectious agents, carcinogenic chemicals, hazardous drugs, and ergonomic hazards like lifting patients (World Health Organization, 2012). Buchan et.al (2009) indicate that low salaries and difficult working conditions has led to the migration of skilled workers from developing countries to Europe and the United States, increasing the burden/workload of the remaining staff and contributing further to exposure to biological and other types of hazards.

1.2 Problem Statement

Nurses and midwives are exposed to a number of biological hazards like needle stick injuries, exposure to patients with infectious diseases and exposure to blood splashes and body fluids most of which can be prevented. Of all healthcare workers, nurses are at most risk of needle-stick incidents and tend to be exposed 4.27 times more often than physicians (Denis, Ecochard, Bernadet, & Forissier, 2013). Globally, healthcare workers (HCW's) sustain 2 million needle-stick injuries (NSIs) per year that results in infections with Hepatitis B and C and HIV (World Health Organization, 2012) These hazards lead to persistent medical problems, absenteeism due to sicknesses, permanent disability and possible death due to occupational injuries and diseases (Center for Disease Control 2010). Occupational health hazards among nurses and midwives have been studied in different parts of the world. However, very few studies have been done on biological occupational health hazards among nurses and midwives in Malawi yet anecdotal reports suggest that the problem of biological occupational health hazards could be in alarming levels. It was therefore necessary that a research study be done to investigate nurses and midwives exposure to biological occupational health hazards in a hospital setting.

1.3 Rationale/ Justification of the study

In Malawi, very few studies have been carried out to determine the types of occupational health hazards nurses and midwives encounter in their day to day work experience. As a result, data on biological occupational hazards among healthcare workers and their mitigation measures remain scarce in most parts of sub-Saharan Africa and Malawi in particular. Understanding the nurses

and midwives exposure to biological occupational health hazards among nurses and midwives is needed to inform occupational health and safety policy and programs for nurses and midwives. This study has established factors that predispose nurses and midwives to biological occupational health hazards in a hospital setting and has recommended how these hazards could be prevented.

1.4 Significance of the study

This study is significant because the risk of exposure of nurses, absenteeism due to sicknesses, permanent disability and possible death due occupational injuries and diseases might be reduced and this could be beneficial to both the employees and the employers. A study of this nature will contribute towards nursing research in Malawi and it will develop knowledge. This study will also improve the health status of the nursing and midwifery personnel as it will identify strategies to reduce nurses' and midwives' exposure to occupational hazards. As a result, the quality of nursing and midwifery care will be improved because a healthy nursing and midwifery community will result in improved patient care.

1.5 Broad objective

The objective of this study was to investigate factors that predispose nurses and midwives to biological occupational health hazards at Kamuzu Central Hospital in Malawi.

1.6 Specific objectives

The specific objectives were:

- To determine the extent to which nurses and midwives are exposed to biological occupational health hazards.
- To determine the prevalence of disease conditions which are related to exposure to biological occupational health hazards among nurses and midwives.
- To identify risk factors associated with exposure to biological occupational health hazards.
- To identify strategies which can be utilized to prevent exposure to biological occupational health hazards.

Chapter Two

2.0 Literature review

Literature search strategy

There are many studies that have been done on occupational health hazards among health care workers outside Malawi. In Malawi literature specific to occupational health hazards among nurses and midwives is scanty. This study reviewed studies that had been conducted on occupational hazards among nurses and midwives locally, regionally and globally. The researcher reviewed peer reviewed articles in English from 2005 to 2015 from HINARI and Pub-Med electronic databases using the following search terms: 'biological health hazards, occupational exposure, blood and body fluid exposure, needle-stick injuries, sharp injuries, blood and body fluid splashes, nurses and midwives.' Preference was given to the most recent publications. However, older articles having information that was not found in recent literature were included. This was a narrative review of studies done in Malawi and other countries. All the references that were cited by the retrieved articles were hand searched. This increased chances of finding relevant articles (Kable, Pich, & Prothero, 2012). Additionally, manual searching of relevant nursing education journals and sourcing of secondary references was done to extend the search.

The primary purpose of literature review is to generate information on what is known and not known about the subject matter of interest, so that a broad understanding of the information is

gained. It also assists the investigator to identify research methods used by others, weaknesses and strengths of chosen research designs so that one can avoid them in own study.

In this study, literature has been reviewed to ensure that it builds on the relevant work previously carried out by others. The literature has also revealed gaps, unresolved issues and debates regarding the study topic. It has also revealed that something can be done to address the problems encountered here in Malawi.

Introduction

Health care workers face a wide range of hazards on the job; including needle-stick injuries, back injuries, latex allergy, violence, and stress. Although it is possible to prevent or reduce healthcare worker exposure to these hazards, they continue to experience injuries and illness in the workplace. Cases of non-fatal occupational injury and illness among healthcare workers are among the highest of any industrial sector. By contrast, two of the most hazardous industries, agriculture and construction, are safer today than they were a decade ago (McAdams, 2011). World Health Organization (2012) indicated that the rate of occupational injury and illness for nurses in health care settings was 18.6% per full-time workers (18.2% accounted for injuries). This is higher than hazardous occupations such as heavy construction where the rate of occupational injury and illness is 13.8% per full-time workers or mining where the total is 7.5% per full-time workers.

Nursing is associated with a lot of hazards, especially in hospitals, nursing care facilities, and clinics, where nurses may care for individuals with infectious diseases (Amosu et al., 2011).

Additionally, nurses are prone to occupational hazards and injuries in the course of their day to day activities in the health care settings (Isara & Ofili, 2012). Given the nature of nursing working environment, responsibilities and duties, nurses are on the frontline of numerous occupational - hazards such as biological/infectious disease, chemical risks, environmental/ mechanical risks, physical risks, and psychosocial risks (Senthil et al., 2015). But the main focus of this study was on biological occupational health hazards because they are more prevalent in Malawian hospital setting.

2.1. Exposure to biological occupational health hazards among healthcare workers

In the health care setting, HCWs are exposed to occupational accidents such as splashes from blood and other body fluids, cuts from drug ampoules, scalpel cuts, glove perforation during surgery, contact with patients' blood with ungloved hands, and open wound contamination with patients' blood.

Several studies have shown a high rate of needle pricks and exposures to blood and body fluids among health care workers (Zhang et al., 2009; Efetie & Salami, 2009; Rada, Vandeweerd, Syre, & Egata, 2009; Nsubuga & Jaakkola, 2005). A study by Efetie and Salami (2009), indicated that it is very worrisome that majority of the occupational exposures are not reported to the hospital authorities and thus no post exposure prophylaxis is given to HCWs following exposure. In support of this, Zafar et al (2008), reported that only 53% of HCWs notified the infection control office subsequent to exposure to an occupational health hazard; this is relatively low.

Some HCWs are at greater risk of acquiring infections through sharps injuries than others. These include those who are in close contact with body fluids such as surgeons, obstetricians, midwives and laboratory personnel (Nwankwo & Aniebue, 2011). Despite the long-standing recommendations for high risk group vaccination against HBV, it remains unavailable to HCWs in the most resource-limited settings in Sub-Saharan Africa and even when available, the coverage remains low (Sofola & Uti, 2008).

A cross sectional study in Poland by Goniewicz et al., (2012) revealed that 37,000 cases of needle stick injury occur annually. Most frequently, they happen to nurses, doctors, laboratory technicians and cleaning personnel. Health care workers know that the increased risk of injury incidents are directly connected with being in a hurry, nervousness, absent- mindedness, and multiple attempts at executing the same procedure. The same study also indicated that the tendency of increased risk was also noted when health care personnel are tired, do not have a patient's co-operation, or when the medical team is not fully present.

A cross sectional study in Pakistan revealed that in addition to very high rates of needle-stick injuries, low safety practices including inadequate vaccination coverage, unavailability of infection control guidelines and other preventive facilities were reported (Afridi, Kumar, & Sayani, 2013). Other studies found that injuries from contaminated needles and other sharp devices used in healthcare settings have been associated with transmission of more than 20 different blood borne pathogens to nurses such as hepatitis B and HIV (Alberta, 2011) A study conducted in Gaza strip reported that 66% of health care workers had been injured by needles or sharp medical instruments in Gaza hospital (Eljedi, 2015). A hospital based cross sectional study

conducted in a general hospital in Malaysia found that the prevalence of needle-stick injuries was 12.5% among nurses (Bhardmaj et al., 2014)

Type of nursing practice specialties is significantly associated with the risk for NSIs (Cho et al., 2014). In comparison to the medical and surgical wards, the predicted odds of NSIs were 43.9% less in the ICU, 55.5% less in the psychiatry wards, and 38.8% less in obstetric units; however, the predicted odds of NSIs in the perioperative unit was 55.5% higher than that identified in medical and surgical wards. A study conducted in the US reported that the rate of NSIs in the perioperative unit was 95% higher than medical and surgical wards while psychiatry, pediatric, and neonatal units had fewer NSI than did medical and surgical wards; ICU and obstetric NSIs did not differ from those of medical and surgical wards (Clarke, Schubert, & Korner, 2007). In an institution based cross sectional study Bekele, Gebremariam, Kaso and Ahmed (2015) revealed that Emergency unit is the most risky area across the hospital units. Health care workers working in the operation theatre, labour rooms, emergency, laboratories and wards have an increased risk of exposure and they experience significant fear, anxiety and emotional distress. (Lee, Botteman, Xanthakos, & Nicklasson, 2005).

2.2. Prevalence of disease conditions related to exposure to biological occupational health hazards among Healthcare workers

Healthcare workers exposure to patients with infectious diseases increases the risk of occupational health hazards especially when working in an environment which is not conducive

and when material resources are inadequate. In Ethiopia, nurses have a 29% and 31% lifetime risk of unsafe exposure to bodily fluids and needle-sticks, respectively (Reda et al. 2010).

In Cote d'Ivoire tuberculin skin test reactivity was significantly higher in Health Care Workers (HCW's) working in TB clinics than in those working in non-TB clinics (Sidibe, Zuber, & Wiktor, 2007) . Similarly, a cross sectional study conducted at a central referral hospital in Malawi revealed a higher rate of TB among nurses; particularly those working in adult medical wards, and this was associated with long delays from the time of admission to start of anti-tuberculosis treatment in smear-positive pulmonary TB (PTB) patients (Harries, Nyirenda, Banerjee, Boeree, & Salaniponi, 1997).

World Health Organization (2012), estimates that three million health workers are exposed to blood-borne viruses each year: two million to hepatitis B; 900,000 to hepatitis C; and 300,000 to HIV. Over 50% of HIV infection cases among health workers in an East Asian study were nurses, followed by laboratory staff and blood collectors (Gold, 2006). Hepatitis C and HIV, the virus that causes AIDS, are two of the most serious of the 20 blood-borne pathogens that healthcare workers are exposed to in their daily work caring for the world's health. (Dajar & Daghdi, 2013)

While less than 10% of the HIV among health workers is the result of an exposure at work, needle-stick injuries, the cause of 95% of the HIV occupational sero-conversions, are preventable with practical, low-cost measures and have the co-benefit of preventing exposure to other blood-borne viruses and bacteria (World Health Organization, 2012).

The prevalence of hepatitis B virus infection was estimated to be 2.1% in a study done among voluntary blood donors of Jimmy University specialized teaching hospital (Yami, Alemseged, & Hassen, 2011). Studies among voluntary counseling and testing clients in Shashemene General Hospital and Addis Ababa showed that 5.7% of voluntary testing and counseling clients had hepatitis B virus (Negero, Sisay, & Medhin, 2011; Shimelis et al., 2008). This implies that if healthcare workers do not take precaution measures, they can get the virus from clients and blood donors. Among health workers infected with hepatitis B, the WHO global burden of disease from sharps injuries to health-care workers showed that 37% of the hepatitis B among health workers was the result of occupational exposure. Infection with the hepatitis B virus is 95% preventable with immunization but less than 20% of health care workers in some regions of the world have received all the three doses needed for immunity (World Health Organization, 2012).

Similarly, a study conducted among medical waste handlers in Gondar town government health institutions revealed that 6% of medical waste handlers had Hepatitis B virus in their blood (Anagaw, Shiferaw, Belyhun, Erku, & Fantahun, 2012). In a case – control study done among HCWs and non HCWs in Ethiopia showed that of the 110 HCWs and 110 non HCWs, Hepatitis B virus was detected in 8 (7.3%) and 1 (0.9%) of health care and non-health care workers respectively (Geberemichael, Gelaw, Moges, & Dagnew, 2013). This implies that HCWs are at a greater risk of acquiring Hepatitis B virus compared to non HCWs.

