RISK FACTORS FOR DEFAULTED FOLLOW UP FOR SHARP INJURY AMONG HEALTH CARE WORKERS IN HOSPITAL UNIVERSITI SAINS MALAYSIA

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BY

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LIST OF ABBREVIATIONS

A&E	Accident and Emergency
Adj. OR	Adjusted Odd Ratio
CI	Confidence Interval
df	Degrees of freedom
HBV	Hepatitis B Virus
HCV	Hepatitis C Virus
HCWs	Health Care Workers
HIV	Human Immunodeficiency Virus
HO	House officer
HUSM	Hospital Universiti Sains Malaysia
MOH	Ministry of Health
NSI	Needle Stick Injury
OR	Odds Ratio
OT	Operation Theatre
PEP	Post Exposure Prophylaxis
QA	Quality Assurance
ROC	Receiver Operating Characteristic
SD	Standard Deviation
SPSS	Statistical Package for Social Science
UKJEH	Unit Kawalan Jangkitan Epidemiologi Hospital
TB	Tuberculosis
U.S.A	United States of America
UPs	Universal Precautions
WHO	World Health Organization

LIST OF SYMBOLS

>	More than
<	Less than
=	Equal to
A	Alpha
B	Beta
%	Percentage

ABSTRAK

Faktor – faktor yang berkaitan dengan kemungkiran rawatan susulan bagi kecederaan oleh benda tajam dalam kalangan petugas kesihatan di Hospital Universiti Sains Malaysia dari Januari 2015 hingga Disember 2020

Latar belakang: Kecederaan benda tajam adalah isu kesihatan pekerjaan yang sangat ketara di kalangan petugas kesihatan (HCWs). Ia adalah salah satu bahaya berkaitan pekerjaan, terutamanya dalam persekitaran penjagaan kesihatan di klinik, hospital, dan di makmal. Di sebalik pelbagai usaha, prevalen kecederaan oleh benda tajam masih tinggi tahun demi tahun. Di Malaysia, ia dikawal oleh program Pendekatan Kualiti (QA) dengan penunjuk – penunjuk khusus. Walau bagaimanapun, ia tidak digambarkan pada prevalen kecederaan oleh benda tajam. Bilangan yang tidak melakukan pelaporan masih sangat tinggi, dan jumlah sebenar jangkitan daripada kecederaan tajam masih tidak jelas kerana jumlah mungkir rawatan susulan bagi kecederaan oleh benda tajam yang tinggi.

Objektif: Untuk mengkaji prevalen mungkir rawatan susulan bagi kecederaan oleh benda tajam dan faktor risikonya di kalangan petugas kesihatan di Hospital Universiti Sains Malaysia(HUSM).

Metodologi: Kajian ini menggunakan reka bentuk kajian kohort retrospektif menggunakan data sekunder dari Borang Insiden Kes Tercucuk Peralatan Tajam Pangkalan Data bagi tempoh enam tahun mulai Januari 2015. Data dikumpul menggunakan proforma dan kemudian dipindahkan ke Microsoft Excell. Analisis dilakukan menggunakan SPSS versi 26. Terdapat 286 kes kecederaan tajam yang

memenuhi kriteria. Semua kes telah dipilih untuk kajian. Analisis deskriptif dan kaedah regresi logistik telah digunakan. Faktor dengan nilai p-value kurang dari 0.05 akan dikira sebagai signifikan secara statistik.

Keputusan: Kebanyakan kes kecederaan tajam yang dilaporkan adalah dengan purata umur 29.4 (5.38) tahun. Lokasi kecederaan banyak berlaku di dalam wad. Jabatan yang melibatkan pembedahan merekodkan jumlah kecederaan paling tinggi. Ciri-ciri pekerjaan menunjukkan kebanyakan kes kecederaan tajam berlaku dalam kalangan doctor pelatih. Kebanyakan kecederaan berlaku adalah disebabkan oleh penggunaan jarum dan branula dan kebanyakan benda – benda tajam ini telah tercemar dengan darah atau cecair badan. Dari kajian ini juga didapati kejadian kecederaan tajam banyak berlaku ketika petugas kesihatan melakukan rawatan ke atas pesakit. Kesemua kes yang dilaporkan perlu menjalani pengurusan dan rawatan selepas insiden. Walaubagaimanapun kajian ini mendapati terdapat dua factor berkaitan kegagalan menghadiri temujanji iaitu ciri-ciri pekerjaan dan juga jenis alatan. Pekerja kesihatan yang bekerja sebagai doktor(Adj OR 2.37;95% CI: 1.40,4.03; p = 0.01) dan mereka yang menggunakan alatan tajam yang lain seperti Coupland, set drip, dan lain-lain(Adj OR 4.55;95% CI: 1.59,13.02; p = 0.005) mempunyai keberangkalian lebih tinggi untuk gagal hadir temu janji.

Kesimpulan: Kecederaan benda tajam adalah satu masalah yang masih belum dapat diselesaikan di peringkat dunia secara umum dan di peringakat negara Malaysia secara spesifiknya. Risiko kecederaan ini boleh berlaku terhadap pekerja kesihatan terutamanya di dalam kalangan mereka yang bertugas sebagai doktor dan terlibat dalam melakukan prosedur pembedahan. Selain itu mereka ini juga lebih cenderung untk tidak hadir temu janji pengurusan dan rawatan selepas kejadian kecederaan benda

tajam. Maka langkah-langkah yang lebih intensif perlu diambil untuk menangani masalah ini.

Kata Kunci: mungkir rawatan susulan, kecederaan oleh benda tajam, kecederaan jarum suntikan, pekerja kesihatan.

