A master thesis about

Needle-Stick Injuries among Healthcare Workers in King Abdul-Aziz University Hospital (Jeddah, Saudi Arabia)

An Empirical Investigation Of Causes And Management Practice

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HAW HAMBURG

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List of Abbreviations

Abbreviation	The full expression
WHO	World Health Organization
HIV	Human Immunodeficiency Virus
NSI	Needle Stick Injury
AIDS	Acquired Immune Deficiency Syndrome
CDC	Centre for Disease Control and Prevention
NIOSH	National Institute of Occupational Safety and Health
IV	Intravenous
HCV	Hepatitis C Virus
HBV	Hepatitis B Virus
SED	Safety Engineered Devices
HBIG	Hepatitis B Immunoglobulin
EPINET	Exposure Prevention Information Network
HCW	Health Care Worker
PIs	Percutaneous Injuries
KAMC	King Abdul-Aziz Medical City – Riyadh
ACS	American College of Surgeons
SPSS	Statistical Package for the Social Science
PEP	Post Exposure Prophylaxis

Abstract

Despite the technological advances and high awareness within the health sectors, health workers are still subject to needle stick injuries while performing their care duties. The serious issues relevant to unreported occupational exposure, where around 40-70% of the injuries are not reported. NSI has the potential to transmit transient or persistent pathogen from the blood source bodies to health workers bodies. Bloodborne pathogen such as hepatitis B virus (HBV), hepatitis C virus (HCV), and Human Immunodeficiency Virus (HIV) induce a serious threat on lives and account for the increasing / declining / current morbidity and mortality.

Centre for Disease Control and Prevention (CDC) stated that unreported sharps-related injuries in United States exceeded the half of all injuries. In the context of Saudi Arabia, there are few numbers of studies addressing the prevalence of the NSIs injuries.

The past studies are not adequate to cover all aspect of the NSIs among health workers, therefore, the current study mainly aims to address the frequency rate of needle stick injuries among health worker in the Abdul-Aziz University Hospital. The research also assesses the distribution of the NSI by gender, age, training, location and employing health department. Furthermore, research intends to discover that health worker practices contribute to NSI and the related safety practice after the injuries occurs.

***Keywords**:* NSI Saudi, NSI among health workers, King Abdul-Aziz University Hospital, Healthcare workers.

Chapter 1: Introduction

1.1 Background

Work place safety is one of the key aspects of occupational health practice and standards, Health care facilities are the work places delivering and getting care, these facilities hire more than 59 million workers who are exposed to various threatening hazards every working day such as biological hazards, physical hazards, psychological hazards and so forth (WHO, 2018). Needle stick injury (NSI) is one of the common injuries occurs in the health working facilities and among health workers, who have direct contact with patients' blood and their bodily fluids during care providing practices (Isara, Oguzie & Okpogoro, 2015).

Needle stick injuries are / are not classified as a serious occupational health risk that threaten the health workers (Marjadi, Nguyen, Hoppet & McLaws, 2017). However, the needle stick injuries considered as common transmitter or conveyor of biological hazards such as bloodborne pathogens like Hepatitis B and C and Human Immunodeficiency Virus (HIV), which are real threats to the healthcare providers' works (Amini, Behzadnia, Saboori, Bahadori & Ravangard, 2015). Khraisat, Juni, Abd Rahman & Said (2014) mentioned that the needle stick injuries expose the health worker's health to more than 30 possible known serious blood-borne pathogens. According to the WHO reports, the needle stick injuries

contributed 7.6% of Hepatitis B, 39% of Hepatitis C and 4.4% of HIV/AIDS in health care workers' infection in the whole world (2018).

In Context of Saudi Labour law, employer obliged to protect employee from any causes of occupational diseases or injuries, and ensuring healthy work environments, the law constitutes health and safety procedures where employers must adhere to it. Corresponding to such practice, the law also constitutes health and safety procedures where workers must adhere to it (Ahmad, Balkhyour, Abokhashabah, Ismail & Rehan, 2017).

Based on the aforementioned, NSI expose health workers to diverse live threatening hazards, these issues cause ethical and legal problems for employers, therefore employers, ~~are~~ in an effort to satisfy and comply the health and safety regulations, ensures acquiring all patient information that reflects their health status in real and with their consent. This patient information is significant for health workers for taking precautional procedures that must be taken on a regular basis.

1.2 Problem Statement

Despite the technological advances and high awareness in the health sectors, the health workers are still subject to needle stick injuries while performing their care duties. The prevalence of NSIs registered in Egypt is 66.2% (per participants professional life), in Germany 31.4% (in the last 12 months), in Pakistan 45% (in period of two months), in Turkey 45% (per participant professional life), and in Australia 51% (per six year retrospective study) (Amini, Behzadnia, Saboori, Bahadori & Ravangard, 2015). Furthermore, the Exposure Prevention Information Network - EPINet Report (2016) emphasized that the NSI rates among health workers in United states is 33.7%, and found that doctor (intern/resident/fellow) specialities are the higher exposure percentage of NSIs during the work at

around 17.8%, followed by doctor (attending staff) specialty and Surgery attendant (International Safety Center, 2016). In Saudi Arabia, Hashmi, Al Reesh & Indah (2012) study found that the 93.6% of health workers sharp injuries reported in six months are caused by needles, While Khabour, Al Ali & Mahallawi, (2018) found that 24% of clinical workers experienced NSIs during performing their duties. Such percentages sound unacceptable high percentages.

The serious issues relevant to unreported occupational exposure, where around 40-70% of the injuries are not reported. In same context, Centre for Disease Control and Prevention (CDC) stated that unreported sharps-related injuries in United States exceeded the half of all injuries (Pai Jakribettu et al., 2017). The unreported injuries are serious problems consequently increasing the unwanted hazards consequences of injury and preventing the health worker from receiving the appropriate post exposure treatments against diverse bloodborne pathogens diseases (Singh, Goel, Kumar & Lingaiah, 2017).

The information of such injuries and its prevalence among the health workers is significant to assess the safety and health level in the working environments, and important for health institutes administration, and the prevalence of blood infection due to NSIs is high in the developing countries (Khabour, Al Ali & Mahallawi, 2018). In the context of Saudi Arabia, there are few numbers of studies addressing the prevalence of the NSIs injuries, such as Hashmi, Al Reesh & Indah (2012) addressed the NSI among healthworkers in Maternity and Children's Hospital, Najran, and study of Khabour, Al Ali & Mahallawi, (2018) addressed the NSIs prevalence among clinical laboratory workers in Al-Madinah health care sectors. However, the previous studies are not adequate to cover all aspect

of the NSIs among health workers, therefore, the current study intends to discover the rate of NSIs among health workers in the last working year (12 months period), causes and post exposure practices, in order to provide a complete perspective of the NSIs among the health workers.

1.3 Research Questions

The research questions formulated as bellow:

- What is the frequency and Rate of NSI occurrence among health worker in Abdul-Aziz University Hospital within last 12 months working period?

- Which practice causes needle stick injuries among the various health worker categories working in the Abdul-Aziz University Hospital?

- What is the management practice post-exposure needles stick injury in the Abdul-Aziz University Hospital among health worker?

-What are the evidences safety measures adopted post-exposure the needle stick injury among health workers in Abdul-Aziz University Hospital?

- Is there a statistically significant relationship between the rate of NSI and demographic variables of Abdul-Aziz University Hospital health workers (Gender, Age, Job categories, training course and employing health department)?

- Is there a statistically significance with the relationship between the rate of NSI and the injuries occurrence location in the Abdul-Aziz University Hospital?

1.4 Research Objectives

The research mainly aims to address the frequency rate of needle stick injuries among health worker in the Abdul-Aziz University Hospital. However, the research extends to assess the distribution of the NSI by

gender, age, training course, occurrence location and employing health department. Furthermore, research intends to discover that health worker practices contribute to NSI and the related safety practice after the injuries occurs.

In terms of research outcomes, the research will pinpoint the recommendations associating the real state of the injuries prevalence and NSI rate among health workers, and recommended practice needed for prevention, avoiding and coping procedures of NSI occurrence.

1.5 Research Significance

The severity of the NSIs prevalence and unreported injuries are not fully underestimated among the health care workers and employers, hence, a lot of opacity and uncertainty surrounded the NSIs in Saudi Arabia health care context due to the lack of studies, and unreported practice. Consequently, the current study gains a potential significance due to the contribution of the expected outcomes in shedding light and concern toward this problem, revealing the rate of NSIs among health workers, investigating the factors cause NSIs, and exposing the current NSIs post-exposure management practices among health workers.

The expected outcomes will enrich the perspectives of health and safety consideration of the health institutes in the Kingdom of Saudi Arabia. These outcomes could benefit the future orientations of safety and health studies in Saudi Arabia. Further, the outcomes will reveal the gap in the management practice of NSIs and exposing the weakness points that would benefit decision makers to determine the needed practice and strategies to cover these gaps.

Regarding the health workers, the current study will clear the health workers' perspective toward the importance of reported NSIs, reveal the

severity of the NSIs consequences on their lives, and identify the causing and contributing factors to NSIs.

The current study is considered one of the rare studies tackling NSIs among Saudi Arabia addressing three main aspects of problem rather than one aspect as previous studies, including the NSIs prevalence, causing, and post–exposure management practices.

1.6 Research Background

Needle stick injuries defines as exposure of health care providers' bodies to blood or potentially dangerous infection matters through hollow bore needle or sharp tools such as contaminated broken glass, scalpel, lancet or needles, experienced during the care providing duties performance (Khraisat, Juni, Abd Rahman & Said, 2014).

Needle stick injuries defined by United States National Institute of Occupational Safety and Health (NIOSH) all injuries induced due to using needles during the care duties providing such as such as hypodermic needles, blood collection needles, intravenous (IV) stylist, and needles used to connect parts of IV delivery systems (Singh, Goel, Kumar & Lingaiah, 2017).

The NSI has a potential to transmit transiently or persistently pathogen of the blood source bodies to health workers bodies, blood –prone pathogen such as hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV) that induces a serious threaten on lives account for morbidity and mortality (Mannocci et al., 2016).