Hepatitis B Virus can be prevented by practicing standard precautions such as regular personal hygiene; use of protective barriers; and by proper disposal of sharps, body fluids, and other

clinical wastes in health care institutions. Moreover, after exposure to blood or body fluids, post-exposure prophylaxis can be administered as a combination of passive immunization with hepatitis B immunoglobulin and vaccination with Hepatitis B vaccine (Khan & Ross, 2013)

Studies in different countries showed different findings on Hepatitis B vaccination status. Studies in Sweden, Pakistan, Turkey, Paris and South Africa showed that 39.8%, 37.2%, 55.8%,93% and 19.9% of HCWs respectively received three doses of Hepatitis B vaccine (Loulergue et al., 2009; Dannetun et al, 2006; Mengal et al, 2008; Hatipoglu et al., 2007; (Burnett et al., 2015). A safe and effective vaccine against Hepatitis B virus is available throughout the world, yet many HCWs in resource poor countries remain at risk because they are not vaccinated against Hepatitis B virus (World Health Organization, 2012).

2.3. Risk factors associated with exposure to biological occupational health hazards among health workers

Several factors have been identified that make health workers to be at risk of being exposed to biological occupational health hazards and these include: age, work experience, poor working conditions, lack of personal protective equipment, lack of training, low immunization coverage against hepatitis B, recapping of needles, poor hand washing practices and failure to report occupational hazards (WHO, 2012).

2.3.1. Working conditions, age and work experience

The morbidity and mortality of HCW's related to occupational exposures has an impact on the workforce, and as a result on access to good health care for patients. A global shortage of nurses has emerged due in part to poor working conditions, including exposures to deadly infectious agents, carcinogenic chemicals, and hazardous drugs, and ergonomic hazards (World Health Organization, 2012). Buchan and May (2009) indicate that low salaries and difficult working conditions lead to the migration of skilled workers from developing countries to Europe and the United States, increasing the burden/workload of the remaining staff and contributing further to illness, injury, dissatisfaction, and the desire to migrate.

Work experience may play a role in the incidence of exposure to occupational injuries. In an Italian study, Wang et al (2010) indicated that student nurses and medical interns accounted for approximately 15% of total exposure compared to the experienced nurses. In support of this, Registered Nurses with fewer years of experience had more NSIs, which is consistent with other international studies (Clarke et al., 2007; Iihan, Durukan, Aras, Turkcuoglu, & Aygun, 2006). Wang et al (2010) in his report from a Chinese study indicates that most of the sharp injuries among student nurses were due to inexperience and excessive handling of contaminated needles. High frequency of injections and infusions in the wards might also influence this. In contrast, some researchers felt that years of experience appear to have no influence on the level of knowledge or behavior on occupational injuries (Trim, Adams, & Elliot, 2003).

A study in Iran by Parsa-Pilli et al (2014), observed a significant association between the risk of needle-stick injury and age, gender, work experience of less than two years and education. The majority of NSI happened at the ICU. According to Habib et al (2011) the incidence of NSI has been reported to be associated with age, level of education, immunization status, number of shifts per month and history of related training. Similarly, a study by Gholami et al (2013) identified age as an important risk in NSI incidents among nurses aged lower than 27 years. This was in agreement with a study in Kenya in which young age and lesser years of work experience were risk factors for percutaneous injuries (Mbaisi, Nganga, Wanzala, & Omolo, 2013)

In contrast, Isara et al (2015) reported that the prevalence of NSIs was high among HCWs aged 30 years and above and those who have worked for 3 years and above. There are also studies that have not found any relationship between age and NSI incidents. For instance, Fredrich et al. (2005) in an assessment of the frequency and NSI risk factors among nurses and midwives in sub-Saharan Africa identified no significant relationship between age and NSI incidents. In addition, Honda (2011) and Kazemi (2010) reported no significant association between age and sharp devices injuries.

Staffing levels in the healthcare system can influence the risk of exposure to occupational hazards among health care workers. A study in China by Smith et al (2010) indicated that nurses who reported their departments were understaffed were more likely to suffer needle stick injuries than nurses who reported that their departments were sufficiently staffed. Furthermore, nurses who worked mixed shifts were more likely to sustain NSI than those who did not. According to Gholami et al (2013), HCW who worked more than 30 shifts in a month were about 2.4 times

more likely to encounter NSI than those who worked 30 shifts or lower in a month. Kakizaki (2011), also reported higher NSI incidents in HCWs working over 35 hours per week. Similarly, Honda (2011) IIhan (2006) and Fredrich (2005), emphasized the importance of long working hours per week in the risk of NSI incidents.

2.3.2. Lack of training on occupational hazards

Lack of training was the most important risk factor for needle-stick injuries, working for more than 40 hours per week, replacing needle caps most of the time, and not wearing gloves when working with needles (Nsubuga & Jaakkola, 2005). In support of this, a Pakistan study on prevalence and factors associated with needle-stick injuries among registered nurses in public sector tertiary care hospitals in Pakistan by Habib et al, (2011) indicated that most injury causing instruments and needle-stick injuries were reported at bedside and wards; the professionals did not participate in any educational sessions, seminars or workshops related to needle-stick injuries during their job.

On the other hand, taking training on infection prevention was not found to be statistically significant on multivariable analysis in terms of protecting healthcare workers from being exposed to occupational health hazards. But, the Odds Ratio suggests that not having training may be associated with an 80% increased odds of injury in the last one year (Bekele et al., 2015). Additionally, the second most common hazard in Nigeria was needle stick injuries among nurses which were about 65.2% in 2002 while in USA more than 800,000 needle-stick injuries

occur each year despite continuing education or other efforts aimed at preventing them (Orji, Fasubaa, Onwudiegwu, Dare, & Ogunniyi, 2002).

2.3.3. Failure to report occupational health hazards

Reporting of incidents of sharp instrument injuries is important to ensure appropriate counseling and treatment of health care workers. A study conducted in India among medical, dental and nursing students by Hussain et al, (2012) revealed that 77.4% of the health care students did not report the injuries and the most common reasons for not reporting was the lack of knowledge among the students about how the injury had to be reported. In the same study, it was noted that only 34.4% of the health care students who reported the injury had not taken Post-Exposure Prophylaxis (PEP) after the injury while 37.3% had received PEP against Hepatitis B Virus and only 21.5% had received PEP for tetanus.

The problem of under-reporting is particularly investigated in Japan and the rate of under-reporting is estimated to be 20% (Smith et al., 2010). However, a study among Japanese nurses revealed a higher percentage (64.1%) of needle-stick and sharp injuries under-reported and shows the importance of interactions between needle-sticks, psychological factors and safety climate as 56% reported much responsibility in their work. (Smith et al., 2010)

According to Isara and Ofili, (2012) it is worrisome that most of the NSIs were not reported to appropriate authorities so that necessary action can be taken to prevent the spread of blood-borne infections. In their study, only 38.0% of those who sustained NSI reported its occurrence and the

major reasons given by them were “no risk of contracting HIV’ (48.3%) and “not necessary” (38.7%).

Most of the needle stick injuries among nurses may occur but are not reported due to many reasons. It is also believed that in many developing countries these injuries may virtually go undocumented. Inadequate knowledge among health care workers influences the reporting process of these injuries. A study in Saudi-Arabia reported that 93% of nurses had needle-stick injuries but they did not report because they were not aware of the importance of post-exposure prophylaxis (Alam, 2012). Trim, Adams and Elliot (2005) reported that 80% of sharp injuries in Birmingham Hospital were not reported due to minimal knowledge and workload pressure.

2.3.4. Recapping of needles

Recapping of needles is an age long tradition that has continued to constitute a significant hazard to HCWs as has been demonstrated in many studies in Nigeria (Omorogbe, Omuemu, & Isara, 2012; Musa, 2007; Isara & Ofili 2010; Isara & Ofili, 2012). Recapping of needles and patient aggression were the most common circumstances leading to NSIs (Isara et al., 2015). Mbaisi et al (2013) in Kenya reported that handling uncooperative patient and patient movement precipitated the occurrence of sharp injury in 22% and 20% of HCWs respectively while Ibekwe et al (2013) in Benin City reported that restraining of patient was responsible for 12.8% among resident doctors.

Unsafe handling practices of needles prior to disposal like two-hand recapping, needle flexing and needle breaking increases the risk of occupational exposure to sharp instrument injuries.

According to Occupational Safety and Health Administration (OSHA)'s blood-borne pathogen standards, needle recapping is prohibited to reduce transmission of blood-borne pathogens. In a study by Hussain et al, (2012) to determine occupational exposure to sharp instrument injuries among dental, medical and nursing students at Mahatma Gandhi Mission Campus, 94.7% of the health care students recapped needles. Most needle-stick injuries are caused by recapping of needles before disposal into containers or by unnecessary opening of these containers.

2.3.5. Lack of personal protective equipment

A study by Malaguti et al., (2008) indicated that among health care workers, personal protective equipment is a fundamental tool for accident prevention, but professional resistance to their use is the main barrier to prevent biological material exposure. Low compliance with personal protective equipment use and its incorrect handling derive from factors like discomfort, inconvenience, carelessness, forgetfulness, lack of habit, equipment inadequacy, insufficient quantity and disbelief in its use (Tipple et al., 2007; Souza & Freitas, 2010) . These factors are aggravated by precarious infrastructure, organizational aspect of work, lack of knowledge due to inexistence of permanent education, work overload, physical fatigue and lack of time (Leigh, Wiatrowski, Gillen, & Steenland, 2008). Compliance with personal protective equipment use is closely related with the professionals perception about the risks they are exposed to and their susceptibility to these risks (Souza & Freitas, 2010).

A study conducted in Palestine by Eljedi (2015) to determine the prevalence and response to occupational hazards among nursing students in Gaza strip revealed that although most of the

participants (97.4%) were fully aware of using personal protective equipment and safety regulations, only 25% were actually compliant. The study further revealed that needle-stick injuries when using sharp devices were reported by 45.5% of the students.

A study in North West Ethiopia revealed that the reasons for job-related exposure to blood and body fluids were sudden movement of a patient during blood sampling or the intramuscular or venous injection of drugs during child birth, during handling of specimen, during handling and collection of waste, and due to lack of personal protective equipment (Yenesew & Fekadu, 2014). Similarly, a study assessing the frequency of body fluid exposure among midwives showed that 65.1% of them had experienced exposure to amniotic fluids or blood at least once in the past six months and that 25.0% reported five or more times that level of exposure. The study revealed that lack of adequate personal protective equipment resulted to such exposures.

2.3.6. Poor hand washing practices

Proper hand hygiene is the single most important, simplest and least expensive means of reducing the prevalence of hospital acquired infections and the spread of antimicrobial resistance (Mathur, 2011). Hand hygiene is considered the single most cost-effective public health measure for preventing healthcare associated infections. Transmission of healthcare-associated pathogens generally occurs via the contaminated hands of healthcare workers often transmitting virulent and multi-drug resistant strains. Though preventable with simple hand washing, health care workers are reluctant to adopt recommended practices to curb these infections (Pittet, Allegranzi, & Sax, 2006).

The World Health Organization (WHO) has issued guidelines for procedural hand washing in order to reduce the prevalence of hospital associated infections but lack of knowledge amongst health care workers is associated with poor compliance (Creedon, 2008). In a study conducted by Suchitra and Lakshim (2007) at Department of Microbiology, Mysore University, it was revealed that compliance for hand washing was maximum among nurses, intermediate for technicians and the least for Doctors. Barriers to practice hand hygiene was attributed to lack of education, high work load, understaffing, working in critical care units, lack of encouragement, lack of role model among senior staff and lack of knowledge of guidelines set by the institutions.

2.4. Strategies for preventing exposure to biological occupational health hazards among health workers

A descriptive cross sectional study by Cho et al., (2014) indicated that hospitals can prevent or reduce exposure to biological health hazards by establishing better work environments in terms of staffing and resource adequacy, minimizing emotional exhaustion and retaining more experienced nurses. Additionally, education regarding the use of protective and safety equipment and reporting of biological health hazards should be promoted on a regular basis. Based on the research conducted in the UK by Gabriel (2009), it has been noted that 50% - 85% of accidents may be prevented by using safety equipment (capped needles or so called vacutainers for venipuncture, whereas 77% - 82% of them can be prevented by providing written recommendations and observing the prescribed rules for practice. In addition to these measures, immunization for hepatitis B is the most effective prevention against this disease.

Occupational hepatitis B Virus infections can be eliminated through optimal hepatitis B vaccination coverage of relevant personnel. Hepatitis B Virus can be prevented by practicing standard precautions such as regular personal hygiene; use of protective barriers; and by proper disposal of sharps, and other clinical wastes in health care institutions. Moreover, after exposure to blood or body fluids, post-exposure prophylaxis can be administered as a combination of passive immunization with hepatitis B immunoglobulin and vaccination with hepatitis B vaccine (Khan & Ross, 2013).