ABSTRACT

Risk factors for defaulted follow up for sharp injury among health care workers in Hospital Universiti Sains Malaysia from January 2015 till December 2020

Background: Sharp injury is a significant occupational health issue among health care workers (HCWs). It is one of the occupational-related hazards, especially in health care settings in clinics, hospitals, and labs. Despite the various effort, the prevalence of sharp injury remains high year by year. For Malaysia, it is being controlled by Quality Approach (QA) program with its specific indicator. However, it does not reflect on the prevalence. The number of under-reporting still very high, and the true number of infection from sharp injury remains uncertain because of the high number of defaulters for follow up.

Objectives: To study the prevalence of defaulted follow up for sharp injury and its risk factors among health care workers in Hospital Universiti Sains Malaysia(HUSM).

Methodology: The study applied a retrospective cohort study design using secondary data from *Borang Insiden Kes Tercucuk Peralatan Tajam* Database within a period of six years from January 2015. Data were collected using proforma and then transferred to Microsoft Excell. Analysis was done using SPSS version 26. There were 286 reported cases of sharp injury who fulfilled study criteria. All cases were selected for the study. Descriptive and logistic regression analyses were applied. Variables with *p*-value of less than 0.05 was judged to be statistically significant.

Results:. The mean (standard deviation (SD)) age of those who had sharp injury was 29.4 (5.38) years old. Women and Malay ethnicity predominates the cases. Mostly the

injury happened in the ward. Departments involving surgical procedure recorded the highest amount of injury. Job category pictured that most of the sharp injury cases were among house officers. Majority of the injuries were caused by needles and branula and mostly these devices were contaminated with blood and bodily fluids. From this study, we also noted that sharp injury mostly occurred when HCWs were handling the patients. All the reported cases must undergo treatment and follow up post exposure. However, from this study we found that there were two factors associated with defaulted follow up which were job category and type of devices used. HCWs who work as a doctor (Adj OR 2.37;95% CI: 1.40,4.03; $p = 0.010$) and those who used other sharp instruments such as Coupland, drip sets, and many others (Adj OR 4.55;95% CI: 1.59,13.02; $p = 0.005$) were at higher odds to default the follow up .

Conclusion: Sharp injury is an issue that remained unresolved throughout the world generally and in Malaysia specifically. The risk to get the injury can occur to HCWs especially among those working as doctors and those involve with surgical procedure. Despite that, they are also more prone to default the treatment and follow up post sharp injury. A more intensive approach must be taken to handle and tackle this problem.

Keywords: defaulted follow up, sharp injury, needle stick, health care worker.

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

1.1.1 Background on Sharp Injuries

Sharp injury was a significant occupational hazard affecting health care workers (HCWs) (Fadhli *et al.*, 2018). In Malaysia, sharp injury was defined as an injury caused by a hollow bore needle or suture needle and an injury caused by broken glass, any sharp devices, or other types of a needle as sharp injury (MOH Malaysia, 2007). HCWs were always associated with the risk of getting injured at the workplace. It was a significant occupational health issue staring at the face of each one of the HCWs globally, and HCWs in Malaysia were not excluded from this problem.

The prevalence of sharp injury among HCWs was different from one country to another, from one region to another. Certain countries had a higher prevalence compared to others, but the bottom line was that the problem remained to exist. The prevalence of sharp injury in health care settings in Ethiopia is 26.6% (Kaweti & Abegaz, 2016). In the United States of America (USA), it estimated that 384,325 HCWs sustained sharp injuries annually (Panlilio, 2004). A study in Iran showed a much higher prevalence of sharp injury among HCWs at 42.5% (Ghanei Gheshlagh *et al.*, 2018). Lee & Noor Hassim (2005) mentioned that the prevalence of sharp injury in Malaysia is 24.9%, and the highest was among doctors at 48%. Another study mentioned it was the highest among medical students (Nagandla *et al.*, 2015).

However, based on recent studies in Malaysia, the prevalence has dropped and ranges between 0.6% – 0.8% (Fadhli *et al.*, 2018; Ishak *et al.*, 2019). The top three highest prevalence are among house officers (HO) (31.8%), nurses (17.6%), and

medical officers (11.5%). The majority of the injuries occur in the ward (37.7%) and 14.9% in operating theatre (Husin *et al.*, 2018).

1.1.2 Hazards in the Health Care Facilities

HCWs faced wide range of hazards and risks while doing their job. During daily working life, HCWs were at high risk of exposure to sharp injury and splash as an occupational hazard. This was closely related to their working nature in dealing with and handling sharp devices and equipment such as needle, suture, scalpel, syringe, and many other sharps. The injury may cause transmission of bloodborne pathogen and viruses, which include Hepatitis B virus (HBV), Hepatitis C virus (HCV), and Acute Immunodeficiency Syndrome (AIDS).

Astonishingly, the number of pathogens that can be transmitted by sharp injury were more than 50 types, namely Diphtheria, Gonorrhea, Herpes, Malaria, Leptospirosis, Ebola, Tuberculosis, Syphilis, Scrub typhus, HCV, HBV, and HIV. Among those mentioned, HCV, HBV, and HIV viruses were the most commonly associated, transmitted, and dangerous for the HCWs. If sustained a sharp injury, the chances of contracting those viruses are 0.3% for HIV, 3% for HCV, and 30% for HBV (Feleke, 2013; Mf *et al.*, 2018). The estimated risk of seroconversion following a sharp injury for HIV, Hepatitis B, Hepatitis C is 0.3%, 30%, 1.8 – 3.0%, respectively (Prüss-üstün *et al.*, 2003).