Recently, NSIs globally gain growth concern and awareness, classifies as one of occupational health hazards by world health organization. Consequently, a high volume for action demands; to prevent and reduce

risk associating with NSIs, enforce huge pressure on various relevant occupational parties such as Union, governmental agencies, federal institutes, legislation parties and so forth, to take appropriate intervention and valuable actions (Porta, Handelman & McGovern, 1999). Back to 1990s, the occupational safety and health administration (OSHA) suggested unique blood borne pathogen codes embrace precaution, concentrates on human blood handling issues, various infection materials, employee training and educating, and identifies the personal protective equipment (PPE) (Hart, 2011).

Furthermore, literature combined various administrative, behavioural and technical intervention in order to reduce and minimize the NSI prevalence, embraces set of proper steps and guidance for needle manipulations, education, using the specialize containers for sharp for appropriate disposal of the sharp instruments, and safety-engineered devices - SED. Each of these interventions has been significant in reducing NSIs among health workers (Mannocci et al., 2016). Jagger, Perry, Gomaa & Phillips (2008) emphasized that the United states occupational blood exposures regulations and the SEDs used minimized the NSIs frequencies among health care workers by 34%.

There are several guidelines, which are issued for health workers exposure occupational blood prone pathogen, and which involve the urgent evolution required of the source, and the status of the infected person with timely managed hepatitis B immune globulin (HBIG), hepatitis B vaccine and/or HIV PEP. However, various tested are supposed to perform for identification the infection development in term of HCV (Desalegn, Gebreselassie & Asemamaw, 2015).

According to OSHA's blood borne pathogen code, employees are expected to report and maintain all experienced injuries during the work due to using needles or sharp device. But the real statistics indicate that the majority of NSIs are unreported (Jaybhaye et al., 2014), which conforms with the findings of Centre for Disease Control and Prevention (CDC) asserted that unreported sharps-related injuries in United States exceeded the half of all injuries (Pai Jakribettu et al., 2017). While, Hanafi, Mohamed, Kassem & Shawki, (2011) found that the unreported cases exceeded the 74% in Egyptian hospitals.

Hart explained the unreported NSIs phenomenon in a set of reasons, pin~~ned~~ pointed below :(2011)

- Absence of written instruction and lack of adequate training regards the injuries post-exposure procedures, evaluation and treatment protocols.

- Contaminate perception regarding the severity of injuries exposure and incidents.

- Traditional reporting forms and procedures require additional time that health workers did not possess.

- Apprehension of the reprimand or embarrassment.

Isara, Oguzie & Okpogoro, (2015) stated that the PEP following injuries up taking among health workers is low, they are not taking the PEP considered it not necessary, while 25% of health workers did not comply with PEP protocols ensures that source patient is HIV negative. Despite, the health workers have high aware of the PEP importance and role in prevention the HIV infections, but they still exhibit ignoring PEP protocol adherence.

According to Khraisat, Juni, Abd Rahman & Said, (2014) there are several factors that contribute the high prevalence of the NSIs among health workers such as lack adherences needle-disposing containers using, Job stress, experience scarcity, and emotional dispersed. In addition, Jaybhaye et al., (2014) found that around 52% of NSIs occurred during recapping the needles, followed by the collection of the blood sample. Associating with this, Afridi, Kumar & Sayani, (2013) stated that injecting medicine and drawing blood and two-handed recapping of needle are the most common factors raising the NSIs frequencies among health workers.

Due to lack of National databases for tracking NSIs prevalence's, factors and post-exposure management practice. Each hospital or health institutes take responsibility to tracking the NSIs prevalence, administration and risk factors among its health workers, in order to comprehend the issues and relevant prevented strategies. However, hospital can perform NSIs monitoring using appropriate surveillance approach such as the EPINet, which proposed and used by International Safety Center at Virginia University in 1992, since then EPINet is used gradually spreads among countries such as United States and Japan (Khraisat, Juni, Abd Rahman & Said, 2014).

1.7 Research Method and Design

The research will utilize the descriptive analytical methodology, which considered appropriate methodology to accomplish research aims and answer research questions. The descriptive analytical methodology describes the phenomenon on the real and natural state. The research will adopt the quantitative descriptive method for collecting data using the survey or questionnaire. The questionnaire will be designed and constructed by researcher. The researcher will formulate the questionnaire

statements in order to cover all research questions and achieving main research objectives taken advantages of prior relevant research questionnaire utilized, and the questionnaire of the EPINet organizations that used for yearly reported the NSI among USA health workers. The questionnaire reliability and validity will be tested and assessed utilizing person correlation statistical analysis tool.

The research design for the current study will be cross –sectional study based on self-reported survey among health workers in the Abdul-Aziz University Hospital. Research population includes all health workers currently working or training in the Abdul-Aziz University Hospital in the study duration.

Research Sample: the researcher will choose and select the research sample based on defined inclusion criteria, illustrated as follows:

Inclusion Criteria: the study will include all health workers that are working in the Abdul-Aziz University Hospital, who are at risk of exposure or subject to NSI risks.

Exclusion criteria: the health workers, who are not exposured or placed at NSI risks will be excluded such as: Pre-clinical year students, hospital administration employee, hospital security employee and so forth.

Statistical analysis: Research will utilize different statistical analysis tools and procedures, taking advantages of the available statistical tool in the SPSS software. Means, frequencies and standard deviation will be calculated for research variables. Further, the multiple linear regression analysis will be performed in order to investigate the relation among research variables.

Research constraints in following:

- Subjective limitation: Research only concerns in the frequencies of the NSI among health workers, causes and safety management practices.

- Time limitation: the research conducts in the period of the research

- Spatial Limitation: Abdul-Aziz University Hospital located in Jeddah.

Chapter 2: Literature Review

2.1) Introduction

Health care workers (HCWs) are characterized as all paid and unpaid people working in health care organizations who have the potential to be exposed to patients and additionally to materials causing infections, including polluted medical equipment and supplies, body substances, polluted air, or polluted environmental surfaces. HCWs may incorporate doctors, attendants, nursing aides, nurses, technicians, dental personnel, therapists, laboratory personnel, emergency medical service personnel, students and trainees and people (such as, dietary, clerical , maintenance, volunteers, security, housekeeping, administrative, laundry and billing) not directly associated with health caring but rather possibly exposed to infections that can be transmitted to and from patients and HCWs (Assiri, Hathout, Anwar, El Dalatony & Kader ,2013)

Those workers are regularly exposed to be infected by dangerous agents that are mainly transmitted to them while they are performing their health care duties. They are at high risk to be exposed to several common occupational accidents such as Needle Stick Injuries, cuts and sprinkles that are responsible for infecting HCWs to various bloodborne pathogens (Hashmi, Al Reesh & Indah, 2012). Transmission of human immune deficiency virus (HIV), hepatitis B various as well as hepatitis C various

(HCV) has been identified with injuries and exposure's frequency. As indicated by world health organization (WHO), 40% of both HCV and HBV cases and 2.5% of HIV cases worldwide are the result of occupational exposure and accidental injuries among HCWs (WHO, 2002).

Needle stick and percutaneous injuries (PIs) are among the most serious occupational hazards that HCWs are exposed to. Needle stick and sharp injuries (NSIs) are identified as wounds caused by sharps (counting any kind of intravenous cannula, needle, scalpel, or surgical instrument) that may result in exposing of the HCW to blood or other body liquids. Sharps can incorporate any material such as glass or any other type, regardless of whether it was utilized or not (Sharma, Rasania, Verma & Singh, 2010)

NSIs in the United States (US) lead HCWs to be exposed to significant fear, emotional distress and anxiety and the monetary expense of treating and dealing with these injuries is significant. The Centers for Disease Control and Prevention (CDC) evaluates the NSIs in average about 385,000 occasions yearly in U.S. medical care facility settings (Lee, Botteman, Xanthakos & Nicklasson, 2005).

In Saudi Arabia, A high prevalence of NSIs was reported widely across its different regions. From 1995 to 1997, there were 282 NSIs among HCWs in 11 healthcare facilities in the Eastern Province of the Saudi Arabia (Abu-Gad & Al-Turki, 2001). An aggregate of 116 cases were reported in one medical center in Abha (south) in the range of 1996 and 2000. In Riyadh (central), there were 477 cases revealed from January of 2007 to December of 2011 (Ghamdi, Al-Azraqi, Bello, Gutierrez, Hyde, & Abdullah, 2003). In Riyadh (central), there were 477 cases revealed from January of 2007 to December of 2011 (Abu-Gad & Al-Turki, 2001). Moreover, in Najran

(south), 32 cases were accounted for in one hospital inside a six-month time period of 2012 (Hashmi, Al Reesh & Indah, 2012).

Therefore, this chapter represents a review of the literature and previous studies related to this topic, in order to shed light on key issues and definitions related to NSIs, its prevalence and risk factor, causes of NSIs underreporting as well its effects and methods of preventing and reducing its occurrence alongside with a description of those variables in Saudi Arabia that would lead into building a solid and theoretical conceptual base which could help the researcher into understanding one of the widespread occupational hazard which is needle-stick injuries.

2.2) Needle Stick Injuries (NSIs) Definitions

Needle-stick Injuries (NSIs) represent accidental skin infiltrating wounds that are caused by sharp instruments in a medical setting. They are characterized as an accidental skin entering wound caused by different kinds of hollow-bore needles, for example, blood- collection needles, Intra-venous (IV) catheter stylets, hypodermic needles as well as needles used to connect the different parts of IV conveyance system (Hashmi, Al Reesh & Indah, 2012).

The National Institute of Occupational Safety and Health (NIOSH) defined the needle stick injuries as:" wounds that accidentally puncture the skin caused by needles or sharp instrument" (Gorman, 2013: P: 29). Needle stick injuries (NSI) implies the Par literal penetrating into the body of HCWs, during the execution of their care duties, of blood or other conceivably dangerous material by a hollow bore needle or any other sharp instruments, including, lancets, polluted broken glass and surgical tools (Siddique, Mirza, Tauqir, Anwar & Malik, 2008).

HCWs confront a high danger of an occupational exposure to blood and bodily fluids, which can prompt the transmission of hazardous pathogens causing a disease and bringing about dangerous consequences affecting their health. Human Immunodeficiency Virus (HIV), Hepatitis C and Hepatitis B are of most extreme concern since they can cause noteworthy death or morbidity. The regular high hazard circumstance of such an occupational exposure is percutaneous damage which is high hazard damage (Siddique, Mirza, Tauqir, Anwar & Malik, 2008).