A study by World Health Organization, (2012) established that less than 10% of the HIV among health workers is the result of an exposure at work. Needle-stick injuries, the cause of 95% of the HIV occupational sero-conversions, are preventable with practical, low-cost measures and have the co-benefit of preventing exposure to other blood-borne viruses and bacteria. A study by Rezaeian et al (2012), reported that improving medical curricula, conducting campaigns, implementation of safety devices and reducing workload of the population under study might have positive effects on decreasing the incidence and prevalence of these constant threats. According to Castro et al (2009), efforts must be made to encourage nurses to report their injuries within their schedule to improve nurse outcomes and the accurate assessment of workplace health and safety.

A cross sectional study revealed that unavailability of some protective devices might have contributed to the high level of biological exposure (Vaz, Mcgrowder, Crawford, Lindo, & Irving, 2010). Therefore, personal protective equipment like head gear, goggles, non-disposable face mask, non-disposable apron and gumboots should be provided to all nurses and midwives.

A study conducted by Habib et al., (2011) indicated that focused programs should be available to teach HCWs the risks of occupational exposure to blood and other infected fluids and educate them on the necessity of vaccination and post-exposure management. Vaz et al (2010), also recommends that all new employed HCWs particularly the young and inexperienced, should be taught the correct techniques for handling/disposing sharps and using protective clothing/devices.

According to a descriptive cross sectional study by Motaarefi et al (2016), attention should be paid to decreasing excessive workloads and to sufficient training for particular work duties among HCWs. Hospitals can decrease NSIs by creating work environment that has adequate staff and resources. In addition, minimizing emotional exhaustion at work as well as providing self-engineered devices and equipment can be useful in this regard.

Conclusion

Currently, literature available on biological occupational health hazards among nurses and midwives in Malawi is scarce. A review of the literature from other countries in developing and developed countries provided insight into ways the study should be facilitated. From the literature review, it has shown that biological hazards range from exposure to needle-stick injuries, body fluids, blood splashes and exposure to patients with infectious conditions. Knowledge to prevent all occupational health hazards is inadequate though most of these hazards are preventable. A safe working environment for nurses can be achieved by reducing occupational hazards mainly through education, provision of adequate materials and adequate

staff-patient ratio. This literature is from all over the world including few studies from Malawi. However, there is no literature from Kamuzu Central Hospital. This study hopes to bridge this gap by describing factors that predispose nurses and midwives to biological occupational health hazards at Kamuzu Central Hospital.

Chapter Three

3.0 Methodology

Introduction

This chapter will discuss the research design, study setting, data instrument, pretesting, reliability and validity, data collection process, data analysis and ethical considerations/issues during the study.

3.1 Research design

The study was rooted in the positivist paradigm. Positivism is a dominant ontological and epistemological paradigm premised on the argument that the world exists externally to the researcher and can be measured through observation (Bryman, 2012). According to this philosophy, the researcher is inclined to establish objective truth about a phenomenon, a conception of truth in which verifiable statements occur with ascertainable facts of reality (Krauss, 2005). As such knowledge produced is held to be a product of straight forward experimentation and observation interpreted through rational deduction because it is conclusions of deductive logic and beliefs derived from direct observation that can be known with certainty (Burke, 2007)

Consistent with the positivist philosophy, the study followed the quantitative approach. Generally, quantitative research is a positivist approach due to the compatibility with the values entrusted by the natural science as it serves the positivist ideal by providing rigorous, reliable and

verified large aggregate of data and statistical testing of empirical hypothesis (Lemeshow, Klar, Hosmar, & Lwanga, 1990). Similarly, in the present study, large aggregate of data were collected in the form of numbers, the mathematical process was the norm for analyzing the numerical data and the results were expressed in statistical terminologies.

Within the quantitative approach, the study used the cross-sectional design. This is a form of descriptive design, which entails the collection of data on more than one case and at a single point in time (Bryman, 2012). The design enabled the study to collect data from nurses and midwives working in different sections of Kamuzu Central Hospital at a single point in time. Similarly, as a descriptive design it helped to extensively describe the phenomenon of exposure to biological occupational health hazards among nurses and midwives through determining the extent of exposure, prevalence of disease conditions related to the exposure, as well as risk factors to biological hazard exposure and preventive measures to reduce exposure to biological occupational health hazards (Grove & Burns, 2005).

3.2 Research setting

The study was conducted at Kamuzu Central Hospital (KCH). The choice of the setting was determined by the fact that it is one of the three largest referral hospitals in Malawi and due to large number of nurses and midwives, the required sample size was reached at a short period of time. Additionally, the study site was convenient for the researcher. Kamuzu Central Hospital is located in the central region, in Lilongwe district, where it serves approximately 1 million people in the district and the entire population (about 5 million) of all the districts in the region namely;

Ntcheu, Dedza, Lilongwe, Mchinji, Nkhotakota, Kasungu, Ntchisi, Dowa and Salima. Estimates of the hospital's size range from 600 to 1000 beds; actual occupancy always exceeds intended occupancy. On average daily occupancy rate is 1300 patients. KCH has five floors, comprising of four operating theatres, one Intensive Care Unit (ICU) with four beds, and a radiology department, laboratory, male and female medical ward, male and female surgical ward, children's ward, gynecological ward, antenatal, post-natal, labour and delivery, nursery ward, Eye department, Dental department, Casualty and emergency department just to mention a few. It is a teaching facility for various cadres of health professionals like Nurses, Clinical Officers, Medical Doctors and para-medicals.

3.3 Study population

The study population comprised nurses and midwives working in various departments of Kamuzu Central Hospital. There are currently 298 nursing staff, comprising of 90 registered nurses-midwives, 154 nurse-midwife technicians (NMT) and 54 enrolled nurse midwives.

3.4 Inclusion criteria

All nurses and midwives who were practicing at Kamuzu Central Hospital were recruited to participate in the study. The study included all qualified nurses and midwives who were willing to participate regardless of their cadre.

3.5 Exclusion criteria

All nurses working on locum basis were not recruited to take part in this study because their allocations are on short term basis thus the findings could not be generalized to the entire population of nurses and midwives.

3.6 Sampling method

The study used the systematic random sampling method to select the sample. Systematic sampling is a form of probability sampling, which allows every element of the population to have an equal chance of being selected (Krauss, 2005). The sampling technique involves the selection of every K^{th} individual or site in the population until the desired sample size is reached (Polit & Beck, 2008). In this study, a sampling interval K was determined by dividing the population of nurses and midwives (N) by the size of the desired sample (n). Therefore, a list of nurses and midwives working at Kamuzu Central Hospital was obtained using the duty rosters from the departments to form a sampling frame. The researcher selected the first respondent between the number 1 and K^{th} member from the sampling frame, after which every K^{th} member of the study population was picked until the desired number was reached.

3.7 Sample size:

KCH has a total of 298 nurse/midwives. A confidence level of 95% was used. The sample size for quantitative data was calculated using a formula by Lemeshew et al.(1990) as follows:

Nurse/midwife sample size from total population of 298:

$n = [z^2p\ (1-p)]/e^2$

$= [(1.96)^2 * (0.66) * (1-0.66)] / (0.05)^2$

$= 0.86205504/0.0025$

$= 344.822016$

$=\underline{345}$

Where n = was the required sample

z = z was the standard value of the normally distributed variable which for a 95% Confidence Interval takes a value of 1.96.

P = was the estimated proportion of nurses exposed to Occupational Health Hazards (an average from 3 studies in Sub-Sahara African region) which was estimated at 66%

e = was the desired level of precision or allowable error of which in this study had been set at 5% (0.05)

However, to come up with the sample size for the study, the finite population correction factor was used because the study population was small.

Finite population correction for proportion:

New n = n/ [1+ (n-1/N)]

Where N =population

= 345 / [1+ (345-1)/298]

= 160.16

=160

Where N was population from which the sample was taken.

The sample of 160 nurse/midwives was targeted for the study.

3.8 Data collection instrument

A self-administered structured questionnaire was used to collect data. The questionnaire was developed by the researcher through a thorough review of literature on occupational health hazards. The questionnaire was also developed using Infection Prevention and Control guidelines. Objectives of the study also influenced the development of the tool. Section A of the questionnaire comprised demographic data of the participants such as: age, sex, marital status, educational status and work experience in their respective departments. Section B collected information on the extent of exposure to biological occupational health hazards. Section C had 9 items that elicited information on risk factors to biological occupational health hazards exposure while section D contained 10 items on strategies for preventing exposure to biological occupational health hazards. Some of the items on these sections were scored as multiple response fixed categories, nominal scale (yes/no), while others were on a four point Likert scale ranging from 0 (strongly disagree) to 3 (strongly agree). Likert scale was chosen because of the

ability to make participants indicate the degree to which they agree or disagree with the opinion expressed by the statement (Polit & Beck, 2012).

3.9 Pre-testing

Pretesting of the questionnaire was done on 10 nurse-midwives at Bwaila Hospital. Pre-testing assisted in identifying any areas in the data collection tool that required revision and to assess suitability of the tool to collect the required data (Joubert & Ehrlich, 2010). The pre-tested questionnaire was given to the research supervisors for their comments, to assist in refining the tool. Amendments of the questionnaire was done after pretesting where necessary.

3.10 Data collection process

Data were collected from 10th to 24th October, 2016. After obtaining the necessary approval letters from the hospital authorities, an audience was booked with the nurses and midwives in their respective departments to explain to them about the study. The questionnaires were physically delivered by the researcher to all nurses and midwives who gave informed consent (see appendix 2). The questionnaire was self-administered because the respondents were literate. The investigator was assisting subjects in need of any help and checking the completeness of the questionnaire. All the questionnaires that were distributed (n = 160) were returned (100%). This maximum return rate was achieved because the questionnaires were physically collected from the participants themselves by the researcher. After data collection, the questionnaires were checked for completeness. Completed questionnaires were kept in a lockable drawer in readiness for data entry.

3.11 Data management

The questionnaires were assigned code numbers for easy identification and sorting. To ensure quality, the questionnaires were checked after being filled for completeness and accuracy of responses at the end of each collection day and before storage. The completed questionnaires were kept in a lockable drawer to maintain confidentiality and for safety purposes. Data from questionnaires were entered into a Microsoft excel which was later imported into Statistical Package for Social Sciences (SPSS) version 20.0 on the researcher's lap top in readiness for analysis and were kept safe and secured by means of a secret user name and password.

3.12 Data Analysis

Data were analyzed using Statistical Package for Social Sciences (SPSS) version 20.0. All questionnaires were eligible for entry and analysis (n = 160). Consistent with Polit and Beck (2008), a quantitative approach was used to analyze, organize, interpret and communicate numerical information. Data from the demographic variables such as sex, age, marital status, educational level and work experience were analyzed by running frequency and percentage distribution. Mean, mode and median were used as measures of central tendency for descriptive statistical analysis. Tables and graphs have been used to enhance interpretation of the findings. Standard deviation was used as a measure of dispersion.

Factor analysis was performed on 24 variables suspected to be preventive measures to biological health hazards. This was done to reduce dimensionality of the total number of measures. The Kaiser – Meyer – Olkin (KMO) measure of sampling adequacy was done to confirm that the

sample size was adequate for factor analysis. Extraction of factors that could be significant preventive measures to biological hazards was done by comparing the Kaiser criterion with the scree plot using principal component analysis (pca).

3.13 Validity

Being a quantitative study, results can only be valid if there was objectivity where the researcher distanced himself from the study. The development of the research instrument was also informed by a thorough review of content on biological occupational health hazards, to ensure that the content emanated from authentic and empirical studies to achieve construct and content validity. Similarly, researcher's supervisors who are experts in community health nursing, a statistician, and senior experienced nurses and midwives who are familiar with the hospital environment and the infection prevention and control arrangements reviewed the research instruments for comprehensiveness, accuracy and clarity. As such all the mistakes were corrected, and clarity improved to ensure the validity of findings emanating from the data generated by the instrument.

3.14 Reliability

Polit and Beck (2012) describes reliability as the extent to which a tool provides the same measurements on different occasions and overtime. In order to ensure that the tool was reliable, the investigator developed some of the questions in the questionnaire using Infection Prevention and Control Guidelines. In addition, pretesting of the questionnaire was done and any inconsistencies were corrected before the actual study.

3.15 Ethical consideration

The researcher ensured that participants were treated with justice and protected from any forms of harm (Polit & Beck, 2004). To this effect, the following strategies were used to make this study ethical:

Approval from College of Medicine Research and Ethics Committee (COMREC) was obtained. From the study site, approval was also obtained from the Hospital Director. Participants were informed regarding the purpose of the study and had autonomy to decide whether to participate in the study or not. The participants were assured of their right to participate or not, or withdraw at any point without in any way affecting their employment status. Furthermore, the participants were informed that they could refrain from answering any question. After receiving information about the study the participants were given time to consider whether they wish to participate. For those that decided to participate, they were given a consent form to sign and a questionnaire to fill. To ensure anonymity, the questionnaires did not bear names of participants, instead code numbers were used.