It is known that Hepatitis B, Hepatitis C, and HIV were significant burden globally, with 350 million, 150 million, and 33 million patients, respectively (Feleke, 2013). Based on the report from World Health Organization (WHO), the proportion of HCWs exposed to bloodborne pathogen annually was 2.6% for HCV, 5.9% for HBV, and 0.5% for HIV worldwide, with the bigger portion was from the developing regions (Prüss-üstün *et al.*, 2003).

Sharp injury not only affects the health of HCWs but health care services as well. This was because of behavioural and occupational changes caused by anxiety, emotional stress, and distress due to the sharp injury (Feleke, 2013). According to the Occupational Health Unit, Ministry of Health (MOH), they were the major cause of injuries among Malaysian HCWs, which amount to 74.9% of all injuries. Nurses sustained the highest number of sharp injuries among the HCWs personnel (MOH Malaysia, 2007).

Apart from sharp injury, there were many other hazards and risks faced by HCWs in health care settings such as Tuberculosis (TB) infection, harmful exposure to chemicals and drugs, chlorhexidine allergy, nosocomial infection, asthma, latex allergy, accident, fall, and many others. However, among all, sharp injury was one of the most important as it affected generally all HCWs in health care setting. This was due to the fact that almost all HCWs had the risk to sustain sharp injury. TB for example, only those who attended and manage TB patient were at risk to get TB infection. As long as health care is offered to individuals with active TB, the risk of nosocomial TB will exist. However, the percentage of HCWs with nosocomial TB infection was relatively low as reported by one study (Krüüner *et al.*, 2001).

Other hazards also not as sinister as sustaining sharp injury injury. The goal of completely eliminating risk among HCWs was unattainable. The goal was to limit this risk to the smallest amount possible. To further limit the risk of blood borne infection among HCWs in health care institutions, a mix of administrative, engineering, and personal control measures must be used. Despite the fact that it was possible to prevent or decrease HCWs' exposure to these hazards, injuries and illnesses continue to occur in the health care settings. Healthcare employees have the greatest rate of nonfatal occupational injury and disease of any industry sector.

This demonstrated the significance of conducting research into sharp injury, particularly to address the problem among defaulters. The ultimate goal is to limit the number of sharp injury occurrences as well as the number of follow up defaulters (Delclos *et al.*, 2007; Wicker *et al.*, 2008; Wittczak *et al.*, 2013; Hefzy *et al.*, 2016; Tudor *et al.*, 2016).

1.1.3 Sharp Injury and Its Implications

An incident of sharp injury among HCWs requires them to have a series of follow up. This was to ensure that they were being monitored for any health issues after the incident. However, it was found that the prevalence of defaulted follow up for sharp injury among HCWs was quite high. Globally, the prevalence of defaulted follow up for sharp injury ranged from 28% to 53% (Miceli *et al.*, 2005; Fadhli *et al.*, 2018). Schmid *et al.* (2007) did a study in Germany, and it was found that the prevalence was quite high, at 35%. It was even higher in Brazil, in which 46% of defaulters were reported (Escudero *et al.*, 2015). A study in Argentina reported a prevalence of 53%, which was higher than that reported in Brazil (Miceli *et al.*, 2005). If we look closer to Malaysia, neighbouring Brunei did a very recent study and reported a prevalence of 36%, which is higher than the prevalence in Malaysia (Win *et al.*, 2020).

Sharp injury can cause HCWs to suffer from anxiety, depression, morbidity, and the health system suffers from reduced income, hospital costs, and lawsuits as a result of such injuries. Healthcare staff in Japan recorded 40 - 50 new HCV cases per year as a result of work - related injuries. Despite the existence of an international sharp reporting system, and widely used in Japan, the sharp injury reporting rate in Japan remains low, estimated at less than 20.7% (Kunishima *et al.*, 2019). In the USA, approximate 600,000–800,000 injuries occur each year, resulting in a significant number of HCWs contracting a severe bloodborne viral infection. HCWs continue to

face a major occupational risk of NSI. The fear and risk of HCV, HBV, and HIV infection were important, and the emotional effect of sharp injury can last a long time. The annual cost burden in the USA was projected to be between $118 million and $591 million (Kunishima *et al.*, 2019). Based on a study in the USA, 110 nurses have had at least one sharp injury, with 73 punctures drawing blood. These sharp injury gross short - term costs were estimated to be between $25 896 and $36 066. Indirect costs made up 44% - 62 % of the overall budget in USA. The average short term cost per sharp injury was $145 to $201, and the average short - term cost per injured nurse was $235 to $328.

For damages in the immediate aftermath of a sharp injury, a national expense of $65 million has been estimated (W. C. Lee *et al.*, 2005). Based on a study in British, the annual cost of treating these sharp injuries are almost £600,000. However, owing to under - reporting and cautious assumptions about the cost of injury management, this was thought to be a substantial underestimate (Trueman *et al.*, 2008). In Japan, based on an average cost per sharp injury of 63,711 yen (US$577) and a number of sharp injuries of 525,000 per year, the national cost burden of sharp injury in hospital is projected to be 33.4 billion yen (US$302 million) per year. Initial laboratory tests account for 70% of the total cost, followed by efficiency loss, which accounts for 20% of the total cost. The cost of a contaminated sharp injury was only 5% of the overall cost. Changes in the number of sharp injuries had an important impact on the outcomes.

1.1.4 The Burden of Sharp Injury Among HCWs in Malaysia

In Malaysia, there were 1231 sharp injury cases notified to the Occupational Health Unit, MOH from January 2010 till January 2011. Subsequently, 1405 cases of sharp injuries were notified from January 2011 till January 2012. It is an increment of 174

cases from the previous year. Selangor, Perak, and Johor were the top three states that recorded the highest number of cases for two years running, with Selangor were the champion of both (215,228).