Alongside with the needle stick injuries' potential infection dangers, NSIs impose different direct costs which are related to laboratory tests, for example, tests for hepatitis B serology, HIV antibodies, and a test for hostile to hepatitis C, in addition to treatment costs spent for these conditions. Different expenses are identified with post exposure prophylaxis for registered HCWs and also the financial loss forced on medical care facilities because of absence from work (Motaarefi, Mahmoudi, Mohammadi & Hasanpour-Dehkordi, 2016). The expenses of the treatments and tests for NSIs are evaluated to extend from $6.1 million in France to $118– 591 million in the USA for every year (Merchant, Talan, Moran & Pinner, 2006).

Therefore, it would be necessary to identify the prevalence of NSIs in Saudi Arabia alongside with the identification of its risk factors in order to understand the importance of having structured plans and more actions for controlling and prevention.

2.3) Prevalence of NSIs and Risk Factors

2.3.1) Prevalence of NSIs in Saudi Arabia

According to the World Health Organization in the Eastern Mediterranean region (in which Saudi Arabia is included) the evaluated number of HCWs

that are annually exposed to at least one percutaneous injury with sharp material contaminated with HIV is 170, with HCV 18,000 and with HBV 43,000 (Prüss-Üstün, Rapiti & Hutin, 2005).

A comprehensive and detailed assessment of NSIs among HCWs in Saudi Arabia was applied over a period of four-years (August 1988-August 1992). The investigation showed that among all Saudi HCWs; nurses had the highest rate of NSIs. The wards of hospital represented the highest rate of NSIs injuries in comparison with hospitals' other areas. The evening time was the most frequent time in which most of NSIs occurred. Moreover, the most susceptible part of the HCWs' body to those NSIs was the palmar surface of the distal forefinger of the non-dominant hand. The authors stated that genuine medical conditions, such as HBV infection (HBV) represent a noteworthy risk in several nations including Saudi Arabia. But, HIV still represents the fundamental source of concern in health care facilities and hospital (Shanks & Al-Kalai, 1995). The primary driver of anxiety among influenced HCWs was HIV, although HBV, because of its high prevalence in Saudi Arabia, represents a more serious hazard. The frequent occurrence of these NSIs among medical staff and HCWs implied that real changes and adjustments should instantly be made in the clinical processes and that health care facilities must be provided with safe defensive venesection equipment. Likewise, the high rates of NSIs occurrence in the evening work-time reflected that the medical staff is less aware and alert and more prone to be exhausted after lunch, and their medical procedures require expanded supervision through those periods (Alanazi, 2016).

Due to lack of National databases for tracking NSIs prevalence's, factors and post-exposure management practice; each Saudi hospital or health

institutes take responsibility to tracking the NSIs prevalence, administration and risk factors among its health workers, in order to comprehend the issues and relevant prevented strategies. However, hospitals can perform NSI monitoring using appropriate surveillance approach such as the EPINet, which proposed and used by International Safety Center at Virginia University in 1992, since then EPINet is used gradually spreads among countries such as United States and Japan (Khraisat, Juni, Abd Rahman & Said, 2014).

Regardless of the ongoing developments and enhancements in strategies, device design and practices, percutaneous injuries from sharp instruments and needles (NSIs) keep on exposing HCWs to the danger of blood borne pathogens. A planned surveillance was founded to investigate the epidemiologic qualities of percutaneous injuries (NSIs) at King Abdulaziz Medical City, Riyadh, Saudi Arabia (KAMC-R) from 2004 through 2008 and to contrast these attributes relative with those of a network of US hospitals taking part in the EPINet™ research group (2004-2007). The surveillance discovered that the mean reported percutaneous injuries (NSIs) rate per 100 beds in KAMC-R was considerably lower than that was reported by educating and nonteaching U.S. EPINet™ hospitals. Moreover, KAMC-R's nurses reported more percutaneous wounds (NSIs) than doctors which was similar to the case of U.S. EPINet™ hospitals. However, compared with US EPINet™ hospitals, the KAMC-R's nurses experienced more percutaneous wounds (NSIs) (52.8% versus 38.1%, respectively), while doctors experienced less percutaneous wounds (18.4% versus 28.6%, respectively). Most of percutaneous wounds (NSIs) occurred in patient wards with a rate of 50.6% in KAMC-R and with a rate of 34.1% in operating rooms of U.S. EPINet™ hospitals (Balkhy, El Beltagy, El-Saed, Sallah & Jagger, 2011).

Furthermore, Suturing was the most successive percutaneous wounds instrument in U.S. EPINet™ hospitals with a rate of 23.3%; however, it was associated with just 10% of percutaneous wounds at KAMC-R. The disposable syringes were the most common instruments included in causing NSIs and the left hand was the most frequent area that was prone to injuries for HCWs in both of KAMC-R and U.S. EPINet™ hospitals. In spite of the fact that this represents a decrement in the rates of percutaneous injuries (NSIs) at KAMC-R with respect to US EPINet™ hospitals, it is hard to completely clarify such contrasts, this could be because of varieties in underreporting, systems of health caring, or the effect of the NSIs prevention measures (Balkhy et al., 2011).

2.3.2) Risk Factors associated with NSIs

Several risk factors play a significant role in NSIs' occurrence; insufficient training of HCWs and medical students represents the most critical risk factor among them. Medical students and HCWs should be taught about the dangers of needle stick injuries, and learn about preventive and safety methods to decrease the incidence of those injuries. Another issue is the absence of assets in rural small hospitals and facilities. Those rural unprepared facilities and hospitals ought to get more administrative help from government associations. There are many other factors that could increase the danger of NSIs among HCWs, such as the quantity of blood contacts experienced by the HCW, and the frequency of blood-borne pathogen contamination among patients in their health care facility or hospital (Sahmsulddin, 2015).

Moreover, it is hard for healthcare workers to set time for training and learning of safe methods to deal with needles and sharp instruments, due to the limited time enabled to them in their schedules. Furthermore, several

HCWs expect that it will never happen to them; the outcome being that a considerable lot of them may not change their standard utilization of those sharp instruments and hence increase their chance of being infected (Sahmsulddin, 2015).

Another important risk factor for NSIs is the job category of health care workers. In 2012, Butsashvili et al., have examined data from 1368 HCWs in Georgia and found that the most noteworthy rate of needle stick injuries happen during the procedure of recapping the needles because of a false move, or passing the needle to another worker. The blood sprinkles were reported in 46% of the cases and the accidental needle stick injury was reported in 45% of them. The most noteworthy rate of NSIs happened among doctors (22%) and nurses (39%) and was fundamentally through the recapping process of utilized needles. The prevalence of HCV disease was 5%.

Other studies investigated the work stress and workload as a risk factor for NSIs. Clarke, Sloane & Aiken (2002) examined data both prospectively and retrospectively from nurses with needle stick injuries, and found that the lack of organization and low staffing in specific units put the nurses at a higher danger of needle stick injuries. The prospective data was gathered from 960 nurses and retrospective data was collected from 732 nurses. This data was about NSIs for more than one-month time spans in 1990 and 1991, and were gathered on 40 units in 20 hospitals. The after effects of this investigation demonstrated the role that understaffing, and lack of administrative support can play in increasing the risk of NSIs.

The conditions in which NSIs happens depend partly on the design and type of the medical instrument. Additionally, aside from the risk related to the characteristics of instruments, needle stick injuries (NSIs) have been

identified with specific risk factors of work practices including (Kommogldomo, 2016):

1) Passing needle from one worker to the next one.
2) Recapping of needles .
3) The transferring of body liquids into containers .
4) Collision between HCWs .
5) Neglecting the appropriate standards of discarding utilized needles .
6) Concealed needles in bed linens and sheets .
7) Through the collection of medical waste and disposal.

Needle stick injuries are typically caused by preventable and accidental mistakes in dealing up with needles and sharp instruments. A large portion of these injuries occur previously or through the transfer process. Some of these causes are; anger distraction, rushing and several endeavors to complete a procedure, HCWs tiredness and exhaustion, uncooperative patients or groups influenced by staff deficiency (Kasatpibal et al., 2015).

The expected preventability of NSIs through safety gadgets depends to a great extent on the sort of action and accessibility of assets and authoritative controls across different HCWs (Wicker, Jung, Allwinn, Gottschalk & Rabenau, 2008).

Regarding Saudi Arabia, a retrospective investigation including every cases of needle stick and sharp injuries among Health care workers was conducted at King Saud Medical City (KSMC) utilizing EPINet™ data and through the period of January 2007-December 2011. It demonstrated that 477 NSIs were accounted for with top frequency (13.84%) through 2009. The distribution of NSIs as indicated by the area of their occurrence

showed that patient ward was the most widely recognized place of NSIs' occurrence as long as 150 cases from the 477 cases have occurred there, followed by emergency units in which 82 cases out of 477 happened there and finally the intensive and critical care units with the remind of the 70 cases out of the 477 (Memish, Assiri, Eldalatony, Hathout, Alzoman & Undaya, 2013).

The examination revealed that nurses were classified as the most influenced category and the utilization of instruments is the most widely recognized action related with the occurrences. The most influenced body parts were hands and the majority of the occurrences were caused by disposable needles. Prevention measures ought to be founded on various working lines including inoculation, training of medicinal services workers and engineering control measures (Memish et al., 2013).

In the western region of Saudi Arabia, practices and knowledge of HCWs related to blood-borne pathogens and NSIs was surveyed in a tertiary hospital by a self-controlled questionnaire. These surveys were disseminated to assess demographic attributes, practices and knowledge of doctors, technicians and nurses on dangers of exposure and prophylaxis against human immunodeficiency infection, HBV infection and HCV infection contaminations. A sum of 466 members (151; 32.4 % doctors and 315; 67.6 % nurses and technicians) completed the survey. Nearly (60.9%) of the doctors and half of the nurses and technicians (47.6 %) had history of exposure to risks of blood borne disease. Despite that the nurses, technician and doctors demonstrated adequate level of knowledge about dangers of blood-borne diseases and NSIs, just a little extent knew the right activities including reporting after the exposure. Strict strategy and behavioral based in-service preparing mediations ought to be executed to

develop consistence of HCWs to the defensive measures against dangerous blood-borne contaminations and NSIs (Al-Zahrani, Farahat & Zolaly, 2014).