Participants were notified that there are no physical risks. However, participants were informed that they could experience psychological discomfort after being reminded on instances that negatively affected them in the past. In case of this happening, participants were assured that psychological counselling would be provided at the hospital clinic. Participants were also notified that they would not benefit directly from participating in the study, but recommendations

made from the findings of the study could be utilized to help reduce occupation health hazards encountered by nurses and midwives in hospitals.

Conclusion

This chapter has discussed the research design and methodology of the study. Data management and analysis have also been discussed. The next chapter will discuss results and findings.

Chapter Four

4.0 Results

Introduction

A summary of the results obtained from analyzing the collected data is presented in this chapter. Results have been presented on proportion of nurses and midwives who have been exposed to biological occupational health hazards, prevalence of disease conditions which are related to exposure to biological occupational health hazards, risk factors associated with exposure to biological hazards and preventive measures to biological hazards. Initially demographic characteristics will be presented.

4.0. Respondents' Demographic Characteristics

Table 1 presents demographic characteristics of the respondents. Out of 160 respondents that were sampled, 83.1% (n = 133) were females. Most of the respondents were married (65.6%, n = 105); nurse midwife technicians by profession (44.4%, n = 71), followed by nursing officers (29.4%, n = 47), then enrolled nurse midwives (15.0%, n = 24) and registered nurses (11.2%, n = 18). At the time of the study, many of the respondents were attached to Maternity department (29.7%, n = 44), followed by Paediatrics department (24.3%, n = 36). Nine of the sampled respondents were attached to other departments such as Orthopaedics (n = 1), Eye ward (n = 3), Dialysis (n = 2); Epilepsy (n = 1), and General paying ward (n = 2).

Table 1: Respondent's Demographic Characteristics (N = 160)

Characteristic	Value	Count (*N* %)
Respondent's Gender	Male	27 (16.9)
	Female	133 (83.1)
Respondent's Marital status	single	42 (26.2)
	married	105 (65.6)
	divorced	1 (0.6)
	widow / widower	10 (6.2)
	separated	2 (1.2)
Respondent's cadre	Nursing officer	47 (29.4)
	Registered nurse/midwife	18 (11.2)
	nurse midwife technician	71 (44.4)
	enrolled nurse midwife	24 (15.0)
Highest Professional Qualification	Master's degree	5 (3.1)
	Bachelor's degree	51 (31.9)
	University diploma	11 (6.9)
	College diploma	61 (38.1)
	Certificate	32 (20.0)
Department where working	Maternity	44 (29.7)
	Gynaecology	13 (8.8)
	Paediatrics	36 (24.3)
	Male/Female medical ward	18 (12.2)
	Male/Female surgical ward	12 (8.1)
	Theatre	11 (7.4)
	Casualty/OPD	14 (9.5)
Other specified department where working	Orthopaedics	1 (11.1)
	Eye ward	3 (33.3)
	Dialysis	2 (22.2)
	Epilepsy	1 (11.1)
	General paying ward	2 (22.2)
		Mean (±SD)
Respondent's age	-	35.72 (±10.72)
Work Experience	-	10.12(±8.76)

4.1. Extent of exposure by biological hazards

Figure 1 presents the extent of exposure by biological hazard. About 91.82% were equally exposed to sharp-related injuries (SO) (n = 146) and direct contact with contaminated specimens (CS) (n = 147), as 8.18% were never exposed; 91.77% (n = 145) were exposed to air-borne diseases (AD); 91.25% (n = 146) were exposed to patients with infectious diseases (ID). More exposure was observed in BS (blood splashes from patients) as 98.12% (n = 157) were exposed. In addition, 95.60% (n = 152) were exposed to body fluids (BF); 91.82% (n = 146) were exposed to vector-borne diseases (VB); 93.67% (n = 148) had inadequate personal protective equipment (PPE); while 95.60% (n = 152) experienced long or extended working hours (WH). It would appear that most respondents were mostly frequently exposed to BF (40.88%, n = 65), and mostly always exposed to long WH (62.89%, n = 100). Refer to figure 1 for details.

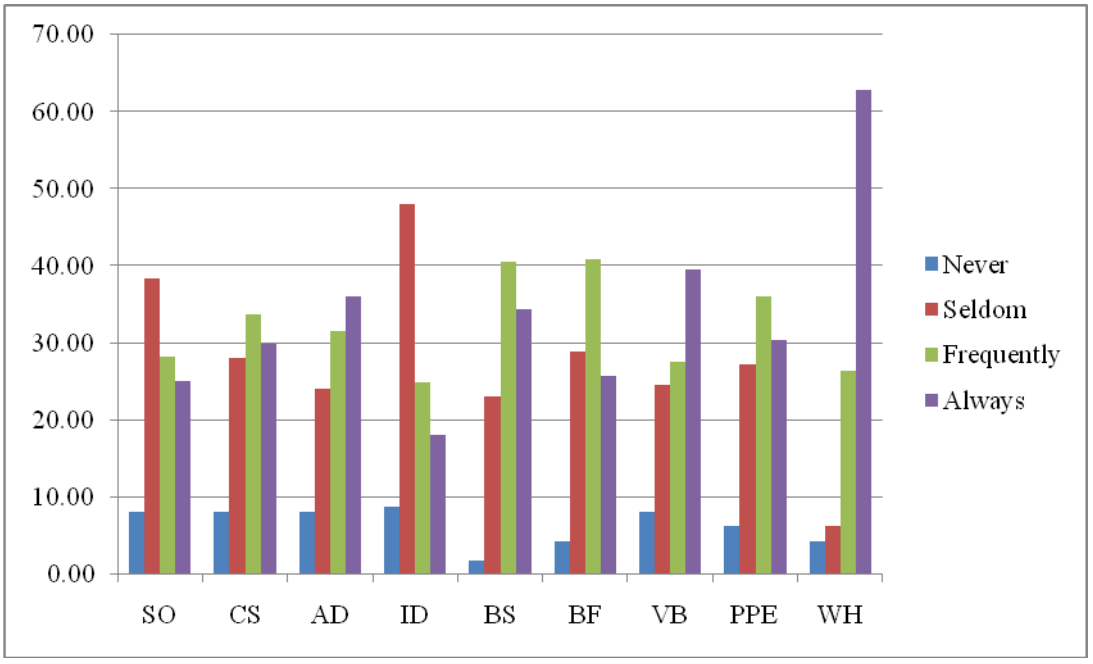

Figure 1: Extent of Exposure by Biological Hazard (%)

4.2. Prevalence of disease conditions which are related to exposure to biological occupational health hazards.

When asked to what extent they received treatment to some diseases conditions which indicated that they had been exposed at one point in time (0 = to no extent; 1 = to a lesser extent; 2 = to some extent; 3 = to a greater extent), it was found that Hepatitis B, a disease that could directly be related to their work related conditions was mentioned by about 17.5% (n = 28)[1]. Hypertension was mentioned by about 28.13% (n=45). On the other hand, diarrhea was mentioned by 74.38% (n=119); malaria was mentioned by 79.38% (n = 127); Respiratory tract

[1] Respondents who scored 1, 2, or 3.

infections that could also be related to their work-related conditions was mentioned by 84.38% (n = 135). Respiratory Tract Infections (RTI) could be related to exposure to patients with infectious conditions while Hepatitis B could be related to needle-stick injuries or exposure to blood splashes. Malaria, diarrhea and hypertension could not be directly linked with occupational exposure. (Refer figure 3 for details).

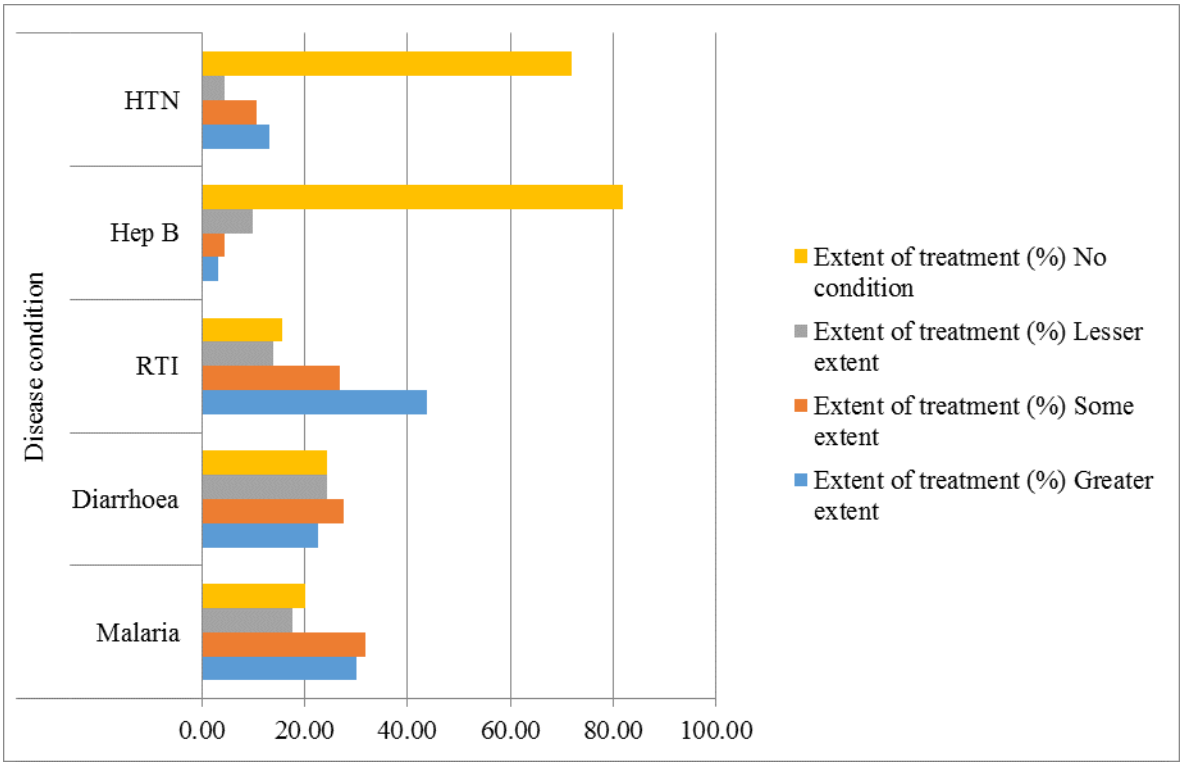

Figure 2: Extent of Treatment of the Disease Conditions or illnesses (%)

4.3. Risk factors associated with exposure to biological occupational health hazards

Figure 4 displays risk factors associated with exposure to biological occupational health hazards. It would appear that the most risk factors are inadequate Personal Protective Equipment (98.75%, n = 158), high workload, (97.5%, n = 156), poor hand washing (93.75%, n = 150), non-reporting of OHH (87.5%, n = 140) and low immunization coverage against vaccine preventable diseases (81.25, n = 130). Refer figure 3 for details.

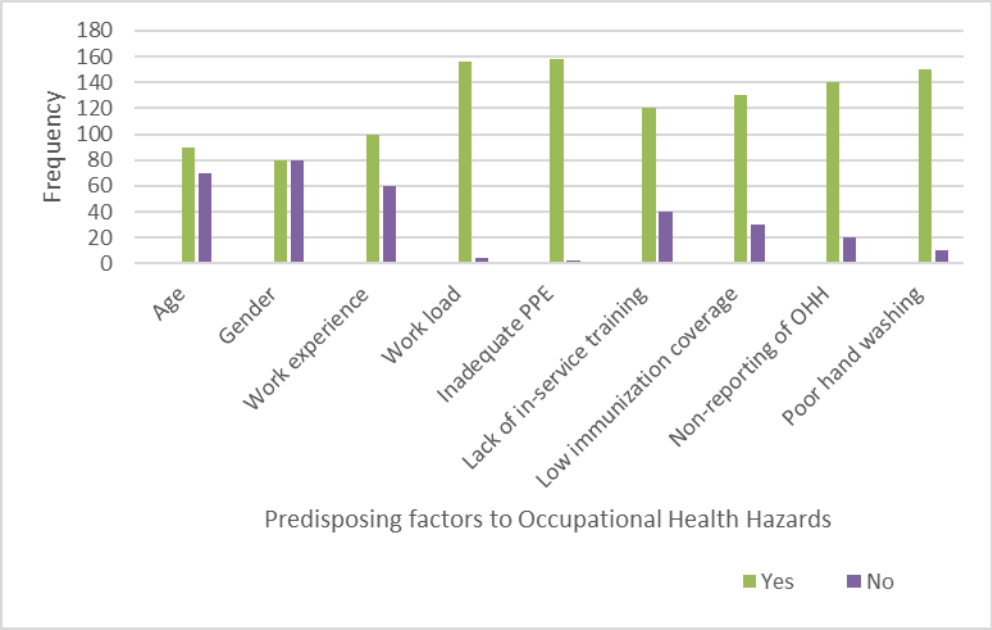

Figure 3: Risk factors associated with exposure to occupational health hazards

Proportion of Respondents that Reported Injuries

For respondents that reported injuries at the work place, only 13.19% (n = 19) indicated they reported injuries at their work place while 86.81% (n = 125) did not report injuries. The remaining 16 participants did not indicate whether they reported injuries or not.