According to the Sharp Injury Surveillance Database, there was an incrementing number of cases from 2016 to 2017, which was 1587 and 1655 cases, respectively (MOH, 2011). From here, we can conclude that from 2010 till 2017, there had been a steady rise of sharp injury cases throughout Malaysia (Fadhli *et al.*, 2018). Females HCWs who were injured was 67.7%, higher compared to males. Incidence of sharp injury reduced in older age, with the biggest number of cases was in the region of aged 20 - 29 years, which were 1006 cases (71.6%). The next age group is 30 - 39 years, with 237 cases (16.9%). Here we can conclude that majority of HCWs who got injured were below 30 years old.

Normally HCWs in Malaysia started working at an average of 25 years old. So those who had working experience of <5 years were more prone to get injured. Most of the cases occurred in the ward, 763 cases (54.3%), followed by in the operating theatre, 155 cases (11%). Among job categories, HOs scored the highest number of cases, 445 cases (31.7%), followed by staff nurses with 245 cases (17.4%). Surprisingly, the most number of cases occurred during injection regardless of intravenous, intramuscular, or subcutaneous, with 301 cases (21.4%). Next was drawing venous blood sample with 242 cases (17.2%). One thousand ninety-seven cases (78.1%) were due to needle alone.

1.1.5 Determinants of Sharp Injury Occurrences

In any medical context, needlestick injury (NSI) was one of the most dangerous professional risks. It can spread deadly infectious diseases and viruses like HBV, HCV, and the HIV. Every year, approximately 3 million HCWs are exposed to

bloodborne pathogens. In nearly all occupationally acquired illnesses, blood had been indicated as the source of exposure.

Exposures occur when a needle was contaminated with an infected patient's blood or when the patient's blood comes into contact with the eye, nose, or mouth (Kebede & Gerensea, 2018). Every year, HCWs in Japan report 40 - 50 new HCV cases as a result of work - related injuries. The danger of NSI in the workplace has an impact on not just the quality of care provided but also the safety and well - being of care workers. HCWs working in operating rooms, delivery rooms, and emergency rooms, as well as in laboratories, were at a higher risk of exposure. Similarly, cleaners, garbage handlers, and other personnel who come into contact with blood - contaminated objects were at a higher risk of contracting NSI (Amira & Awobusuyi, 2014).

The yearly financial burden due to the injuries was projected to be between $118 million and $591 million in the USA, and £500,000 (US$919,117.65) per the National Health Service in the United Kingdom. One of the most serious dangers that HCWs encounter was NSI. Nonetheless, these risks were frequently accepted as part of the profession. It was founded on the belief that companies must take worker health and safety into account when designing work procedures and supplying appropriate equipment, such as safer needle devices, finger shields, and sharps bins (Kunishima *et al.*, 2019). We need to understand the current situation, aiming towards an NSI free work environment for HCWs in this country.

1.1.6 Quality Assurance (QA) Programme and National Indicator Approach

Globally, many countries, if not all, had developed and adopted policies on reducing the prevalence of sharp injury. Each country had its own system to cater to its magnitude of problems. To show the importance of this problem, many countries had

put up the prevalence of sharp injury as one of the QA Indicators to promote and ensure HCWs in a health care setting practice safely.

As far as Malaysia is concerned, National Indicator Approach was zero incidences of a new case. These indicators were important because it indirectly enables us to evaluate the policy's effectiveness, ultimately bringing down the prevalence, risk of bloodborne transmission, and seroconversion risk. According to the QA Manual (2002), NSI was still prevalent today, indicating that HCWs were not following Universal Precautions (UPs). According to a similar study by Lee and Noor Hassim (2005), the main reason Malaysian HCWs did not achieve the QA Indicator was inadequate UPs practice despite having appropriate knowledge.

In 1987, the Centre for Disease Control and Prevention suggested that HCWs wear UPs to limit the spread of bloodborne diseases. When collecting blood or body fluid from patients and handling specimens, gloves, goggles, and other protective clothes were required. According to Thakur *et al.* (2015), nearly three - quarters of the sharp injury exposure could have been prevented if the workers followed the UPs protocol. To avoid HCWs from being exposed to bloodborne pathogens and being infected, raise awareness and increase compliance with UPs guidelines was important.

1.1.7 Post Exposure Management for Sharp Injury Among HCWs

Sharp tools were particularly dangerous to HCWs such as doctors, nurses, physicians, paramedics, and laboratory technicians while on the job. Even a slight cut created by a sharp instrument that results in little blood loss can result in the transmission of over 20 diseases. HBV, HCV, HIV, and other bloodborne infections such as malaria, syphilis, TB, brucellosis, herpes virus, and diphtheria are the most frequent and dangerous. Each year, two million injuries are predicted to induce 66,000 HBV, 16,000 HCV, and 1,000 HIV infections among 35 million HCWs.

Long term disease, disability, death, high treatment cost, and legal consequences were among the terrible effects of these bloodborne illnesses. Such negative repercussions harm the healthcare system by affecting its personnel at a time when many countries are reporting shortages of healthcare employees. In addition to the stress placed on this profession, occupational exposure to sharp devices may result in additional issues, such as discrimination against HIV - infected patients who are afraid of contracting the virus. This showed that sharp injury had many effects and consequences. Sharp instrument exposure and its repercussions can be greatly reduced with simple interventions such as vaccination, post exposure prophylaxis (PEP), education, and the provision of sharp instrument containers (Merchant & Keshavarz, 2003; Varghese *et al.*, 2003; Goniewicz *et al.*, 2012; Chakravarthy *et al.*, 2015).