2.4) Causes of NSIs Underreporting

Reporting represents a vital step to be taken whenever NSIs case occurred; this is for prevention and treatment reasons. For the harmed individual, NSIs reporting prompts assessment of the requirement for post-exposure prophylaxis, permits early discovery of seroconversion and declines nervousness. In general, the NSIs reporting permits distinguishing of dangerous devices or practices and thus serve to lessen the danger of future injuries. Preventive actions, including HCW instruction, expanded utilization of universal precautionary measures and execution of safety devices have been appeared to essentially decrease NSIs (Kommogldomo, 2016).

The underreporting of needle-stick injuries is a significant issue representing around 40– 80% of injuries going unreported. Accordingly, some injured HCWs in sometimes do not get the suitable care and follow-up when incidentally stuck by needle or sharp material. Underreporting and the absence of documentation also forbids administration the chance to assess the conditions prompting the injuries for considerations in policy practices, directives or items that could prevent the future similar exposures (Kommogldomo,2016). In developing nations, monitoring and surveillance are seldom conducted to provide care for HCWs from occupational exposure of dangers factors that could cause contaminations, infections, disability, illness and even morbidity that may thus influence the health care's quality (Aderaw, 2013).

Azadi, Anoosheh, and Delpisheh (2011) verified that 33.3% of nurses who did not report NSI were a direct result of dissatisfaction with post exposure measurements, while 29.2% was a direct result of thinking about NSI as a low infection source. Moreover, Tabak, Shiaabana, and ShaSha (2006) investigate that HCWs' failure to conform to the NSI reporting system was connected with their assumptions that reporting such injuries require excessive–time. Furthermore, A study done among 300 physicians and nurses shows that underreporting was a direct result of time restriction, workload pressure and an authoritative culture of quietness towards NSIs (Abdulmahdi, 2014).

According to OSHA's blood borne pathogen code, employees have to report and maintain the all experienced injuries during the work due to needles or sharp device using. But the real statics indicates that majority of NSIs are unreported (Jaybhaye et al., 2014), which conforms with the findings of Centre for Disease Control and Prevention (CDC) asserted that unreported sharps-related injuries in United States exceeded the half of all injuries (Pai Jakribettu et al., 2017).

Hart (2011) explained the unreported NSIs phenomenon in a set of reasons, which are displayed as in the following point:

- Absence of written instruction and lack of adequate training regards the injuries post-exposure procedures, evaluation and treatment protocols.

- Contaminate perception regarding the severity of injuries exposure and incidents.

- Traditional reporting forms and procedures require additional time that health workers did not possess.

- Apprehension of the reprimand or embarrassment.

Undistinguishable effects and uncertain consequences of NSIs among health care workers are for the most part because of underreporting of the incidents (Azadi, Anoosheh, and Delpisheh 2011). CCOHS (2005) concurred with them that the issue of needle stick injuries is being underestimated due to the numerous unreported cases by HCWs. Thomas and Murray (2009) clarify that needle stick occurrences are related with critical hazard to HCWs health, career, patients and families which reflect the importance of reporting such cases.

2.5) NSI's Effects and Prevention:

NSI is the major transmitting medium of blood borne pathogens, for example, hepatitis C (HCV), human immunodeficiency infection and hepatitis B (HBV), (Tabak et al 2006). WHO (2002) announced that 2.5% of HIV cases among HCWs and 40% of hepatitis B and C cases among HCWs worldwide are the after effect of occupational exposure? In the same manner, Prüss-Üstün, Rapiti & Hutin (2005) illuminate that half of all hepatitis C and B among HCWs in Asia and Africa and more than two-third of all hepatitis B in South America are a direct result of polluted sharps and occupational exposure. Different infections that may be transmitted by means of NSI include diphtheria, malaria, syphilis, tuberculosis brucellosis and herpes infection (Abdulmahdi, 2014).

In addition, HCWs who had NSI experienced anxiety, fear and stress about the possible effects of NSI and getting HIV without monitoring it (Abdulmahdi, 2014). Even when NSI did not transmit any infectious diseases, its emotional impacts can be permanent and extreme. Other effects incorporate being more cautious, taking better precautions towards

it and sometimes staying away from such methodology. Additionally, around 34% attempted to enhance their insight through perusing articles about avoiding NSI. Cost additionally is another consequence of NSI, which incorporate the follow up testing and treatment (Zaidi, 2009).

They are several other short and long haul negative effects of needle stick injuries. Due to the expense of these effects, which are exceptionally hard to estimate, security measures and strategies should be highlighted. The expense of needle stick injuries additionally incorporate loss of worker efficiency and time, cost of the staff members exploring the injuries, cost of lab testing, and cost of the treatment if required (Sahmsulddin, 2015).

Various preventive measures can be utilized to lessen the rate of needle stick injuries including attempting to decrease the utilization of sharps, utilizing needles with safety instruments, teaching with satisfactory assets, providing training, and decreasing the process of hand-to-hand passing and transporting of sharp instruments (Sahmsulddin ,2015).

Expelling the needle's cap for the most part increase the danger of needle stick injuries, so endeavors have been made to create safe needles and needle removers. It was discovered that the "no-contact" conventions, which incorporate avoiding contact with needles amid their utilization and transfer, is exceptionally viable in lessening the rate of needle stick injuries. In the surgical settings and operation room, the utilization of blunt-tip suture needles decreased the rate of NSIs by about half (Sahmsulddin, 2015). Many other suggestions by the American College of Surgeons (ACS) have been made, for example, double gloving has been directed toward lessening the rate of needle stick injuries and has been found to diminish the danger of NSIs in surgical settings (Sahmsulddin, 2015).

Furthermore, literature combined various administrative, behavioral and technical intervention in order to reduce and minimize the NSI prevalence, embraces set of proper steps and guidance for needle manipulations, education, using the specialize containers for sharp for appropriate disposal of the sharp instruments, and safety-engineered devices - SED. Each of these interventions has significance in reducing NSIs among health workers (Mannocci et al., 2016). Furthermore, Jagger, Perry, Gomaa & Phillips (2008) emphasized that the United States occupational blood exposures regulations and the SEDs used minimized the NSIs frequencies among health care workers by 34%.

2.6) Summary

The burden of NSIs in the world generally and in Saudi Arabia specifically calls for more structured plans and actions to avoid and control this accidental occupational exposure. Accurate detailing of NSIs is of essential significance, as this information directs endeavors towards places requiring further consideration and more guidance programs. In spite of the fact that a considerable amount of studies above record needle stick injuries in Saudi Arabia, the data they utilize is constrained to just certain hospital and does not indicate which clinic department the incident occurred in. In this examination, our point is to broaden the current literature in Saudi Arabia by covering a more extensive number of NSIs issues, chosen from uninvestigated hospital which is King Abdul-Aziz University Hospital and analyzing a comprehensive array of factors in connection to NSIs.

Chapter 3: Research Methodology

Introduction

Research methodology can be defined as a subject that deals with how research or study is carried out in a scientific way. The importance of research methodologies lies in its ability to highlight and give essential training in the arrangement and collection of material in a way that can be recognized in an easy way (Creswell, 2008).

The present chapter aims to clarify the methodology adopted by the researcher in order to achieve the objectives of this study. It discusses and explains the research methods utilized by the researcher in order to collect and analyse data for this study. The chapter starts with an explanation of the research design, then, goes with describing the data and information gathering process and instruments, which is survey (questionnaire). It then portrays the data management and analysis to be followed in order to reach the study's aimed results.

Research Design

Research design is the strategy used in research for data collection and data analysis. There are many factors that govern the process of research design, including the research area and research objectives that the study seeks to achieve (Neuman, 2013). Research design usually involves the tools used for data collection, the strategy by which the sample is selected, and the methods used to analyse the data (Neuman, 2013).

The present study's strategy includes firstly a collection of background information from previous relevant literature and studies with the same topic and interests. This literature examination and reviewing would help the researcher in formulating conceptual idea about the subject and assisting him in designing the study's collecting data instrument. Moreover, it is important to turn lights on the validity and reliability of the utilized data collection tools.

Then, the data collection phase will be performed through the distribution of research tools (questionnaire) to the selected sample and collect their responses. After that, the analysis phase would take place in which the researcher will implement several statistical approaches and analysis in order to figure out the answers of the research questions and achieve its aims. Finally, based on the obtained results, a set of conclusions and recommendations will be drawn up and provided.

Research Methods

Research method is a set of procedure and tools that determine the processes to achieve research objectives and results. One of the main popular methodologies is the analytical descriptive methodology that describes the phenomenon as it occurred exactly in real. There are two common methods that are commonly used in the descriptive research for

data collection, which are qualitative and quantitative methods (Yilmaz, 2013).

The qualitative approach used to collect and examine individual's attitude, thoughts, and actions, which primarily based on the interview and case study tools, which generate in depth understanding of the research topic or studied phenomenon, while the quantitative approach based in survey tools for data collection, which these data transformed later to specific set of statistical numbers that can be tested in order to examined the relations between variables (Hartas, 2010).

The descriptive analytical method specifically the quantitative approach is considered as the most appropriate utilised approach to cover the research problem of this study in a clearer way.

A significant premise behind the utilization of quantitative analytical methodology in this study is that the quantitative approach is more objective in its nature and less subjective than the qualitative approach, and the accentuation of quantitative research is on gathering and evaluating numerical information; as it focuses on measuring, for example, the scale, frequency and range of a phenomenon. This sort of approach, even though at first harder to configuration, is typically greatly itemized and organized, and results can be effectively grouped and exhibited statistically (Hartas, 2010).

Therefore, and due to the context of the current study and its objectives, this study is a type of descriptive analytical studies that is based on studying facts about a phenomena and events, photographing and documenting them through analyzing and assessing the characteristics of the problem, by collecting data and sufficient information from the sample members. The quantitative method will be used and exploited in this study in order to

create a well understanding for the research topic and obtain sufficient empirical evidences that enrich and support the theoretical information. The research will utilize the questionnaire as data collection tools.

Data Sources and Collection Methods

In the process of quantitative and qualitative collecting data, many resources and methods are available to be used such as, focus groups, interviews, observations, diaries, questionnaires, etc. (Neuman, 2013).

As stated earlier that this study implements the analytical descriptive methodology consisting of quantitative approach, where the data collection techniques utilized is questionnaire.

Questionnaire is a simplest tool for collecting data on the particular subject that basically comprised of several questions which are preceded by answering instructions (Hartas, 2010). The questionnaire was utilized in this research as an instrument to collect the primary data for the following reasons:

- The questionnaire is suitable to collect large amount of data which is the case in our study, as well as, its appropriateness for extracting and obtaining desired information efficiently.