Proportion of Respondents that had Ever Attended Infection Prevention (IP) Training

For respondents that had ever attended infection prevention (IP) training, only 28.79% (n = 38) indicated they had ever attended IP training while 75.94% (n = 120) indicated they had never attended IP training. The remaining 2 participants did not indicate whether they attended an IP training or not.

Proportion of Respondents that had Received 3 Doses of Hepatitis B Vaccine

For respondents that had received 3 doses of Hepatitis B vaccine. About 42.77% (n = 68) indicated they had received 3 doses of Hepatitis B vaccine while 57.23% (n = 91) indicated they had not received 3 doses of Hepatitis B vaccine. Only one participant did not indicate whether the three doses of Hepatitis B were received or not.

Testing Associations between Biological Health Hazards and predisposing Factors

Table 2 presents results of testing associations between exposure[2] to biological health hazards (0 = Not exposed, 1 = Exposed) and predisposing factors[3].

It is clear from the results that at 5% significance level, exposure to infectious diseases was significantly associated with work experience (χ^2 = 42.466, P = 0.013) and age (χ^2 = 46.685, P = 0.013). The correlations were fairly strong and positive for both associations (r = 0.570 and 0.631, respectively). In addition, exposure to contaminated specimens was significantly associated with age (χ^2 = 48.472, P = 0.005) and gender (χ^2 = 4.700, P = 0.046). The odds of being exposed to contaminated specimens was found to be about 3.6 times more among males, compared to females (OR = 3.551, 95% CI: 1.063 to 11.858). The correlation between age and exposure to contaminated specimens was fairly strong and positive (r = 0.062). Furthermore, exposure to blood fluids was also found to be significantly associated with the highest professional qualification of the respondent (χ^2 = 9.933, P = 0.016). However, the correlation between them was weak, though positive (r = 0.258). Also, exposure to sharp objects was significantly associated with heavy workload (χ^2 = 5.788, P = 0.033). The odds of being exposed

[2] Exposure to health hazards was recoded from ordinal to binary (0 = Not exposed; 1 = exposed). Those who scored "0 = Never exposed" were coded "0 = Not exposed" and those who scored "1 = Seldom", "2 = Frequently", or "3 = Always" were recoded as "1 = Exposed".

[3] Only significant associations have been displayed, leaving out associations whose p-values were greater than 0.05.

to sharp objects was found to be about 4 times more among respondents with heavy workload compared to those with minimal workload (OR = 4.191; 95% CI: 1.230 to 14.281).

Table 2: Associations between Biological Health Hazards and Risk Factors

Exposure	**Risk Factor**	***Chi square***[4]	***P-value****	***OR***	***r***
ID	*work experience***	42.466	0.013	-	0.570
	*Age****	46.685	0.013	-	0.631
CS	*Age****	48.472	0.005	-	0.662
	Gender	4.700	0.046	3.551	-
BF	*Highest professional qualification***	9.933	0.016	-	0.258
SO	*Workload*	5.788	0.033	4.191	-

Note: (*) at 5% significance level; (**) *Phi* used as correlation coefficient; (***) *Eta* used as Correlation coefficient.

4.4. Preventive Measures to Biological Health Hazards

To reduce dimensionality of the total number of measures, factor analysis was performed on assumption that the factors are not interrelated. The analysis involved twenty-four (24) variables suspected to be preventive measures to biological health hazards. Due to very small correlations (R < 0.01), three (3) variables were removed from the analysis, remaining with 21 variables. All negative variables had their codes reversed to make them positive. The analysis involved a

[4] Fisher exact test was used where the number of cells with expected count less than 5 was greater than 20%.

sample of 152 respondents. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was 0.705 > 0.5, indicating that the sample size was adequate for factor analysis. The determinant was positive definite (0.02 > 0.00001), implying that there was neither multicollinearity nor singularity (very high inter-correlations). (Refer to Table 3 for the statistics) The sample was therefore suitable for factor analysis. The Bartlett's test of Sphericity was found to be significant ($\chi^2 = 925.742$, $P < 0.001$), indicating that the variables were significantly intercorrelated

Table 3: KMO and Bartlett's Test of Sphericity

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	0.705
Bartlett's Test of Sphericity	$\chi^2 = 925.742$
	df = 210
	P <0.001
Determinant	0.02

Extraction

Extraction of factors was done by comparing the Kaiser criterion (components with Eigen values > 1 be extracted) with the scree plot (Field, 2000), using principal components analysis (pca). The Kaiser criterion extracted eight (8) components. The number of components to be extracted was confirmed using the scree plot. The break (elbow) was observed at 6 or 8 components, implying that either 6 or 8 components could be extracted (Refer to Figure 4).

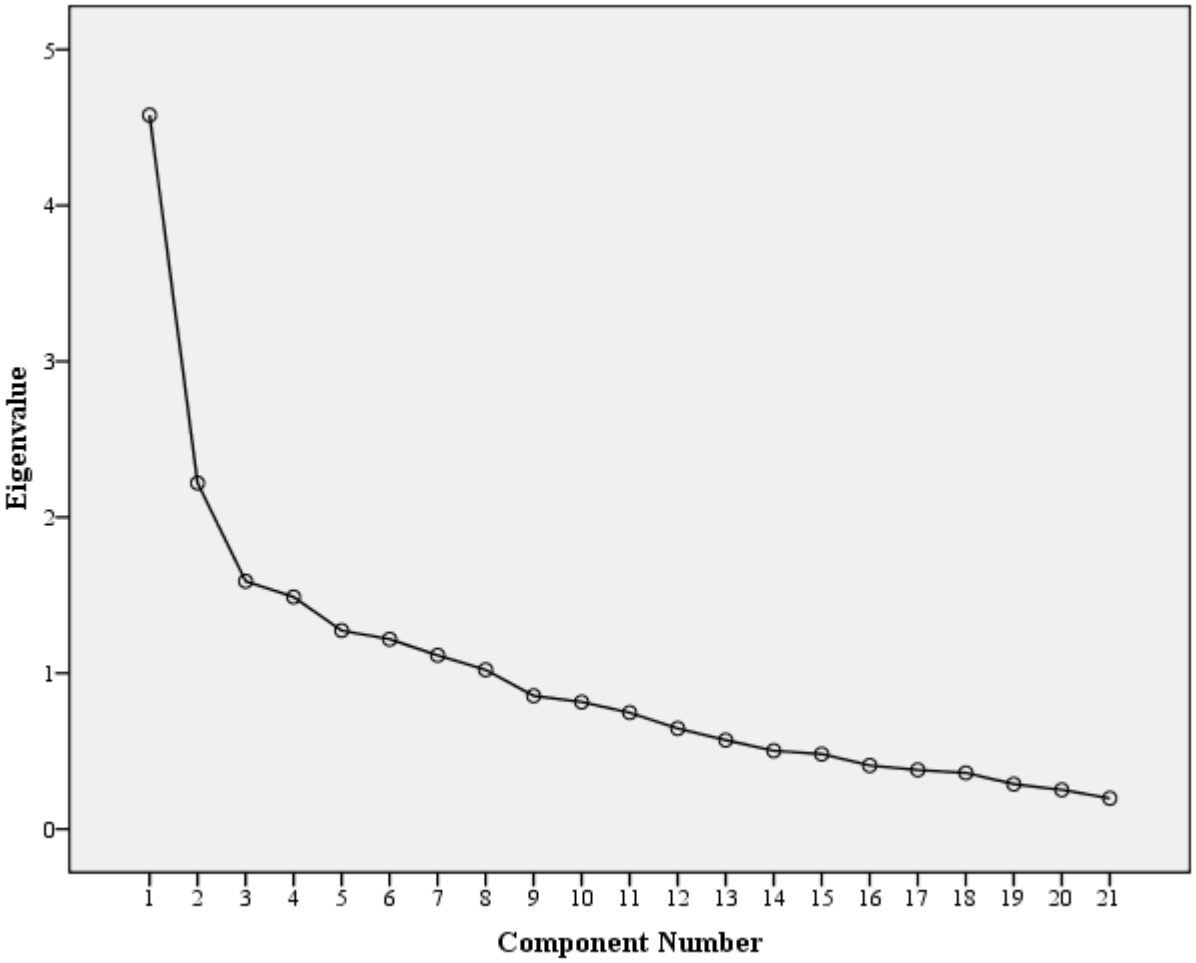

Figure 4: Number of Components (Factors) to be extracted

There were 21 variables that could reduce exposure to biological occupational hazards and out of these variables only six had a great impact on reducing exposure. The column of initial Eigen values indicates the percentage of variance and cumulative percentage of the 21 components. The column of extraction sums of squared loadings indicates the percentage of variance and cumulative percentage of the 6 components that were extracted from the 21 components. When

the six components were extracted, results showed that before rotation Factor 1 accounted for about 21.81% of the total variability among the 21 components (variables); Factor 2 accounted for 10.57% of the total variability, and so on. All the six factors accounted for about 58.89% of the total variability. (Refer to Table 4)

Table 4: Total Variance Explained by the Six Components before Rotation

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.579	21.807	21.807	4.579	21.807	21.807
2	2.219	10.567	32.374	2.219	10.567	32.374
3	1.589	7.567	39.941	1.589	7.567	39.941
4	1.489	7.088	47.029	1.489	7.088	47.029
5	1.273	6.062	53.091	1.273	6.062	53.091
6	1.218	5.799	58.889	1.218	5.799	58.889
7	1.114	5.306	64.196			
8	1.021	4.863	69.058			
9	.854	4.069	73.127			
10	.815	3.880	77.007			
11	.746	3.555	80.561			
12	.645	3.071	83.632			
13	.571	2.717	86.349			
14	.502	2.392	88.742			
15	.481	2.290	91.032			
16	.408	1.941	92.973			
17	.379	1.804	94.777			
18	.360	1.716	96.493			
19	.288	1.372	97.865			
20	.251	1.197	99.062			
21	.197	.938	100.000			

Extraction Method: Principal Component Analysis.

Rotation

When rotation was done using Varimax extraction method on assumption that the factors were independent (not correlated). Table 5 presents the results.

Table 5: Rotated Component (Factor) Matrix

	Component					
	1	2	3	4	5	6
Infection Prevention (Know where to find guidelines and protocols for PEP)	.834					
Infection Prevention (Know reporting procedures in case of injuries)	.781					
Infection Prevention (Know necessary measures to follow in case of blood splashes)	.737					
PPE (There is always availability of disposable gloves)	.575					
Infection Prevention (always report all injuries encountered in the department)	.513					
Hand-washing practices (always wash hands before and after handling each patient)		.858				
Hand-washing practices (always wash hands before and after every procedure)		.837				
Hand-washing practices (always wash hands after removing gloves)		.759				
Hand-washing practices (always wash hands after handling biological samples)		.641				
Sanitation in the working environment (always dust free)			.867			
Sanitation in the working environment (always clean and conducive)			.786			
Hand-washing practices (always use hand rub as disinfectant)						
Safety measures (enough sharp containers in the department)						
Infection Prevention (training as a nurse has prepared me to deal with health hazards)						
Working conditions (department is adequately staffed with nurses)				.792		
Working conditions (I work for not more than 40 hours per week)				.792		
PPE (I have a personal set of PPE)						
Sanitation in the work place (there is absence of vectors in my dept.)					.636	
Infection Prevention (PEP can be accessed any time throughout the year in the hospital)					.573	
Infection Prevention (Ever attended a training session on IP)					.512	
Working conditions (there is no work overload in my dept.)						.842

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 8 iterations.

Based on the results in Table 5, three variables loaded strongly and two variables loaded fairly strongly on Factor 1 ("*Knowledge of infection prevention*"); four variables loaded strongly on Factor 2 ("*Adherence to hand-washing practices*"); two variables loaded strongly on Factor 3 ("*Good sanitation in the working environment*"); two variables loaded strongly on Factor 4 ("*Good working conditions*"); One variable loaded strongly, and two other variables loaded fairly strongly on Factor 5 ("*Adherence to good Sanitation and Infection Prevention practices*"); while working conditions also loaded highly on Factor 6 ("*Adequate workload*"). Variables that loaded strongly on any of those factors can significantly reduce the risk of exposure to biological hazards if implemented properly followed by those variables that loaded fairly strongly.