Post exposure management of the sharp injury was important for HCWs. Within 24 hours after injury, those sustained sharp injury will be given intramuscular tetanus toxoid together with confidential counselling regarding the injury and post exposure management. The HCWs will be given follow up appointment, and there was a slight difference from the guideline used by MOH and Hospital Universiti Sains Malaysia (HUSM). For MOH, HCWs will only be given three TCAs at one week, three months, and lastly, six months after injury where as HUSM give four TCAs at one week, six weeks, three months, and lastly, six months post injury. Those at high risk of getting a bloodborne infection will be given PEP after a proper risk assessment by a specialist.

Proper treatment was necessary to prevent sharp injury and its consequences, including HIV and HBV PEP, HBV vaccination for HCWs, knowledge, insight, awareness, and the provision of sharp bins (Prüss-üstün *et al.*, 2003). Sharp injuries are preventable as everyone must take care of their health and not others, as mentioned under the Occupational Safety and Health Act 1994 (MOH Malaysia, 2007).

1.2 Rationale of Study

Sharp injury is a major occupational hazard with a sinister complication of bloodborne infection. Furthermore, it is a preventable condition with the final aim for the incidence reduction and elimination of the occurrence. Despite QA with its indicator and National Indicator Approach, prevalence still high and not showing any sign of marked reduction. A high number of cases will create a burden for many parties from many angles and aspects.

HCWs who sustained the injury will have some sort of stress, and this will affect the quality of work, which might increase the chance of another sharp injury occurrence. If the HCWs contracted the bloodborne infection from sharp injury, the staff need to be started on treatment which will increase the financial burden to the country. HCWs with an infection will become prone to medical leave, and this will reduce the manpower source. This will decrease the quality of the workplace. Sharp injury can have a profound impact on human capital, healthcare organisations, and the entire system. Hence, it is important to find the risk factors contributing to this incident so that the goal to eliminate the sharp injury among HWCs will come true.

To achieve the goal, we need to know in and out regarding the problems. We must have updated knowledge on what are the features and factors of sharp injury occurrences and the associated factors why a huge number of HCW defaulted to the follow up post injury. However, until today, we have limited data available even at the national level to accurately describe the epidemiological features of sharp injury in Malaysia.

On top of that, there are very limited studies published both locally and globally related to the issue of risk factors of defaulted follow up for sharp injury. This is very alarming because apart from making notification for sharp injury incident, HCWs must

adhere to follow up to prevent any spread of infection if HCWs happened to be infected. We absolutely want to prevent HCWs from spreading infection while treating the patient.

As a result, the proposed research would considerably update the epidemiological description of sharp injury among HCWs and identify risk factors for defaulted sharp injury follow up, which can be employed in future interventional studies. The outcomes of this study could help stakeholders establish effective prevention initiatives and researchers establish appropriate research procedures in the future.

1.3 Research Questions, Hypothesis, and Objectives

1.3.1 Research Questions

1. What is the prevalence of defaulted follow up for sharp injury among HCWs in HUSM?

2. What are the associated factors for defaulted follow up for sharp injury among HCWs in HUSM?

1.3.2 Research Hypothesis

There are significant associations between sociodemographic (age and gender), nature of injury (type of device, device contamination, and procedure conducted), job related factors (location of event, department, and job category), source status, and defaulted follow for sharp injury among HCWs in HUSM.

1.3.3 General Objective

To study the prevalence of defaulted follow up for sharp injury and its associated factors among HCWs in HUSM.

1.3.4 Specific Objectives

1. To determine the prevalence of defaulted follow up for sharp injury among HCWs in HUSM.

2. To determine associations between sociodemographic (age and gender), nature of injury (type of device, device contamination, and procedure conducted), job related factors (location of event, department and job category), source status and defaulted follow for sharp injury among HCWs in HUSM.

CHAPTER 2

LITERATURE REVIEW

There were few factors related to the prevalence of sharp injury. They can be categorised into sociodemographic factors, job related factors, nature of the injury, and source factor

2.1 The Proportion of Defaulted Follow Up to Sharp Injury Post Exposure Management

In the workplace, healthcare personnel were continuously in danger, the most serious of which was inadvertent exposure to potentially infected blood and other fluids. HBV, HCV, and HIV were all infections that can be transferred and pose serious health risks to HCWs. It was critical that HCWs have follow up evaluations following unintentional, occupational contact to blood and body fluids to diagnose and early treatment of an acute infection, especially in situations of HCV positive seroconversion. In situations of bloodborne pathogen exposure, the success of post exposure treatment has been shown to correlate positively with the completeness of follow up.

HCWs compliance with post exposure management and treatment follow up, on the other hand, was lower than expected. As a result, a more in-depth examination of the variables causing HCWs non - compliance with follow up became necessary. Many HCWs did not complete the post exposure follow up despite being contacted by phone and official mail, a conclusion supported by a few studies (Escudero *et al.*, 2015). The percentage of HCWs who completed post exposure follow up dropped as time passed after the accident. However, the pattern of sharps injury cases and follow up practises indicated an improved tendency. According to a Brunei study, this could be attributed

to the Occupational Health Doctors expanded targeted awareness efforts for healthcare staff, which were undertaken on a regular basis. However, when compared to Malaysia, this outcome was shown to be lower (Win *et al.*, 2020). The rate of defaulted follow up in Malaysia was 28%, and the global prevalence of defaulted follow up for sharp injury range from 28% to 53% (Miceli *et al.*, 2005; Fadhli *et al.*, 2018).

2.2 Risk Factors for Sharp Injury Among HCWs

2.2.1 Sociodemographic Factors

Sociodemographic factors include age distribution, gender difference, and different ethnicity.