- Further advantages and benefits of the questionnaire are that it provides accurate as well as being fast in processing compared to other tools. Also, it is flexible and easy to be used.

Therefore, a closed ended questionnaire designed by the researcher entitled: "Needle-Stick Injuries among Healthcare Workers in King Abdul-Aziz University Hospital" was used in the study. The content of the questionnaire was designed based on previous information from the

literature reviewed and the questionnaire of the EPINet organizations that used for yearly reported the NSI among United States health workers.

The questionnaire had three sections that seek for different type of data that would satisfy the aims of the study, these sections were as below:

Section 1: collects personal data and demographics of respondents (Gender, Age, Job categories and employing health department).

Section2: contains questions on the health worker practices that cause NSI occurrence among them.

Section 3: asks about the related safety practices after the injuries occurs (management practice post-exposure needles stick injury).

The questionnaire utilized Likert Scale for the collection of responses. The Likert scale used the five following five responses: strongly agree, agree, neutral, disagree and strongly disagree.

Population and Sampling

A study population is in general an expansive collection of objects or people that is the principle focal point of a researching inquiry. Because of the vast sizes of population, scientists and researchers frequently can't test each person in the population because it is excessively costly and time consuming. Therefore, the researchers tend to depend on sampling techniques (Cohen, Manion & Morrison, 2011).

The idea of sample emerges from the failure of the researchers to test the whole population's individuals. The sample must be representative and must have a qualified size to ensure the quality of statistical analysis results (Cohen, Manion & Morrison, 2011).

For this study, the population consists of all health care workers that are working in Abdul-Aziz University Hospital and are potentially exposure or subjected to NSI risks. However, the current study sample was selected based on the following criteria:

- Inclusion Criteria: the study will conduct all health worker that working in the Abdul-Aziz University Hospital, which are exposure or subject for NSI risks.
- Exclusion criteria: the health workers, which are not exposure or place for NSI risks will be excluded such as: Pre-clinical year students, hospital administration employee, hospital security employee and so forth

A representative random sample was selected out of the population which consisted from "300" health care workers that have the possibility to be subjected to NSI risks, as long as those health care workers would have a good experience and beneficial knowledge about the practices that may cause NSI occurrence and the related safety practices to be conducted after the injuries occurs which would help the researcher effectively in understanding his study phenomenon and achieving his goals.

Research Validity and Reliability

It is vital step to check the validity and reliability of the research tools utilized in collecting the data, for our research it would be important to check the reliability and validity of the utilized questionnaire (Bryman, 2012).

- **Validity:**

The validity of the research defined as a measurement of the instrument's ability to measure what is expected to be measured and its ability to

perform in accordance to it its designed purposes (Polonsky & Waller, 2010). Validity in this research was ensured through defining correct sample size, utilizing adequate sampling criteria for sample selection, designing the questionnaire based on the previous researches and taking them as a secondary source of information, and by utilizing appropriate data analysis tools.

- **Reliability:**

The reliability defined as the consistency of the research instrument to measure is intended to be measured (Polonsky & Waller, 2010). This was ensured through developing measurement scale based on test-retest technique to examine questionnaire stability, and calculating Cronbach's alpha coefficients in order to evaluate its internal consistency.

Ethics

Additional efforts and care were taken by the researcher in order to satisfy all ethical issues that arose as data were collected from the field.

Firstly, the researcher got an approval and consent sign from King Abdul-Aziz University Hospital in which it allowed him to officially distribute the questionnaires over its different departments including the clinical, emergency, administrative and other departments.

Furthermore, the participants were given a consent form before they initiated to fill the questionnaire to be signed by them as an agreement to be involved in the research survey. The researcher ensured that it was signed by each member before the survey began. He additionally guaranteed that every member comprehended the concept of the study and of their involvement in it .

Through the consent form and information sheet, the participants were aware that they could withdraw from the research whenever and without repercussions and their participations were on a voluntary base. They were likewise informed that the collected data before their withdrawal of consent would be destroyed at their demand. Also, the consent form presented how anonymity and confidentially of participants would be guaranteed.

Methods of Data Analysis

In order to analyze the collected primary data from the questionnaires, the researcher used the Statistical Package for the Social Sciences (SPSS) program as an analysis tool. Several tests have been used to analyze the collected data, including, Mean, Standard Deviation and frequency distribution. Further, the multiple linear regression analysis will be performed in order to investigate the relation among research variables.

The study sample and sampling

A questionnaire was designed to analyse the Needle-Stick Injuries among Healthcare Workers in King Abdul-Aziz University Hospital in this study (see Appendix A) to gather primary data. The questionnaire was then distributed to (150) of respondents in King Abdul-Aziz University Hospital, who represent more than half population of the hospitals' health employees as the total number of health workers.

The following is a description of participants of the study sample according to (gender, age, Job categories, number of times the correspondent had been exposed to needle stick injury annually, and where did the needle stick injury occur), as in following Tables:

- **Gender**

Table 1: distribution of the sample according to gender

Variable	Categories	Frequency	Percent %
Gender	Male	114	76.0
	Female	36	24.0
	Total	**150**	**100.0**

The table above points out that (76%) of respondents in health care workers at Abdul-Aziz University Hospital were males and is the major category in comparison to (24%) of female respondents.

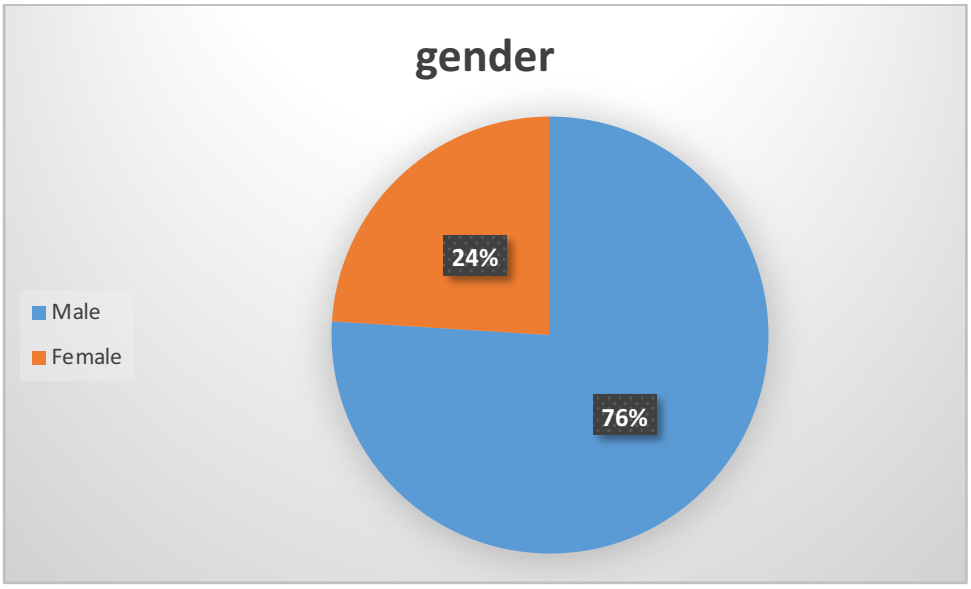

Figure 1: Gender of respondents in Abdul-Aziz University Hospital.

- **Age**

Table 2: distribution of the sample according to age

Variable	Categories	Frequency	Percentage
Age	under 25	2	1.3
	25-30	46	30.7
	31-35	21	14.0
	36-40	15	10.0
	over 40	66	44.0
	Total	**150**	**100.0**

The table above presents the profile of the respondents in terms of their age, the results indicate that 44% of respondents were older than 40 years old. (30.7%) of participants aged 25- 30 years old. Only (1.3%) of respondents' age was below 25 years old. The results indicate that the members of the youngest age group are less vulnerable to needle stick juries in King Abdul-Aziz University Hospital.

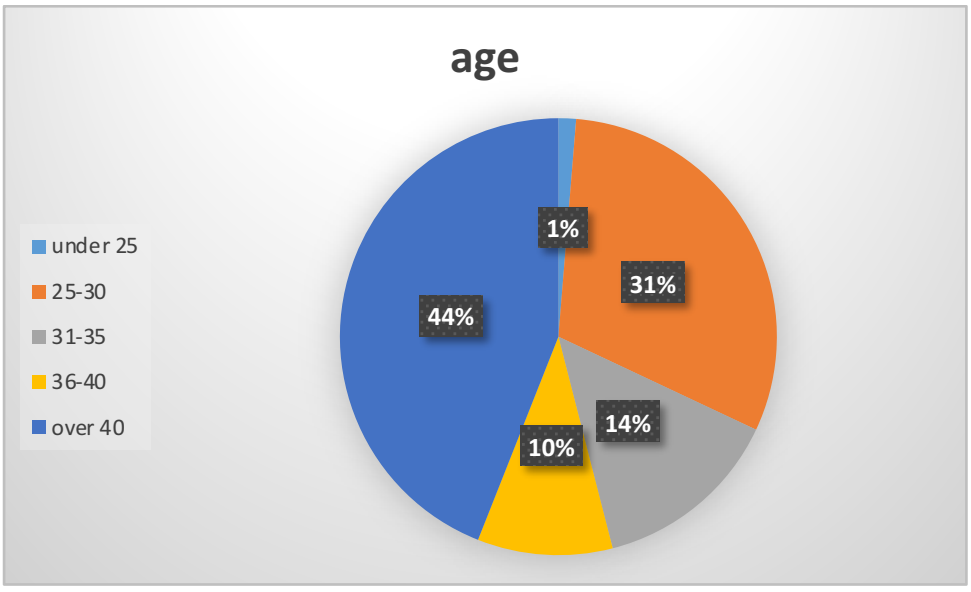

Figure 2: Age of respondents in King Abdul-Aziz University Hospital.

- Job categories

Table 3: distribution of the sample according to Job categories

Variable	Categories	Frequency	Percent
Job categories	Physicians	26	17.3
	Nurses	18	12.0
	Attendants	41	27.3
	Technicians	53	35.3
	Dental personnel	4	2.7
	Laboratory personnel	2	1.3
	Therapists	1	.7
	Emergency medical service personnel	2	1.3
	Pharmacist	1	.7
	Fronsic medicine	2	1.3
	Total	**150**	**100.0**

Table 3 shows the Job variable, it is worth pointing out that most of the respondents are Technicians at a percentage of (35.3%). Followed with

(27.3%) of the respondents as Attendants. The lowest number of personnel was recorded for the following categories: Dental personnel, by frequency of (4) and percentage of (2.7 %); Laboratory, and Emergency medical service personnel who recorded frequency of (2) and percentage of (1.3%); Therapists, and Pharmacist by frequency of (1) and percentage of (0.7%) for each.