Total Variance Explained by the Six Rotated Factors

Table 6 presents the total variability accounted for by the six (6) rotated factors. *Knowledge of infection prevention* accounts for about 14.39% of the total variability*; Adherence to hand-washing practices* accounts for 13.36%; *Good sanitation in the working environment* accounts for 10.18%*; Good working conditions* account for 7.96%; *Adherence to good Sanitation and Infection Prevention practices* accounts for 6.78%, while *Adequate workload* accounts for 6.22%, of the total variability. All the six factors account for about 58.89% of the total variability that could be accounted for by all the 21 variables. This implies that about 41% of the total variability is unexplained by the study.

Table 6: Total Variance Explained by the Six Rotated Factors

	Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %
Knowledge of infection prevention	3.021	14.387	14.387
Adherence to hand-washing practices	2.806	13.361	27.748
Good sanitation in the working environment	2.137	10.177	37.924
Good working conditions	1.671	7.957	45.881
Adherence to good Sanitation and Infection Prevention practices	1.425	6.784	52.665
Adequate workload	1.307	6.224	58.889

Extraction Method: Principal Component Analysis.

In summary, factor analysis has shown that "*Knowledge of infection prevention"; "Adherence to hand-washing practices"; "Good sanitation in the working environment"; "Good working conditions"; "Adherence to good Sanitation and Infection Prevention practices"; and "Adequate workload";* could probably be significant preventive measures to biological occupational health hazards.

Conclusion

This chapter reported results of data analysis. Knowledge of infection prevention and adherence to hand-washing practices have proved to be some of the preventive measures to biological hazards. A high proportion of nurses and midwives are exposed to biological hazards. There was a significant association between exposure to hazards and increased workload. The next chapter will discuss these results.

Chapter 5

5.0 Discussion

Introduction

This chapter will discuss biological occupational health hazards and its preventive measures. The discussion is derived from the results and interpretation of the study findings from the preceding chapter and will be discussed under the following areas; demographic characteristics of respondents, exposure to various biological occupational health hazards and prevalence of disease conditions which are work-related. Lastly, strategies undertaken to prevent exposure to biological occupational health hazards will be discussed.

Demographic characteristics of respondents

Out of 160 respondents that were sampled, majority 133 (83.1%) were females and the remaining 27 (16.9%) were males. This is similar with the study findings in Namibia by Tuvadimbwa (2005), in which 82% of the respondents were females. The mean age of the study participants was 35.72 years which is almost similar to mean age of 37.4 years by Fayaz et al (2014) in Afghanistan. The respondents' median duration of working experience was 10.12 years. About 29.4% of the respondents were professional nurses unlike the study findings by Mbah (2012) who reported that over 50% of the respondents were professional nurses. It can suggested that this can be due to few nursing training institutions that train nurses at professional level like Kamuzu

College of Nursing, Mzuzu University and Deayang Luke Nursing College against a number of training institutions that train nurses at technician level.

At the time of the study, (29.7%) of the respondents were attached to maternity department followed by (24.3%) in paediatric department. Maternity department at Kamuzu Central Hospital is a combination of antenatal, post-natal as well as labour and delivery wards; thus more nurses and midwives from these wards participated in the study. The same applies with paediatric department which comprises High Dependency Unit (HDU), ward A, B, C and Nutritional Rehabilitation Unit (NRU). The rest of the respondents were working in gynaecological ward, male/female medical ward, male/female surgical ward, theatre, casualty, Out Patient Department, Orthopaedics department, Eye ward, Dialysis department, Epilepsy clinic and General Paying Ward.

5.1. Exposure to biological occupation health hazards among health workers

Nurses and midwives are exposed to many biological occupational health hazards like sharp-related objects, blood splashes and body fluids. Exposure to such biological hazards put nurses and midwives at risk of infections.

5.1.1. Exposure to sharp-related objects

Further analysis of the data revealed that majority (91.82%) of the respondents were exposed to sharp-related injuries (SO).This is in line with the findings of Alam (2012), in a study conducted in Saudi Arabia which reported that 93% of health care workers had needle-stick injuries. On the contrary, the needle-stick injury in this study was higher than in other studies performed by

Irmak and Baybuga 2011 (19.4%); Yamazhan et al 2011 (28.1%); Camacho-Ortiz et al. 2013 (36.98%) and Karadag, 2010 (35.5%).

A study by Eljedi and Dalo (2015) in Gaza strip reported low prevalence of needle-stick injuries (66%) among healthcare workers in Gaza hospitals. In support of the low prevalence rate recorded in other studies, needle-stick injuries accounted for 48.6% among nurses in Nigeria in a study conducted by Amosu et al (2011), where the author wanted to determine the level of knowledge regarding occupational health hazards among nurses. A much lower prevalence of needle-stick injuries among nurses was as low as 12.5% in a hospital based cross-sectional study conducted in a general hospital in Malaysia by Bhardmaj (2014).

In the current study, most of the sharp injuries could be due to the absence of sharps bin at the site of the procedure and in addition neglected needles are often left in trays, kidney dishes, among drapes and trash. In addition, unsafe practices among some nurses who still practiced needle recapping has also contributed to the higher rate of NSIs in this study. Similarly, Wang et al (2013), found that health care workers suffered injuries in the process of sorting and cleaning instruments after use.

5.1.2. Exposure to blood splashes and body fluids from patients

The study revealed that exposure to body fluids from patients accounted for 91.82%. This figure is much higher than 53.3% reported by Isara and Ofili (2012) and 48.4% reported by Rezaeian et al (2012). A study assessing the frequency of body fluid exposure among midwives in Nigeria showed that 65.1% of them had experienced exposure to amniotic fluids or blood at least once in

the past six months and that 25.0% reported five or more times that level of exposure. In Ethiopia, nurses have a 29% and 31% lifetime risk of unsafe exposure to bodily fluids and needle-sticks, respectively (Reda, Fisseha, Mengistie, & Vandeweerd, 2010).

There are several assertions that have been put forward in explaining the reasons for job-related exposure to blood and body fluids. Yenesew and Fekadu (2014) attributed sudden movement of a patient during blood sampling or intramuscular or venous injection of drugs, during child birth, during handling of specimen, during handling and collection of waste, and due to lack of personal protective equipment. While these reasons are applicable to the current study, lack of personal protective equipment stands out to be one of the most prominent reason for increased exposure to blood and body fluids from patients because the study site is a resource limited institution. It should be noted that almost all the previous studies on exposure to blood and body fluids were conducted in the previous six months of their study while in this study exposure was measured in the past one year. This might partially explain why there is a higher exposure than most of the studies.

5.2. Prevalence of disease conditions related to exposure to biological occupational health hazards among health workers

Exposure to biological occupational health hazards put nurses and midwives at risk of suffering a number of disease conditions. Hepatitis B and HIV/AIDS are the two blood-borne diseases which are so prevalent in the hospital setting due to exposure to blood splashes and needle stick injuries. Between these two conditions, the study concentrated much on hepatitis B. For HIV/AIDS it was

difficult to solicit information in terms of its prevalence, treatment as well as preventive measures due to its sensitivity and the stigma associated with it. The study also obtained data on the prevalence and extent of treatment for respiratory tract infections. Though conditions like malaria, diarrhea and hypertension were also prevalent among the nurses and midwives, the discussion did not focus much on these because they could not be directly linked to occupational exposure.

Out of 160 respondents, majority (88.75%) believed that most of their illnesses were related to their work. The study did not elicit the various conditions suffered by the study participants but HIV/AIDS and Hepatitis B which are transmitted by blood-borne pathogens were of particular interest. Between these two conditions, the study managed to determine the extent at which nurses and midwives were treated for Hepatitis B infection.

In the literature, it is estimated that the risk of HIV infection after needle stick injury is approximately 0.3%, of Hepatitis B infection 30%, and of Hepatitis C 3% (Azap et al., 2005). HCWs are at risk of acquiring blood borne diseases including HBV due to occupational exposure to blood and body fluids (Hutin, Chiarello, Catlin, Stilwell, & Ghebrehiwet, 2013). The World Health Organization (WHO) estimated that, of the 35 million HCWs worldwide, 3 million experience percutaneous exposure to blood pathogens each year. According to World Health Organization (2012), 37% of the hepatitis B among health workers was the result of occupational work exposure while less than 10% of the HIV among health workers is the result of an exposure at work.

On the extent of treatment to disease conditions, minority (17.5%) of the respondents indicated that they had received treatment for Hepatitis B since they started working. This condition could be work-related. These findings are relatively on the higher side compared with the study findings of (Anagaw et al., 2012) which was conducted among medical waste handlers in Gondar town Government health institutions which revealed that 6% of medical waste handlers had Hepatitis B virus in their blood. Another study done among HCWs in Ethiopia showed that of the 110 HCWs, Hepatitis B virus was detected in 8 (7.3%) of the Healthcare workers (Geberemichael et al., 2013).

Literature indicates that Hepatitis B virus accounts for an estimated 360 million chronic infections with about a million who die each year from chronic liver diseases (Khan & Ross, 2013). Most persons who become chronic carriers of the virus live in Asia and Africa (World Health Organization, 2012b). Studies conducted among different segments of the population in Ethiopia showed that Hepatitis B virus is a major public health problem in the country. A study conducted in Addis Ababa by Abebe et al. (2013) to investigate sero-epidemiology of Hepatitis B virus estimated that the prevalence of Hepatitis B infection among healthcare workers was 7%. This necessitates that necessary infection prevention measures need to be followed by these infected healthcare workers to avoid transmission of the virus to patients.

The current study further established that majority (91.25%) of the respondents were exposed to patients with infectious conditions and airborne diseases in the past one year. This is in agreement to the study findings by Amosu et al (2011) who indicated that exposure to infections from patients accounted for 82.9% in a study conducted in Abeokuta, Ogun State, Nigeria to

determine the level of knowledge regarding occupational health hazards among nurses. In Cote d'Ivoire tuberculin skin test reactivity which is an indication of exposure to Pulmonary Tuberculosis was significantly higher in HCWs working in TB clinics than those working in non-TB clinics (Sidibe, Zuber, & Wiktor, 2007). Similarly, a cross-sectional study conducted at a referral hospital in Malawi showed a higher rate of TB among nurses; particularly those working in adult medical wards, and this was associated with long delays from the time of admission to start of anti-tuberculosis treatment in smear-positive pulmonary TB (PTB) patients (Harries, Nyirenda, Banerjee, Boeree, & Salaniponi, 1997).

Therefore, it is not surprising that 84.38% of the respondents in this study were treated for Respiratory Tract Infections. High exposure to infectious diseases could be attributed to lack of personal protective equipment like face masks that can reduce the risk of exposure to respiratory tract infections like Pneumonia, influenza and tuberculosis. Overcrowding of patients in the ward settings could also contribute to this high exposure.

5.3. Risk factors associated with exposure to biological occupational health hazards

The study has revealed a number of factors that put nurses and midwives at risk of being exposed to biological occupational health hazards and these include: gender, age, work experience, workload, inadequate personal protective equipment, low immunization coverage against vaccine preventable diseases, non-reporting of occupational hazards, lack of in-service training on occupational hazards and poor hand washing practices.

5.3.1. Gender

According to literature, there is an association between exposure to biological health hazards and gender, in the sense that the majority of exposures happen to women (Habib et al., 2011).In agreement to this assertion is a study by Mbah (2014) that was aimed at determining the rate of, and reasons for underreporting of blood and body fluid exposure by doctors and nurses working in the public primary health care setting in the Johannesburg metropolitan district. It was established that female health care workers were more likely to be exposed to blood splashes and body fluids. This is consistent with the study findings of Voide et al (2012) and Naderi et al (2012) in Switzerland and Iran respectively.

These results are different from the present study findings in which the odds of being exposed to biological health hazards was found to be about 3.6 times more among males compared to females. Compatible with the current study findings, are the study results of Fayaz et al (2014), in Afghanistan, who reported that female HCWs were more likely to adhere to Universal Precautions compared to male HCWs. Similarly, a study in Canada regarding compliance with infection control procedures also showed that male HCWs were less compliant with all types of infection control procedures (Yassi, 2006). According to Hamid et al (2010), female HCWs' good practices might be due to natural tendencies of female HCWs to obey rules and regulations.

5.3.2 Use of personal protective equipment

The study further revealed that the majority (93.67%) did not have adequate personal protective equipment. A study conducted in Palestine by Eljedi (2015), to determine the prevalence and response to occupational hazards among nursing students in Gaza strip revealed that although most of the participants (97.4%) were fully aware of using personal protective equipment and safety regulations, only 25% were actually compliant.

A study by Malaguti et al., (2008) indicated that among health care workers, personal protective equipment is a fundamental tool for accident prevention, but being reluctant to its use is one of the barriers to prevent exposure to biological hazards. Similarly, low compliance with personal protective equipment use and its incorrect handling derive from factors like discomfort, inconvenience, carelessness, forgetfulness, lack of habit, equipment inadequacy and disbelief in effectiveness of its use (Tipple et al., 2007; Souza & Freitas, 2010).