2.2.1.1 Age Distribution

Based on a study by Lee L. K. and Noor Hassim (2005) mean age of sharp injury incidents was 31.73 years old. As reported by MOH Annual Report (2011), data from Sharp Injury Surveillance showed that the majority of the incidents among HCWs occurred among age group 20 - 29 years old (71.6%), followed by between 30 - 39 years old (16.9%), age group of 40 - 49 years old (5.4%), above 50 years old (3.9%), and the lowest number of cases occurred among below 20 years old. Based on the statistic above, it showed that the sharp injury incidents decrease with age.

Kebede and Gerensea (2018) stated a similar outcome that the majority of incidents occurred in the age group of 20 - 29 years old (67.9%). Another study also supported the finding that the majority of injury were among the age group of 20 - 29 years old (Dilie *et al.*, 2017). According to Cheng *et al.* (2012), 25.7% of sharp injury cases occurred among those below 31years old, 24.3% between 31 to 40 years old, 29.4% in the age group between 41 to 50 years old, and 20.6% of incidents among those above 50 years old.

The number of sharp injury cases is well distributed among all age group, and no definite age group was contributing to the occurrence of sharp injury. A study in Malaysia also mentioned similar result with the majority of cases occurred among the age group of 25 - 29 years old, 30 - 34 years old (18.2%), ≥35 years old (7.7%), and the rest (22.4%) were among those <25 years old (Fadhli *et al.*, 2018).

2.2.1.2 Gender

Males participate in more injury-risk activities than females, according to findings and studies. Many theories had been proposed to explain gender differences in risk-taking behaviour, including the idea that boys were more impulsive, have higher activity levels, and are less likely to seek help than girls. Based on Afridi *et al.* (2013), the prevalence of sharp injury in Pakistan was around 64%, with the majority of the injuries occur among female HCWs, which were 319 of them (64.2%) and 178 (35.8%) male HCWs sustained the injury too.

A meta-analysis study by Ghanei Gheshlagh *et al.* (2018) stated that the prevalence of sharp injury was more common in females compared to male (47% vs 42%) and 58.5%. A study in Malaysia mentioned that 76% of the cases which were the majority, were among female (Fadhli *et al.*, 2018). However, another study conducted by Cheng *et al.* (2012) found that 74.6% of cases were male. A study had a similar conclusion with the majority of incidents were among male HCWs (54.9%) (AOR = 10; 95% CI 1.5,16) than female. There was another similar study done in Nigeria reported that male HCWs were more likely to get more sharp injury than female counterpart (OR = 1.99; 95% CI: 1.06,3.72). This may be because females are more cautious than males when it comes to safety precautions (Dilie *et al.*, 2017).

2.2.1.3 Ethnicity

In Malaysian culture, the race was a basic organising concept. It was still used in the post - colonial imagination of the country and its identity. A person's race as a "Malay," "Chinese," "Indian," or "Other" (MCIO) is defined at/by birth, printed on the birth certificate, and, starting at the age of 12, on the national identity card, and cannot be changed (Gabriel, 2015). Malaysian society formed by multi-racial component consists of three major ethnics which were Malay, Chinese, and Indian and few other small ethnic groups (Nakamura, 2012). Malays (58%) were the most common ethnic group, followed by Chinese (24%), and Indians (8%), with a minority of "others" (10%) including foreigners, Sabahans, and Sarawakians (Murty *et al.*, 2008). As mentioned by Lee L. K. and Noor Hassim (2005), the majority of sharp injury were among Malay, followed by Chinese and Indian. Another study in Malaysia by Ismail and Rampal (2009) mentioned that majority of cases were among Malays.

2.2.2 Job Related Factors

Job related factors include the location of the event, department, and job category.

2.2.2.1 Location of Event

Different locations had different job scope and nature. The number of sharp injury incidents also will vary. Location of occurrences that contributed to the biggest proportion of sharp injury was in the ward (54.3%), followed by operating theatre (OT)(11.0%), and lastly, Accident and Emergency Department (A&E) (10.0%) (MOH Annual Report, 2011). According to a study done by Rais and Jamil (2013), the majority number of sharp injury happened in inpatient room/ward, 15% of sharp injury occurred at A&E, Intensive Care Unit reported 9.1% cases, and 33.8% cases reported in OT. A similar study done back in 2010 reported a similar result, with the majority of sharp injury cases happened in the ward (42.5%).

2.2.2.2 Department

Type of patient, type of disease, and job burden were different from one department to another. These were among other factors that can influence the occurrence of the sharp injury from happening or not. Some department workloads were lesser than others, some were more hectic than others, and some deal with the sharp object more often than other departments. A study by Afridi *et al.* (2013) mentioned that the most cases occurred in the medical department, with 308 cases (62%) and the remaining 189 cases (38%) occurred in the surgical department. A study done in Ethiopia reported that the majority of sharp injury occurred in the medical based department which were A&E (15.4%), medical department (15.4%), and paediatric department (17.1%). Meanwhile, the surgical based department is a little bit lower with the surgical department (21.1%), O&G (5.7%), and OT (12.2%) (Kebede & Gerensea, 2018).

2.2.2.3 Job Category

According to the report by MOH Annual Report (2011), the number of incidents differs between different job categories. HO sustained a sharp injury, the highest with 31.7%, while a nurse with 17.4% of injury and 10.7% occurred among support staff. A similar result reported in a study by Rais and Jamil (2013) majority of sharp injury occurred among doctors (87.5%). Sharp injury among HCWs who were non - doctor was more frequent, with 262 cases (52.7%) and 235 cases (47.3%) among doctors. A similar study by Amira and Awobusuyi (2014) mentioned that majority of injuries occurred among non - doctor (70.7%) with among doctor were only 29.3% and 11.1% of doctors sustained a sharp injury (Schmid *et al.*, 2007).