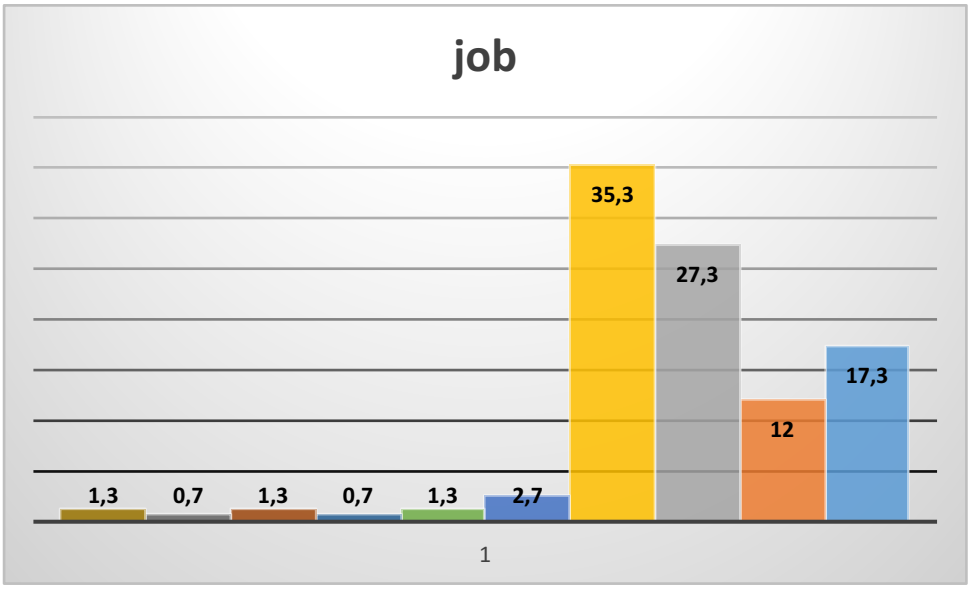

Figure 3: job of respondents in King Abdul-Aziz University Hospital.

- **Where did the needle stick injury occur?**

Table 4: distribution of the sample according to needle stick injury place

Variable	Categories	Frequency	Percent
place Needle stick injury	Patient Room	11	7.3
	Emergency Department	24	16.0

	Intensive Care Unit	18	12.0
	Operating Room	21	14.0
	Outpatient Clinical Office	14	9.3
	Dental Clinic	14	9.3
	At home	9	6.0
	Never had a NSI	32	21.3
	Not in the hospital	7	4.7
	Total	**150**	**100.0**

Table (4) shows the places where needle stick injuries happened. (21.3%) of the correspondents never had a needle stick injury which represents the highest percentage among all followed by (16%) of respondents who got a NSI in the Emergency Department, (14%) of needle stick injuries occurred in Operating Room, (12%) occurred in Intensive Care Unit, (9.3 %) occurred in the Outpatient Clinical Office and Dental Clinic for each, (7.3%) occurred in Patient rooms, (6%) occurred at home, and (4.7%) had needle stick injuries outside the hospital. Figure 4 represents a chart for the places where NSI happened.

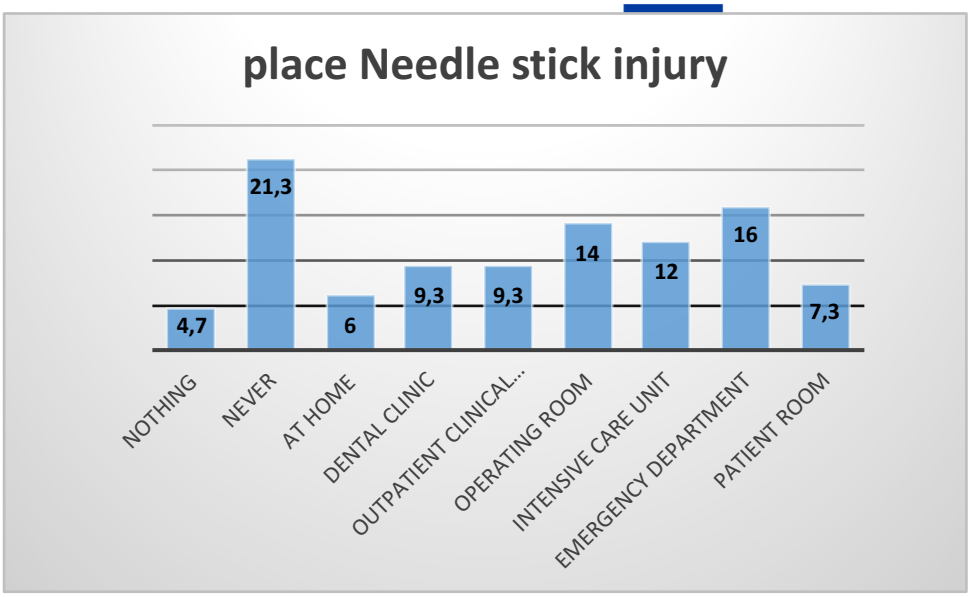

Figure 4: place Needle stick injury responses at King Abdul-Aziz University Hospital

Questionnaire Reliability: the researcher distributed the questionnaire of a pilot study (40 respondent) and computes extents of questionnaire reliability by calculation of internal consistency using Cronbach' alpha values, table (5) show that:

Table 5: the result of reliability (Cronbach' alpha)

No		Alpha	Item No
1	Health care worker practices that commonly cause NSIs occurrence among them	0.723	11
2	Management practices post-exposure needles stick injury	0.704	10
Needle-Stick Injuries among Healthcare Workers in King Abdul-Aziz University Hospital		**0.729**	**21**

Table (5) shows that the highest Cronbach' alpha value reached (0.72) for "Health care worker practices that commonly cause NSIs occurrence among them", and the alpha value was (0.70) for " Management practices post-exposure needles stick injury". Nevertheless, the total alpha values of " needle stick injuries among healthcare workers in King Abdul-Aziz University Hospital " reached (0.729) this indicates an acceptable reliability of the study as the number of incidents is significant to run the study in this hospital.

Study's procedures

Aiming to achieve the objectives of the study, the researcher has followed the following procedures:

- Reviewing the literature and the previous studies correspondent to the study.
- Conducting the study's tool (the questionnaire).
- Identifying the population and the sample of the study.
- Distributing the questionnaire among participants and processing data.
- The researcher has submitted the questionnaire in its final script to the sample that consist of (150 respondents in Abdul-Aziz University Hospital).
- Data were processed and analyzed by computer using (SPSS) to find out the results.
- In the light of the results of the study, many recommendations have been suggested.

Statistical treatment

The following statistical treatments through statistical software packages (SPSS) were used:

- The reliability (Cronbach Alpha).
- Frequencies and percent of the characteristics of the study sample.
- Means and standard deviation for study.
- Independent t-test to answer questions.
- One-way ANOVA to analyze questions' answers.

Chapter 4: Data Analysis

Results Analysis

This chapter presents the findings of the study which aims to address the frequency rate of needle stick injuries among health workers at Abdul-Aziz University Hospital and discover the health worker practices that contribute to NSI and the related safety practice after injuries occurrence. Also, results are displayed based on the study questions.

4.1. Results analysis for answers of the first question:

Question one: What is the frequency and Rate of NSI occurrence among health workers in Abdul-Aziz University Hospital within the last 12 months working period?

To answer this question, arithmetic frequencies and percentages were calculated for all answers, Table (6) shows that:

Table 6: frequencies and percentages for the frequency and Rate of NSI occurrence among health worker in Abdul-Aziz University Hospital

Variable	Categories	Frequency	Percent
How many times have you been infected with Needle stick injury annually?	Never	51	34.0
	1-5 Needle stick injury	59	39.3
	6-10 Needle stick injury	17	11.3
	11-15 Needle stick injury	13	8.7
	More than 15	10	6.7

	Total	**150**	**100.0**

Table (6) shows analysis of the times Needle stick injury indicates that about (39.3%) of the respondents have 1-5 needle stick injuries annually, and (34%) for workers who never been exposed to needle stick injury, these two results are considered extreme in comparison to the rest of the results, however, this could be justified as 1-5 injuries is expected number or regular incidents for health sector personnel as needles are basic medical equipment available in all departments, as well the percentage of who never been exposed to needle injuries is also justified as many health sector personnel are aware of the dangerous effects of such tools and might have taken all the required cautions. 6-10 needle stick injuries were recorded with (11.3%), 11-15 needle stick injuries occurred with (8.7%), and more than 15 needle stick injuries were recorded with (6.7%).

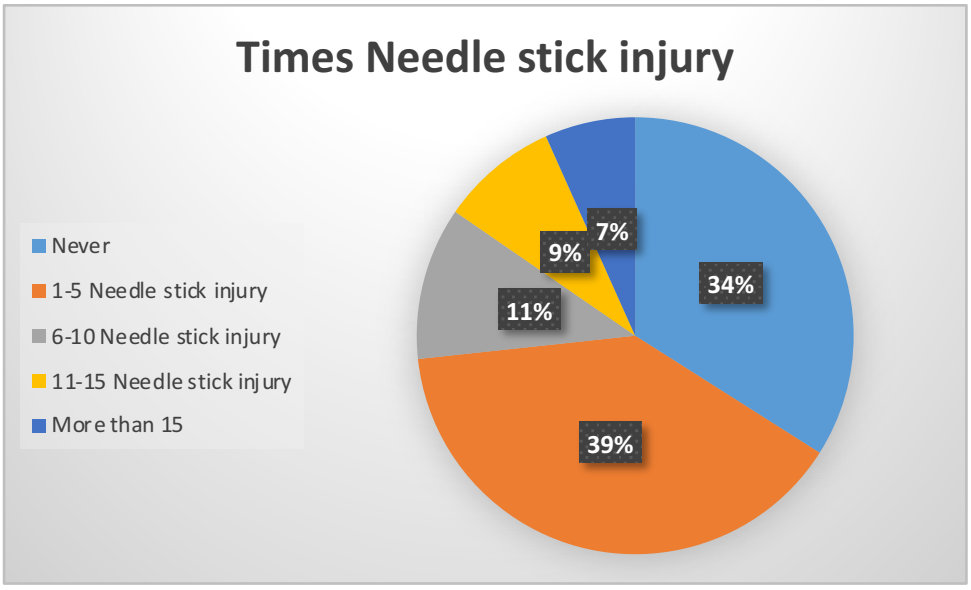

Figure 5: number of times needle stick injury responses at King Abdul-Aziz University Hospital.