In regard to this study, non-compliance to use of Personal Protective Equipment (PPEs) by a large proportion of nurses (93.67%) was due to unavailability of these PPEs. The finding may not be surprising considering that Malawi health care system is struggling economically, therefore it is difficult to procure adequate PPEs for the health care workers. Additionally, even the limited PPEs in the hospital are prioritized to departments like theatre, Intensive Care Unit, and High Dependency Unit where they are highly needed; and there were few participants from these departments.

5.3.3 Working conditions

The majority of the respondents (95.60%) experienced long or extended working hours. A study by Nsubuga and Jaakkola (2011) indicated that working for more than 40 hours per week is a risk factor for needle-stick injuries. This is not a surprising result because with the high disease burden and shortage of nurses in Malawi, nurses and midwives work under strenuous conditions and experience work overload. The recruitment of healthcare workers from developing countries has emerged as one of the main responses of developed countries to the shortage of healthcare professionals. In the case of Registered nurses, nearly every European country is experiencing a shortage (Buchan & May, 2009).

Malawi reported that only 28% of nursing positions were filled (Samson, 2008). The reasons for shortages in less affluent countries are somewhat different from those in wealthier nations. Developing countries Malawi inclusive generally lack the resources to train an adequate number of nurses. They have fewer nurse training programmes and fewer qualified nurse educators. Moreover, very low and extreme unsatisfactory working conditions make it difficult to attract and retain nurses (World Health Organization, 2012). In the literature, it is indicated that low salaries and difficult working conditions lead to the migration of skilled workers from developing countries to Europe and the United States, increasing the burden/workload of the remaining staff and contributing further to illness, injury, dissatisfaction, and the desire to migrate (Buchan & May, 2009).

The National Organization of Nurses and Midwives of Malawi (NONM) indicated that with the current population of approximately 18 million people, the average nurse to patient ratio is 1 to 80 and this is one of the highest in the world. The International Council of Nurses (ICN) recommends one nurse to six average sick patients or one to one ratio if the patient is seriously sick to ensure safe and quality patient care. The low number of nurses in Malawi's public hospitals risks exposing both the health care workers and patients to infections and unprofessional conduct due to fatigue and other disappointments. Low salaries as well as poor job satisfaction have been linked with high turnover in Malawi's public health care system (Schmiedeknecht et al., 2015)

5.3.4. In-service training on infection prevention

On training, the study revealed that a minority of the participants (28.79%) had ever attended a training session on infection prevention. This is low compared to 85% reported by Gershom et al (2007), in a study conducted in the United States of America among nurses. The current study did not find any significant association between attendance of training on infection prevention and exposure variables ($P > 0.05$). The above findings concur with what was revealed in a study by Bekele (2015) who indicated that taking training on infection prevention was not found to be statistically significant on multivariable analysis. Similarly, Orji et al (2012) indicated that in the USA more than 800,000 needle-stick injuries occur each year despite continuing education or other efforts aimed at preventing them.

There could be a number of reasons that could be assigned as to why trainings have no effect on infection prevention and exposure variables in the current study. Anecdotally, majority of health care workers do not attend trainings because they have a knowledge gap but for monetary gains and utilization of the gained knowledge is very minimal. The trend in Malawi is that people attend trainings to acquire knowledge but in addition to that participants also get allowances for accommodation and meals. Secondly, it is also a trend among Malawian nursing professional that most of the trainings are attended by top level managers like matrons and ward-in- charges who do not necessarily do much of the operational work in the ward settings.

In contrast Habib et al (2011), indicated that most needle-stick injuries were from professionals who did not participate in any educational sessions, seminars or workshops related to needle-stick injuries. This result is compatible with a study by Nsubuga and Jaakkola (2011) who indicated that the nurses who did not participate in any training sessions regarding prevention and dealing with NSIs in their workplace faced significant higher risk of suffering such injuries in comparison with those participating in some type of training. Despite the findings of the current study, educational reminder about the risk of blood borne infections, their transmission, and ways of reducing the risk of transmission in the workplace through training may hold the key to reducing exposure to biological occupational hazards like needle-stick injuries, blood splashes, body fluids and many more.

5.3.5. Work experience and age

In this study, there was no significant association between work experience and exposure variables ($P > 0.05$). Despite being well experienced, nurses and midwives may still find it difficult to prevent or minimize their exposure to biological hazards in the presence of high workload, limited material resources as well as unsafe and unconducive working environments. Similar to the current study finding, Trim et al., (2003), in Britain, found that years of work experience had no influence on the level of knowledge or behavior on occupational injuries.

This is contrary to research findings in Taiwan by Wang et al (2010), which revealed that student nurses and medical interns accounted for approximately 75% of total exposure compared to the experienced nurses. Their study further indicated that most of the sharp injuries among student nurses were due to inexperience, unnecessary handling of contaminated needles in the wards and high frequency of injections and infusions in the wards. Similarly, Clarke (2007) indicated that Registered nurses with fewer years of experience had more NSIs. In addition, Mbaisi et al (2013), in their study in Kenya, reported that lesser years of work experience were risk factors for percutaneous injuries. In support of this, a study by Fayaz et al (2014), in Afghanstan revealed that HCWs with more years of experience had significantly higher Odds Ratio of adhering to Universal Precautions. A study of compliance with universal precautions in rural northern India was consistent with the findings of Fayaz et al (2014) that HCWs who had been at their jobs for more years were more compliant with Universal Precautions (Alberta, 2011b).

The findings of the current study are in contrast with study findings of Smith et al (2010) who reported a 4.5 times higher risk of NSI incidents among nurses in Japan aged lower than 27 years. This is in agreement with a study in Kenya by Mbaisi et al (2013) in which young age was a risk factor for percutaneous injuries. Inadequate experience when handling sharp-related equipment might be the reason for the increased incidences of NSIs in younger Healthcare workers. In addition, younger Healthcare workers may be coming from nursing training institutions where the learning environment was well stocked with material resources; and coming to work in a resource limited facility in case of Kenya which is a developing country would be challenging. This could also contribute to the increased incidences of NSIs in young Healthcare workers.

A number of studies have not found any relationship between age and NSI. Fredrich et al (2005), in an assessment of the frequency and NSI risk factors among nurses and midwives in Sub-Saharan Africa identified no significant relationship between age and NSI incidents. In addition, Honda (2011) and Kazemi (2010) reported no significant association between age and sharp devices injuries. The inconsistency between the results may require further investigation using larger study groups.

Exposure to body fluids was found to be significantly associated with the highest professional qualification of the respondent. This may be so because most of the procedures in the wards are performed by lower cadre nurses and this gives them adequate experience in the way they conduct procedures in terms of safety measures to be followed. On the other hand, higher cadre nurses spend most of the time performing managerial duties thus having less experience on

regular ward procedures. Some studies found no significant relationship between occurrence of NSIs and level of education of study participants. In a survey of nursing workers of Khanevadeh Hospital in Tehran by Kazemi (2010), no significant association was observed between NSIs and the level of education.

5.3.6. Immunization against hepatitis B virus

A safe and effective vaccine against Hepatitis B Virus is available throughout the world, yet many HCWs in resource poor countries remain at risk because they are not vaccinated against HBV (Suckling et al., 2006). On immunization against Hepatitis B virus, results of the current study revealed that 42.77% had received all the 3 doses of Hepatitis B vaccine. The vaccination rate was slightly higher compared to 39.8%, a proportion reported by Loulergue et al (2009) in Sweden, 37.2% by Dannetun et al (2006) in Pakistan and 19.9% by Bennett (2015) in South Africa. Despite recording slightly higher levels of vaccination rate against Hepatitis B virus in this study compared to the other studies, the remaining proportion of 57.23% of the nurse/midwives who were not fully vaccinated is of great concern as the level of occupational exposure to biological hazards is high among the study participants.

Vaccination coverage for other studies against Hepatitis B vaccine recorded higher rates compared to the current study findings of 42.77%. A study in Turkey by Mengal et al (2008), recorded 55.8% vaccination coverage while in Paris a study by Hatipoglu (2007) recorded 93% vaccination coverage. In a study by Denic et al (2013), 50.2% of respondents were fully vaccinated with three doses of Hepatitis B vaccine.

There are many potential reasons for low hepatitis B virus vaccine coverage among nurse-midwives including lack of knowledge about the vaccine, negligence, and unavailability of the vaccine. Specific to this study the main reason why many nurse-midwives have not been fully vaccinated against HBV was the unavailability of the vaccine at the health facility. It is the responsibility of the Hospital management to procure and vaccinate all the HCWs but due to financial constraints majority of the HCWs remained unprotected against Hepatitis B virus. The vaccine is expensive, and most HCWs cannot manage to procure the vaccine on their own. This probably explains the reason why more than half of the participants were not fully vaccinated against Hepatitis B virus.

5.3.7. Reporting of occupational hazards

Although the Centre for Disease Control recommends immediate reporting of all accidents and exposures so that post-exposure prophylaxis can be instituted within 2 hours of such accidents majority of respondents (86.81%, n = 125) in the current study indicated that they did not report such injuries. It is of great concern that only a few (13.19%) of participants in this study reported the NSIs to the necessary authorities. This is lower than 53%, proportion reported by Zafar et al (2008), 41.2% by Denic et al (2013) and 38% by Isara et al (2015). The problem of under-reporting of injuries was also observed in a study conducted by Hussain et al (2012), in which only 22.6% of the health care students reported the injuries. The most common reasons for not reporting was the lack of knowledge among the students about how the injury had to be reported. In the same study, it was noted that only 34.4% of those who reported had not taken Post-Exposure Prophylaxis (PEP) after the injury and 37.3% had received PEP against Hepatitis B

Virus and only 21.5% had received PEP for tetanus. This might result to high prevalence of HIV/AIDS, Hepatitis B infection and tetanus among HCWs following exposure to blood-borne infectious agents

Reporting of incidents of sharp instrument injuries is important to ensure appropriate counselling and treatment of health care workers. It is worrisome that most of the NSIs in this study were not reported to appropriate authorities so that necessary actions can be taken to prevent the spread of blood-borne infections. This could be due to poor perception of the risk of contracting blood borne infections from such injuries by the health care workers.

Studies have shown that there is stigma associated with blood borne diseases like AIDS and Hepatitis B, the fear of a positive result as well as the denial of personal risk prevent the reporting of incidents (May & Brewer, 2011). From anecdotal evidence it seems that many nurses and medical doctors would rather not know their HIV status following injury for fear of the potentially devastating impact a positive result could have on their life. According to Rabaud et al., 2010, the other reason for not reporting may be fear of disciplinary action due to negligence of the health care workers or the inability to influence the outcome following injury.

5.4. Strategies for preventing exposure to biological occupational health hazards among health care workers

Factor analysis revealed that knowledge of infection prevention, adherence to hand-washing practices, good sanitation in the working environment, good working conditions, adherence to

good sanitation and infection prevention practices and adequate workload could be significant preventive measures to reduce exposure to biological occupational health hazards.

Knowledge of infection prevention accounted for 14.39% of the total variability as one of the necessary measures to be taken in order to prevent nurses' and midwives' exposure to biological occupational health hazards. In support of this, Gabriel (2009) reported that 50% - 80% of accidents may be prevented by using safety equipment whereas 77% - 82% of them can be prevented by providing written recommendations and observing rules for practice. Vaz et al (2010), recommends that focused programs should be available to teach HCWs the risks of occupational exposure to blood and other infected fluids. According to World Health Organization (2012), the relationship between knowledge and power helps to employ and implement strategies to reduce infection and improve patient safety and educating healthcare workers is a vital strategy for effective infection control.

Adherence to hand washing practices accounted for 13.36% as a preventive measure. Literature states that proper hand hygiene is the single most important, simplest, and least expensive means of reducing the prevalence of hospital acquired infections and the spread of antimicrobial resistance (Smith et al., 2010). According to Mathur (2011), an increase in handwashing compliance has been found to be accompanied by a fall in pathogen acquisition rates. Centre for Disease Control (2010), states that a cornerstone of infection control is ensuring that health-care workers wash their hands at appropriate times. Transmission of health-care associated Klebsiella species has also been documented to reduce with improvement in hand hygiene (Pittet et al., 2006). Unfortunately, healthcare workers and caregivers often fail to comply with handwashing

protocols due to inconvenient access to hand washing utilities or shortage of time to perform this procedure (World Health Organization, 2012), Thus, there is need to ensure that hospitals have convenient access to hand washing utilities. The evidence suggests that adherence to hand hygiene practices has significantly reduced the rates of acquisition of pathogens on hands and has ultimately reduced the rates of hospital acquired infections. (Larson, Early, Cloonan, Sugrue, & Parides, 2006).