2.2.3 Nature of Injury

Nature of injury includes the type of device, device contamination, and procedure conducted.

2.2.3.1 Type of Device

All type of sharp injury devices had the potential to cause sharp injury. Any sharp injury objects in health care facilities can cause sharp injury, for example, all types of needles, scalpels, trochar, broken glass, and other sharp devices (MOH Malaysia, 2007). However, different type of devices pose a different kind of danger depends on the features. Their specific features make a certain device more dangerous compared to others. For example, needle, difficulty in drawing blood from a complicated patient, manipulation during drawing blood, and an act of recapping after procedure make it more dangerous compared to others.

The design of the devices used in health care facilities can put HCWs at specific risk to get a sharp injury (De Lima *et al.*, 2015). The most serious risk of seroconversion for injured staff was a sharp injury with a hollow - bore needle (Shiao *et al.*, 2002). Kebede and Gerensea (2018) mentioned that 57.7% of sharp injury caused by hollow bore needle while 28.5% caused by suturing needle. As reported by MOH Annual Report (2011), most sharp injury incidents involved injury due to needle (78.1%) and followed by surgical instruments (20.8%). Needle associated injury normally occurred in the ward setting, whereas surgical instruments occurred during the operating procedure. Another study in Ethiopia also mentioned that majority of cases caused by needle (77.8%) while surgical equipment (16.6%) (Dilie *et al.*, 2017). Hollow - bore syringe needles caused 29.7% of all NSIs, suture needles caused 24.0 %, scalpel blades caused 15.7%, and glass products caused 13.3%. These devices accounted for 22.8 %, 19.1%, 12.1%, and 10.2 %, respectively, of all sharp injury (Smith, Wei, *et al.*, 2006).

2.2.3.2 Device Contamination

Sharp injury and NSI were endemic and hyperendemic in certain parts of the world, for example, Taiwan. The medical management of a sharp injury was calculated by assessing the likelihood of seroconversion among the personnel based on the source available patient's information, the type of item or device used, and the seriousness of the injury. HBV seroprevalence in Asian populations was recently estimated to be between 15% and 21%, and HCV seroprevalence in the general population was estimated to be 2.5%. As a consequence, the risk of seroconversion in an HCWs from a bloodborne disease - infected device was high.

A sharp injury with a hollow - bore needle was considered to pose the greatest risk of seroconversion to injured workers. The prevalence of the three most prevalent bloodborne diseases namely HBV, HCV, and HIV in hospitalised patients was unknown, but it was assumed to be higher than in the general population. The devices are reported to have been used on a patient in 66.7% (95% CI: 0.65,0.68) of the injuries (Shiao *et al.*, 2002).

Based on a study in China, half of the total number of sharp injury (50.3%) caused by instruments that had been used on a patient which were definitely contaminated. These sharp injury instruments were more likely to have been contaminated prior to the sharp injury incident (Smith, Wei, *et al.*, 2006). Another study done in Korea showed a higher prevalence of sharp injury caused by used instruments prior to incidents and contaminated (Smith, Choe, *et al.*, 2006). According to a study in Malaysia, out of 143 sharp injury cases, 141cases involving contaminated devices (98.6%) (Fadhli *et al.*, 2018).

2.2.3.3 Procedure Conducted

Different type of procedures will have different risk in term of causing sharp injury incidents. The largest proportion of incidents of sharp injury occurred during injection (18.4%), followed by drawing venous blood (17.2%), collecting clinical waste which were non - medical procedure (14.2%), and 13.2% while doing the surgical procedure in the operating field for example cutting and suturing (MOH Annual Report, 2011). Based on a study, 383 cases (77.1%) occurred while handling patient, whereas 182 cases happened while handling the equipment (Afridi *et al.*, 2013). A study by Amira and Awobusuyi (2014) mentioned that the most common activity leading to sharp injury was while handling equipment which was recapping needle (45%), followed by disposal related (30%), and lastly 25% occurred while handling patient who was on iv cannulation.

2.2.4 Source Factors

Source factor that was discussed was contamination source.

2.2.4.1 Contamination Source

For any sharp injury cases, the source of contamination from the contaminated device was important to be known so that the patient can be traced and blood investigation can be taken to rule out any possibilities of bloodborne infection and if there was any a prompt treatment can be initiated for better prognosis. According to Amira and Awobusuyi (2014), the majority of patient viral status for sharp injury were known (80%). Among them were patient with HBV positive (7%), HIV positive (5%), and the rest of the known source were tested negative from HBV, HCV, and HIV infection (68%). Consistent with a study from Memish *et al.* (2013), out of 477 cases of sharp injury, 73.2% of source identification were known.

2.3 Post Exposure Management of Sharp Injury

Sharp injuries in the healthcare industry were a global occupational health problem. Following a sharp injury among HCWs, more than 25 bloodborne viruses have been identified, including the HIV, HCV, and HBV. Training on safe injection procedures and proper use and disposal of sharps, also known as "universal or regular precautions," safety - engineered devices that include replacing "conventional" needles with safety needles and introducing containers for safe disposal of used needles can all help to avoid sharp injury. Injuries from needlesticks were well known occupational hazard for healthcare employees.

In 1984, the first case of occupationally acquired HIV infection were identified, highlighting the risk of HIV and hepatitis among HCWs. Occupational Safety and Health Administration had worked hard over the last decade to reduce the risk of NSIs. Despite uniform safeguards and work practise controls, accidents nevertheless occurred at a high rate, and multiple studies revealed that healthcare personnel did not follow safety precautions and did not have access to safety equipment. For HIV, HBV, and HCV, the risk of disease transmission through NSI varies.