4.2. Result analysis for answers of the second question:

Question two: Which practice causes needle stick injuries among the various health worker categories working in the Abdul-Aziz University Hospital?

For the practices that cause needle stick injuries among the various health worker categories working in the Abdul-Aziz University Hospital, arithmetic means and standard deviations for all the paragraphs of were calculated and shown in the table below.

Table 7: Mean and standard deviation for " health care worker practices that commonly cause NSIs occurrence among them " items and total means of them (n= 150)

N	Item	Percentage (%)					Mean (1-5)	SD	Rank
		Strongly do not agree	Do not agree	To some extent (not certain)	Agree	Strongly Agree			
1	Passing needles from one worker to another is the main causative practice for NSIs occurrence.	8.0	10.7	16.0	44.0	21.3	3.60	1.170	8
2	One of the common practices that cause NSIs occurrence is the needles' recapping.	3.3	6.0	16.0	47.3	27.3	3.89	.984	1

3	The accidently collisions between HCWs represents a common cause of NSIs occurrence in King Abdul-Aziz University Hospital	8.0	11.3	18.0	48.0	14.7	3.50	1.123	9
4	Neglecting the appropriate standards of discarding utilized needles is the main causative practice for NSIs occurrences.	6.0	18.7	18.7	39.3	17.3	3.43	1.155	10
5	Concealed needles in bed linens and sheets represent a common cause of NSIs occurrences.	2.7	10.7	22.0	44.0	20.7	3.69	1.003	4
6	HCWs tiredness and exhaustion would represent another factor of NSIs commonly occurrences.	4.0	14.0	28.0	42.7	1.3	3.43	.999	10
7	HCWs uncovering of their open skin areas or lesions on hands and arms at all times is a danger practice that would increase NSIs occurrence.	1.3	14.7	19.3	48.0	16.7	3.64	.971	7
8	The utilization of inappropriate disposal containers for the collection and disposing of needles represent a common cause of NSIs occurrences.	4.0	9.3	16.0	46.7	24.0	3.77	1.044	3
9	The non-utilization of Personal Protective Equipment (PPE) represents a common cause of NSIs occurrences.	2.0	12.0	18.0	52.0	16.0	3.68	.951	5

10	The non-utilization of protected needle devices, or needle-free systems with self-sealing ports and syringes is the main causative practice for NSIs occurrences.	1.3	11.3	19.3	41.3	26.7	3.81	1.001	2
11	The inappropriate education and training of HCWs on the safe utilization of needles represent a common cause of NSIs high occurrence.	5.3	13.3	11.3	49.3	20.7	3.67	1.109	6
Total Means							3.647	.5736	

Shown in table (7) that the arithmetic means of paragraphs "health care worker practices that commonly cause NSIs occurrence among them", mean ranged between (1 -5), as 1 point for the strongly disagree and 5 points for who strongly agree. Answers' mean range was between (3.43-3.89), and most notably the highest means reached (3.89) out of (5) for the second item "One of the common practices that cause NSIs occurrence is the needles' recapping" respectively by agree, then for item (10) "The non-utilization of protected needle devices, or needle-free systems with self-sealing ports and syringes is the main causative practice for NSIs occurrences" by agree (means 3.81). And the lowest mean recorded was (2.43) for items (4), (6) "Neglecting the appropriate standards of discarding utilized needles is the main causative practice for NSIs occurrences", "HCWs tiredness and exhaustion would represent another factor of NSIs common occurrences" by agreeing. The total mean for "practice causes needle stick injuries among the various health worker categories working

in the Abdul-Aziz University Hospital" reached (3.647) and standard deviation (0.573).

4.3. Results for the third question answers:

Question three: What is the post-exposure to needles stick injury management practice in the Abdul-Aziz University Hospital among health workers?

To answer this question, means and standard deviation for the management practice post-exposure needles stick injury in the Abdul-Aziz University Hospital among health workers were measured, table (8) shows that:

Table 8: Means and standard deviation for " Management practices post-exposure needles stick injury" items and total means of them (n= 150)

N	Item	Percentage (%)					Mean (1-5)	SD	Rank
		Strongly do not agree	Do not agree	To some extent (not	Agree	Strongly Agree			
1	One of the most important practices to be taken after the occurrence of needles stick injury is to report the incident and exposure immediately to your employer.	2.0	5.3	6.7	52.0	34.0	4.11	.891	1
2	Initiating the injury reporting system used in your workplace and documenting the exposure in detail is necessary as a post-	12.7	11.3	12.7	31.3	32.0	3.59	1.372	9

	exposure needles stick injury safety practice.								
3	Identifying the source patient is also important to be conducted as a management practice for post-exposure needles stick injury.	2.7	8.7	12.0	44.0	32.7	3.95	1.019	2
4	Reporting the location of the NSIs occurrence (patient room, operating room, emergency department, etc.) represent an important management post exposure practice.	3.3	6.7	21.3	50.7	18.0	3.73	.946	6
5	Reporting the type of needles whether its contaminated or not and the purposes of its utilization is also considered as an important management practice after NSIs occurrence.	3.3	14.0	15.3	47.3	20.0	3.67	1.053	7
6	Documenting the severity of the injury (superficial, moderate or severe) is also an important safety management practice after the occurrence of NSIs.	2.0	11.3	16.7	44.7	25.3	3.80	1.010	5
7	Identifying the dominant hand of the injured worker and the degree of needle's penetration during the injury (single, double or no gloves is necessary as a	4.0	12.7	14.7	32.7	36.0	3.84	1.165	4

	post-exposure needles stick injury safety practice.								
8	Getting confidential follow-up, post-exposure testing at six weeks, three months, and six months, depending on the risk, at one year represents a necessary post-exposure needles stick injury safety practice.	2.7	16.0	17.3	44.0	20.0	3.63	1.059	8
9	HCWs receiving of monitoring and following-up of (post-exposure prophylaxis PEP) represent a necessary post-exposure needles stick injury safety practice.	6.7	26.0	13.3	42.7	11.3	3.26	1.161	10
10	Infected HCWs by NSIs must take precautionary measures to prevent exposing others until follow-up testing is complete represents a necessary post-exposure needles stick injury safety practice.	2.7	11.3	11.3	44.7	30.0	3.88	1.049	3
Total Means							3.745	.6425	

Table (8) Shows that the means measurements for the paragraphs related to " post-exposure needles stick injury management practices " ranges between (3.26-4.11), and most notably the highest mean recorded (4.11) out of (5) for the item (1) by agree, then for the item (3) by Agree (mean

3.95). And the lowest mean was (3.26) for item (9) "HCWs receiving of monitoring and following-up of (post-exposure prophylaxis PEP) represent a necessary post-exposure needles stick injury safety practice" by agreeing.

All respondents agreed with the management practice post-exposure needles stick injury in the Abdul-Aziz University Hospital among health worker reached (3.745) and standard deviation (0.643).

Results of question four answers:

Question four: Is there a statistically significant relationship between the rate of NSI and demographic variables of Abdul-Aziz University Hospital health workers (Gender, Age, Job categories)?

One-way ANOVA was performed. The independent t-test was applied to investigate the relationship of gender on the rate of NSI of Abdul-Aziz University Hospital health workers (gender was the independent variable, the scores of all scales the dependent variable). Independent t-test for differences between male and female regarding the Needle-Stick Injuries among Healthcare Workers in King Abdul-Aziz University Hospital was applied, tables below show the results.

One-way ANOVA was used for variables that have more than two categories, it was applied to investigate differences between the participants' responses according to age and Job categories variables.

	Type	No of Ts	Mean	SD	Std. Error Mean	T-Value (148)	Sig.
Health care worker practices that commonly cause NSIs occurrence among them	Male	114	3.6388	.54859	.05138	0.323	0.747
	Female	36	3.6742	.65425	.10904		

Management practices post-exposure needles stick injury	Male	114	3.7333	.62523	.05856	0.406	0.685
	Female	36	3.7833	.70244	.11707		
Needle-Stick Injuries among Healthcare Workers in King Abdul-Aziz University Hospital	Male	114	3.6838	.50993	.04776	0.420	0.675
	Female	36	3.7262	.58403	.09734		

Table 9: Independent t-test results to the differences between male and female

Table (9) presents that independent sample t-test was conducted to compare the rate of NSI of Abdul-Aziz University Hospital health workers for males and females. There was no statistically significant relationship in health care worker practices that commonly cause NSIs occurrence among them. For males (M=3.64, SD=.549) and females (M=3.67, SD=.654; t (148) =0.323, p=.747, two-tailed). The magnitude of the differences in the means (mean difference=-0.0355, 95% CI: -0.253 to.182).

There was no statistically significant relationship in post-exposure needles stick injury management practices for males (M=3.73, SD=.625) and females (M=3.78, SD=.702; t (148) =0.406, p=.685), the magnitude of the differences in the means (mean difference=-.050, 95% CI: -.293 to.193).

There was no statistically significant relationship in needle-stick injuries among healthcare workers in King Abdul-Aziz University Hospital for males (M=3.68, SD=.510) and females (M=3.73, SD=.584; t (148) =0.420, p= .675), the magnitude of the differences in the means (mean difference= -.042, 95% CI: -.242 to.157).

The following table shows the results of the independent samples ANOVA for the dependent variables among the different levels of age and Job categories. It can be seen that there were significant differences in the participants' responses to the rate of NSI of Abdul-Aziz University Hospital health workers.