Good sanitation in the working environment accounted for 10.18% as one of the preventive measures to biological hazard exposure among nurses and midwives. In agreement, a study by Cho et al (2014) indicated that hospitals can prevent or reduce exposure to biological health hazards by establishing better work environments in terms of resource adequacy, clean and safe working environments. Poor hospital hygiene has been widely publicized, including patients' concerns about safety in hospitals (Souza & Freitas, 2010). Inadequate sanitary conditions and poor hygiene practices play major roles in the increased burden of communicable disease within developing countries (Omorogbe et al., 2012). According to the Environmental Protection Agency (EPA) 3.2 million tons of infectious wastes are generated from health related facilities yearly (Fayaz et al., 2014).

Good working conditions and adequate workload accounted for 7.96% and 6.22% respectively of the total variability as preventive measures to biological hazard exposure. This result is compatible with the study findings of Motaarefi et al (2016) who reported that attention should be paid to decreasing excessive workloads and to sufficient training for particular work duties among HCWs. The authors further stated that hospitals can decrease NSIs by creating work

environment that has adequate staff and resources. In support of this assertion, Gholami et al (2013), reported that HCWs who worked more than 30 shifts in a month were about 2.4 times more likely to encounter NSIs than those who worked 30 shifts or lower in a month.

Conclusion

It has been established that nurses and midwives are susceptible to biological occupational hazards, many of which are avoidable and preventable while others may be inevitable. Nurses and midwives are exposed to needle-stick injuries, infectious conditions, blood and body fluid splashes. Biological occupational hazards that are avoidable can be taken care of through adequate vigilance and carefulness on the part of the nurses, while concerted and focused efforts should be made to minimize those hazards that are inevitable. Knowledge of infection prevention, personal protective equipment, adherence to hand washing practices, good sanitation in the working environment, good working conditions and adequate workload are some of the measures to be followed in order to reduce nurses' exposure to biological occupational hazards.

Recommendations

Based on the findings of this study, the following recommendations have been made:

- Conduct frequent in-service training to sensitize nurses and midwives on biological and other occupational health hazards.
- Personal protective equipment must be available for all nurses and midwives

- Provision of support in case of occupational injury or illness should be equally rendered to all nurses/midwives.
- More nurses and midwives should be trained and recruited in order to improve staff to patient ratio.

Limitations of the study

- The study relied on self-reporting of exposure to biological occupational hazards. Therefore, recall bias cannot be ruled out as the recall period is long enough to be remembered.

Areas for further study

- A comparative study needs to be conducted in all Central Hospitals as well as District Hospitals.
- A similar study need to be conducted among nursing and midwifery students.
- A qualitative study need to be conducted to understand the lived experiences of nurses/midwives who experienced biological health hazard.

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Appendices

Appendix 1 - Participants' information letter

Factors that predispose nurses and midwives to biological occupational health hazards.

Dear participant,

My name is Owen Gangata. I am a student at Kamuzu College of Nursing pursuing masters' degree in Community Health Nursing. In partial fulfillment for the award of the degree, I am required to conduct a research project. The title of my research is: **"*Factors that predispose nurses and midwives to biological occupational health hazards at Kamuzu Central Hospital."***

Healthcare workers are exposed to many hazards that can adversely affect their health and well-being. Exposure to infectious diseases and harmful chemicals are examples of hazards that put these workers at risk of illness and injury. The study therefore aims to establish factors that predispose nurses and midwives to biological occupational health hazards so as to make recommendations for prevention of these health hazards among nurses and midwives.

You are being invited to participate in the study. You will be requested to fill a questionnaire that will be provided. It will take you **a minimum of 30 minutes** to fill the questionnaire.

Please note that participation in the study is voluntary and you can withdraw any time you wish to without giving reasons. There will be no negative consequences if you decline to participate or

withdraw from the study. The information you will give will not be used against you in any way. The findings will be generalized to the whole population and not just one participant.

No names will be indicated on the questionnaire and only signatures will be required for the informed consent form. No other person apart from the researcher and the supervisor will have access to the information. However, in special circumstances, College of Medicine Research and Ethics Committee (COMREC) or Malawi National Health Sciences Research Ethics Committee may be given access to the confidential information. All documents for this study will be destroyed after a period of five years.

There are no physical risks in taking part in this study. However, you might experience psychological discomforts after being reminded of some instances that had negatively affected you in the past. If this happens to you, psychological counselling will be provided at the hospital clinic. You may not benefit directly from participating in the study but recommendations to be made from the findings of the study if utilized may help to reduce occupation health hazards encountered by nurses and midwives in their respective working departments. No names or identifying details will appear on any publications, reports, presentations or briefings. A copy of the research report will be put in the hospital library where you can have access to.

Should you need to contact the researcher for clarification, below are the contact details:

Phone number: +265 999 367 096

Email address: owengangata@yahoo.com

You may also contact the following for queries and clarification

The Chairperson

College of Medicine Research and Ethics Committee

Private Bag 360,

Chichiri

Blantyre 3

Malawi

Tel: +265 1 874 377

Fax: +265 1 874 740

Email: comrec@medcol.mw

Thank you.

Appendix 2 - Consent form

I understand that I am being requested to participate in a research study that aims at describing factors that predispose nurses and midwives to biological occupational health hazards at Kamuzu Central Hospital. I understand that participation in the study is voluntary and that I can withdraw any time I wish to should I accept and later change my mind.

I understand that I will be required to fill a questionnaire that will take a minimum of 30 minutes. I understand that my participation will be anonymous and that data will be kept confidential. However, results that will be generalized to the whole population will be available in nursing and midwifery publications.

The study has been explained to me and I have read and understood the participant information. All my questions have been answered. However, should I require further clarification I understand that I can contact the researcher any time through the contact details provided.

I agree to participate in the study.

_____ _____

Participant's signature Date

_____ _____

Researcher's Signature Date

Thank you for participating in this study.

Appendix 3 – Research Questionnaire

Research Title: **Factors predisposing nurses and midwives to biological occupational health hazards at Kamuzu Central Hospital**

- This questionnaire contains three sections namely: demographic data, exposure to health hazards, and prevention and management of health hazards.
- Indicate your answer by ticking/writing in the appropriate box.
- Please make sure you have filled all the sections of the questionnaire.
- Make sure you answer the questions as honestly as possible.

Section A: Demographic data

1. What is your age?

2. What is your gender?

1	Male	
2	Female	

3. What is your marital status?

1	Single	
2	Married	
3	Divorced	
4	Widow/widower	
5	Separated	

4. What is your cadre?

1	Nursing Officer (BSc above)	
2	Registered nurse (University diploma)	
3	Nurse Midwife Technician	
4	Enrolled Nurse Midwife	

5. What is your highest professional qualification?

1	Master’s degree	
2	Bachelor’s degree	
3	University diploma	
4	College diploma	
5	Certificate	

6. What is your work experience (number of years practicing as a nurse/midwife)?

7. In which department are you working?

1	Maternity	
2	Gynecology	
3	Pediatrics	
4	Male/female medical ward	
5	Male/female surgical ward	
6	Theatre	
7	Casualty/OPD	
8	Other (specify)	

Section B: Exposure to biological occupational health hazards

Please tick in the appropriate box regarding exposure to occupational health hazards

Key: Never = have not been exposed, **Seldom** = exposed once every year, **Frequently** = once every month, **Always** = several times every month

	The extent of exposure to occupational health hazards	**Never 0**	**Seldom 1**	**Frequently 2**	**Always 3**
1	Exposure to sharp-related injuries (such as Needle stick injuries, cuts and wounds from sharp objects).				
2	Direct contact with contaminated specimens/bio-hazardous materials.				
3	Exposure to airborne diseases e.g Acute Respiratory Infections, pneumonia, & TB				
4	Exposure to patients with infectious diseases like measles, scabies & other skin conditions.				
5	Exposure to blood splashes from patients				
6	Exposure to body fluids e.g. saliva, vomitus from the patient				
7	Exposure to vector borne diseases e.g mosquito bites.				
8	Working in an environment with inadequate personal protective equipment, i.e gloves, aprons, face masks.				
9	Long/extended working hours				

Section C: Risk factors to exposure to biological occupational health hazards

Please indicate by ticking in the appropriate box whether the following factors predisposes you to exposure to occupational health hazards

	Do you agree or disagree with the following statements	**Yes**	**No**
Predisposing factors to exposure			
10	Your age		
11	Your gender		
12	Your work experience		
13	Your working department		
14	Workload		
15	Inadequate Personal Protective Equipment (PPE)		
16	Lack of in-service training on occupational health hazards		
17	Lack of vaccine against vaccine preventable infections		
18	Failure to report Occupational health hazards		

Section D: Preventive measures to biological health hazards

Please tick in the appropriate box the level of your agreement to the following statements:

	Do you agree or disagree with the following statements?	**Strongly disagree 0**	**Disagree 1**	**Agree 2**	**Strongly agree 3**
	Hand-washing practices				
19	I always wash hands after removing gloves				
20	I always wash hands before and after every procedure				
21	I always wash hands before and after handling each patient				
22	I always wash hands after handling biological samples				
23	We always have access to running water in our department				
24	I always use hand rub as a disinfectant				

Safety measures					
25	There are enough sharp containers in my department				
26	Sharp containers are always replaced when they are three-quarter full				
27	We do needle recapping in my department				
Sanitation of the working environment					
28	My working environment is always clean and conducive				
29	I always work in a dust free environment				
30	The toilets in my department are clean and in good working condition.				
31	There is presence of vectors like cockroaches, mites and rats in my department				

	Do you agree or disagree with the following statements	Strongly disagree 0	Disagree 1	Agree 2	Strongly agree 3
Personal Protective Equipment (PPE)					
32	I have a personal set of personal protective equipment i.e. head gear, goggles, non-disposable face mask, non-disposable apron and gumboots				
33	There is always availability of disposable gloves in my department				

Infection prevention					
34	I know the necessary measures to follow in case of blood splashes or any other body fluids				
35	I know where to find guidelines and protocols for Post Exposure Prophylaxis in my department				
36	I know the reporting procedures in case of injuries in my workplace.				
37	I always report all injuries I encounter in my workplace				
38	Most of my illnesses are related to my work				
39	Post-Exposure Prophylaxis can be accessed at any time throughout the year at this hospital.				
40	I have ever attended a training session on infection prevention at one point in time.				
41	My training as a nurse has fully prepared me to deal with health hazards in my place of work				
Working conditions					
42	There is work overload in my department				
43	I work for not more than 40 hours per week				
44	We are adequately staffed in my department				

Section E: Other preventive measures to biological health hazards

Please tick in the appropriate box

	Do you agree or disagree with the following statements	**Yes**	**No**
45	I have received three doses of Hepatitis B vaccine		
46	I went for medical check-up before being employed (pre-placement check-up)		
47	I go for periodic medical check-up annually		
48	Does the hospital have Occupational Health & Safety Policy		

Section F: Extent of treatment to some disease conditions

Please tick in the appropriate box the level of your agreement to the following statements:

To what extent have you been treated for the following disease conditions since you started working?

Key: Have had no condition = None, **Greater extent =** three times or more, **Some extent = twice**, **Lesser extent =** Once**.**

		Have had no condition 0	Greater extent 1	Some extent 2	Lesser Extent 3
49	Malaria				
50	Diarrheal Diseases				
51	Respiratory tract infections				
52	Hepatitis B				
53	Hypertension				

Thank you for taking part in this study

Appendix 4: Approval Letter

TELEPHONE NO.: (265) 01753 555/754 331
TELE FAX NO.: (265) 01 756 380

PLEASE ADDRESS ALL COMMUNICATION
THE HOSPITAL DIRECTOR
E-MAIL:KAMUZUCENTRALHOSPITAL@YAHOO.COM

Ref. No.KCH/HR/14

MINISTRY OF HEALTH
KAMUZU CENTRAL HOSPITAL
P. O. BOX 149
LILONGWE
MALAWI

10TH MARCH, 2015

TO WHOM IT MAY CONCERN

The bearer of this letter ..... has been given permission to carry out a study titled..... at Kamuzu Central Hospital having satisfied the requirements of the Hospital Research Committee.

By virtue of this letter the bearer is allowed access to patients, staff and/or medical records for purposes of his/her study.

Yours faithfully

Research Coordinator
for: **HOSPITAL DIRECTOR**

Appendix 5 – Ethical Approval Certificate

CERTIFICATE OF ETHICS APPROVAL

This is to certify that the College of Medicine Research and Ethics Committee (COMREC) has reviewed and approved a study entitled:

P.05/06/1944 – Factors that predispose nurses and midwives to biological occupational health hazards at Kamuzu Central Hospital by Owen Gangata

On 12th August 2016

As you proceed with the implementation of your study, we would like you to adhere to international ethical guidelines, national guidelines and all requirements by COMREC as indicated on the next page

Dr. C. Dzamalala- Chairperson (COMREC)

Approved by College of Medicine
12 AUG 2016
(COMREC) Research and Ethics Committee

12th August 2016
Date