The risk of a NSI from a contaminated source patient was difficult to quantify and poorly researched. Researchers have often used the disease's seroprevalence rate in the patient population as a proxy for the likelihood of a NSIs from an infected source patient while designing probability models for disease transmission. HCWs were at risk to be infected with HIV, HBV, and HCV after any incident of sharp injury. Deep injury, injury with a devices clearly contaminated with the source patient's blood, a procedure involving a needle inserted in the source patient's artery or vein, and proximity to a source patient who died of AIDS in the two months following the occupational exposure were all factors that raised the risk of HIV seroconversion after

a needlestick and sharps injury involving HIV - infected blood (J. M. Lee *et al.*, 2005; Tarigan *et al.*, 2015)

2.3.1 Factors Associated with Defaulted Follow Up for sharp Injury Management Among HCWs

Default was a significant, costly, and intractable problem in health care that can result in suffering and injury. To begin, we must first comprehend the meanings and causes of default. The degree to which patients obey medical advice and the patient's ability to stick to a treatment plan prescribed by a doctor was commonly referred to as compliance. On the other side of the coin, it was called noncompliance or default. Although it was often applied to the taking of medications, it did not have to be. It may also be applied to the following of any health advice (Barber, 2002). Default occurs on various levels and manifests itself in a variety of ways. It was not all about drugs, though it was the most widely studied aspect of it. In reality, default rates were high because patients did not see compliance as a problem. (Donovan & Blake, 1992).

Since the default was one of the most common causes of treatment failure, physicians must be able to consistently differentiate between non - adherence and non - response. As a result, awareness of the variables that influence optimum care usage and decrease default was critical. Various reasons for non - adherence that were highlighted in various studies, including age, gender, ethnicity, job category, location of injury occur, department, type of device, device contamination, a procedure conducted, and contamination source. The rate of HCWs adherence to post exposure follow up, on the other hand, was lower than predicted. As a consequence, a more comprehensive assessment of the variables causing HCWs to defaulter with follow up became relevant (Escudero *et al.*, 2015).

There were many studies regarding factor associated with sharp injury, but not many researches had been done regarding factors associated with defaulted follow up among HCWs both globally and locally. There were few local studies regarding sharp injury touched upon the factors associated with defaulted follow up. Once a HCW sustained a sharp injury, the post exposure management starts right away after the injury, which was within 24 hour post exposure. Then for HUSM, four follow ups will be given at one week, six weeks, three months, and lastly, six months post injury. Based on the data, observation, and simple analysis, it shows that there was no specific time where HCWs will default the follow up, which means that HCWs tend to default at any given point in time.

The reasons for choosing to default at that particular time open for study in the future. The factors associated with defaulted follow up were discussed in this study and can be divided into two which were patient factors and health system factors. Still, there are many HCWs with sharp injury defaulted the follow up, and this directly brings down the compliance rate for PEP which could lead to many unwanted occurrences such as bloodborne infection.

2.3.1.1 Patient Factor

Patient centred factors were basic demographic factors, and the factors identified to be inside of this group included age, gender, ethnicity, and job category (Lin *et al.*, 2008). Evidence regarding the relationship between demographic factors such as race/ethnicity, gender, and age were largely inconsistent (Stryker *et al.*, 2010).

a) Age

Age factor was one of the most often encountered factor in the literature regarding non - compliance, poor compliance, and defaulter. However, the results often vary from one article to another. Certain literature mentioned that age was a risk

factor for defaulter, where some said that age was not a factor causing defaulter for treatment or follow up. This factor was mentioned in over thirty articles that were found. While the majority of studies found a connection between age and compliance, a few researchers found that age was not a factor in non - compliance (Lin *et al.*, 2008).

El-muttalut and Khidirelnimeiri (2017) mentioned that age was found to be substantially correlated with non - compliance with care after controlling for the other study variables. The default rate was found to be higher in patients aged 40 and higher. The majority of the defaulters were adults between the ages of 35 years old and 60 years old. Castelnuovo (2010) mentioned that being more than 25 years old are more likely to default. Agarwal *et al.* (1998) mentioned that those aged below 30 years old are more likely to default to the treatment. Semvua *et al.* (2017) reported that defaulted was associated with the younger age group (AOR = 0.54; 95% CI: 0.36,0.80). A study mentioned that being younger than the age of 24 years old was significantly associated with defaulted (OR = 5.1; 95% CI: 1.3,24.5) (Tesfahuneygn *et al.*, 2015). Agarwal *et al.* (1998) mentioned that age was a significantly associated factor for defaulter with a *p* - value of 0.02, and Krasniqi *et al.* (2017) reported those who are age between 36 - 45 years old were statistically associated with defaulter with a *p* - value of 0.018.

Quite a number of studies also reported that age was not a risk factor for the defaulter. Age was not a significant factor associated with non - adherence to treatment and follow up (AOR = 1.22; 95% CI: 0.70,2.04) (Demoz *et al.*, 2020). Age was not significantly and positively associated with defaulter (Naing *et al.*, 2001; Riaz *et al.*, 2014; Ibrahim *et al.*, 2015; Lulebo *et al.*, 2015). Some studies reported a *p* - value not significant for defaulter with a *p* - value of 0.845 according to Riaz *et al.* (2014), a *p* - value of 0.137 based on Fagundez *et al.* (2016), and another one by Tang *et al.* (2015) was *p* - value > 0.05. Xu *et al.* (2009) and Kulkarni *et al.* (2013) reported that age was