Table 10: differences in the rate of NSI of Abdul-Aziz University Hospital health workers according to age

M (SD)						F-test (4)	Sig.
	under 25 (n=2)	25-30 (n=46)	31-35 (n=21)	36-40 (n=15)	over 40 (n=66)		
Health care worker practices that commonly cause NSIs occurrence among them	2.31(0.449)	3.74(0.489)	3.48(0.788)	3.68(0.856)	3.67(0.408)	3.735	0.006

Management practices post-exposure needles stick injury	3.00(1.414)	3.75(0.547)	4.01(1.013)	3.67(1.022)	3.70(0.354)	1.699	0.153
Needle-Stick Injuries among Healthcare Workers in King Abdul-Aziz University Hospitalmale	2.64(0.909)	3.75(0.423)	3.73(0.823)	3.67(0.898)	3.68(0.285)	2.211	0.071

*significant results

A one-way ANOVA analysis of variance indicated that there was a statistically significant relationship in health care worker practices that commonly cause NSIs occurrence among them with the following age categories, < 25 years (M=2.31, SD=.449), 25–30 years (M=3.74, SD=.489), 31–35 years (M=3.48, SD=.788), 36–40 years (M=3.86, SD=.856) and over 40 years (M= 3.67, SD= .408, P < .001) age.

There was a no statistically significant relationship in post-exposure needles stick injury management practices amongst the <25 years (M=3.00, SD=1.414), 25–30 years (M=3.75, SD=.547), 31–35 years (M=4.01, SD=1.013), 36–40 years (M=3.67, SD=1.022) and over 40 years (M= 3.70, SD= .354, P > .001) age.

There was no statistically significant relationship in needle-stick injury among healthcare workers in King Abdul-Aziz University Hospital amongst the <=- 25 years (M=2.64, SD=.909), 25–30 years (M=3.75, SD=.423), 31–35 years (M=3.73, SD=.823), 36–40 years (M=3.67, SD=.898) and over 40 years (M= 3.68, SD= .285, P > .001).

To explore the places of significant difference, post Hoc test (Scheffe) was applied; tables below show that.

Table 11: the results of (Scheffe) for "health care worker practices that commonly cause NSIs occurrence among them", due age variable

Age	under 25	25-30	31-35	36-40	over 40
under 25		-1.4249*	-1.1623	1.3606*	-1.3485*
25-30	1.4249*		0.2626	0.0643	0.0764
31-35	1.1623	-0.2626		-0.1983	-0.1862
36-40	1.3606*	-0.0643	0.1983		0.0121
over 40	1.3485*	-0.0764	0.1862	-0.0121	

*** Differences are statistically significant at the level of significance (α ≤0.05)**

Table (11) shows that:

- The places of significant difference in "health care worker practices that commonly cause NSIs occurrence among them" due to age variable was between two category < 25 years and 25-30 years in favor of 25-30 years category the mean was (3.74), but < 25 years category mean was (2.31).
- The places of significant difference in "health care workers practices that commonly cause NSIs occurrence among them" due to age variable was between two categories <25 years and 36-40 years in favor of 36-40 years category by mean (3.68), but < 25 years category mean was (2.31)

- The places of significant difference in "health care workers practices that commonly cause NSIs occurrence among them" due to age variable was between the two categories < 25 and > 40 in favor of > 40 category the mean was (3.67), but < 25 category the mean was (2.31)
- There are no statistic significant differences between other categories.

Table 12: differences in the rate of NSI of Abdul-Aziz University Hospital health workers according to Job categories

	Type	No of Ts	Mean	SD	Std. Error Mean	F-Value (9)	Sig.
Health care worker practices that commonly cause NSIs occurrence among them	Physicians	26	3.8916	.54182	.10626	2.461	0.012
	Nurses	18	3.3232	.94693	.22319		
	Attendants	41	3.7716	.37379	.05838		
	Technicians	53	3.5883	.45650	.06271		
	Dental personnel	4	3.4773	.30940	.15470		
	Laboratory personnel	2	4.0909	.12856	.09091		
	Therapists	1	3.6364	.	.		

	Emergency medical service personnel	2	2.9545	1.34993	.95455		
	Pharmacist	1	3.7273	.	.		
	Fronsic medicine	2	2.9545	1.09280	.77273		
Management practices post-exposure needles stick injury	Physicians	26	4.2269	.55249	.10835	2.673	0.007
	Nurses	18	3.7444	1.10678	.26087		
	Attendants	41	3.6829	.35700	.05575		
	Technicians	53	3.6245	.53813	.07392		
	Dental personnel	4	3.5000	.52915	.26458		
	Laboratory personnel	2	3.8000	.28284	.20000		
	Therapists	1	3.0000	.	.		
	Emergency medical service personnel	2	3.2000	1.69706	1.20000		
	Pharmacist	1	4.0000	.	.		

	Fronsic medicine	2	3.2000	.28284	.20000		
Needle-Stick Injuries among Healthcare Workers in King Abdul-Aziz University Hospitalmale	Physicians	26	4.0513	.42548	.08344	2.803	0.005
	Nurses	18	3.5238	.97316	.22938		
	Attendants	41	3.7294	.25004	.03905		
	Technicians	53	3.6056	.40797	.05604		
	Dental personnel	4	3.4881	.38170	.19085		
	Laboratory personnel	2	3.9524	.20203	.14286		
	Therapists	1	3.3333	.	.		
	Emergency medical service personnel	2	3.0714	1.51523	1.07143		
	Pharmacist	1	3.8571	.	.		
	Fronsic medicine	2	3.0714	.70711	.50000		

*significant results

Table (12) shows that:

- There are statistically significant relationships at significant level (α ≤0.05) in "health care workers practices that commonly cause NSIs

occurrence among them", due to Job categories variable F value was (2.461) by sig (0.012).

- There is a statistically significant relationship at significant level (α ≤0.05) in "post-exposure needles stick injury management practices", due to Job categories variable F value was (2.673) by sig (0.007).
- There are statistically significant relationships at significant level (α ≤0.05) in "needle-Stick Injuries among Healthcare Workers in King Abdul-Aziz University Hospital", due to Job categories variable F value was (2.803) by sig (0.005).

Results for question five answers:

Question five: Is there a statistically significance relationship between the rate of NSI and the injuries occurrence location in the Abdul-Aziz University Hospital?

To answer this question was applied one-way ANOVA test analysis for differences between the participants' responses according to occurrence location variables regarding the needle-stick injuries among healthcare workers in King Abdul-Aziz University Hospital, as the table shows results of the analysis.

Table 13: differences in the rate of NSI of Abdul-Aziz University Hospital health workers according to occurrence location

	Type	No of Ts	Mean	SD	Std. Error Mean	F-Value (8)	Sig.
Health care worker practices that commonly cause NSIs occurrence among them	Patient room	11	3.1653	1.01217	.30518	1.885	0.067
	Emergency department	24	3.5758	.76044	.15522		
	Intensive care unit	18	3.5606	.32889	.07752		
	Operating room	21	3.5844	.45958	.10029		
	Outpatient clinical office	14	3.8831	.36088	.09645		
	Dental Clinic	14	3.7403	.38048	.10169		
	At home	9	3.8687	.46379	.15460		
	Never been injured	32	3.7670	.46638	.08244		
	Not at hospital	7	3.5714	.66331	.25071		
Management practices	Patient room	11	3.4545	1.19194	.35938	0.772	0.628

post-exposure needles stick injury	Emergency department	24	3.8375	.99381	.20286		
	Intensive care unit	18	3.7278	.24688	.05819		
	Operating room	21	3.8143	.41748	.09110		
	Outpatient clinical office	14	3.7929	.30751	.08218		
	Dental Clinic	14	3.6429	.63575	.16991		
	At home	9	3.4556	.26977	.08992		
	never	32	3.8563	.51802	.09157		
	Nothing	7	3.7000	.59161	.22361		
Needle-Stick Injuries among Healthcare Workers in King Abdul-Aziz University Hospital	Patient room	11	3.3030	1.05308	.31751	1.129	0.347
	Emergency department	24	3.7004	.79142	.16155		
	Intensive care unit	18	3.6402	.20931	.04933		
	Operating room	21	3.6939	.33285	.07263		

	Outpatient clinical office	14	3.8401	.26056	.06964		
	Dental Clinic	14	3.6939	.40951	.10945		
	At home	9	3.6720	.31983	.10661		
	Never been injured	32	3.8095	.38515	.06809		
	Not at the hospital	7	3.6327	.56925	.21516		

*significant results

Table (12) shows that:

- There is no statistically significant relationship at significant level (α ≤0.05) in "health care worker practices that commonly cause NSIs occurrence among them", due to occurrence location variable F value was (1.885) by sig (0.067).
- There is no statistically significant relationship at significant level (α≤0.05) in "management practices post-exposure needles stick injury", due to occurrence location variable F value was (0.772) by sig (0.628).
- There is no statistically significant relationship at significant level (α≤0.05) in "needle-Stick Injuries among Healthcare Workers in King Abdul-Aziz University Hospital", due to occurrence location variable F value was (1.129) by sig (0.347).

Chapter five: Discussion and Recommendations

Introduction

This chapter discusses the results and the main conclusions that the researcher has arrived at as a result of the analysis and discussion of the results. It also deals with the suggested recommendations and ends with suggestions for further research.

Discussion of the Results

Analysis of the results of the present study revealed that the participants achieved the main aim of the study, examined and addressed the frequency rate of needle stick injuries among health workers in Abdul-Aziz University Hospital. The results showed that occurrence of needle stick injuries the has same rate between both genders.

The results suggest that there is a statistically significant relationship in needle-stick Injuries among healthcare workers in King Abdul-Aziz University Hospital and Job categories variable. Also, results showed that statistically significant relationship in the health care worker practices that commonly cause NSIs occurrence among them depend on the age variable.

In term of occurrence location variable, results found that no statistically significant relationship existed based on occurrence location, there is no statistically significant relationship in needle-stick injuries among healthcare workers in King Abdul-Aziz University Hospital depends on the occurrence location.

Results analysis of the present study revealed that healthcare workers practices that commonly cause NSIs occurrence among them is the needles' recapping and the non-utilization of protected needle devices, or needle-free systems with self-sealing ports and syringes is the main causative

practice for NSIs occurrences. This result is similar to a study held in Nigeria by Isara, A. (2015), where recapping of needles 19/50 (38.0%) and patient aggression 13/50 (26.0%) were responsible for most injuries.

Also, the results show that one of the most important practices to be taken after the occurrence of needles stick injury is to report the incident and exposure immediately to the employer, identifying the source patient is also important to be conducted as a post-exposure needles stick injury management practice, and infected HCWs by NSIs must take precautionary measures to prevent exposing others until follow-up testing is complete represents a necessary post-exposure needles stick injury safety practice from post-exposure needles stick injury management practices.

The results of the current study are consistent with the study conducted by Abdulmahdi (2014) where the study was held among 300 physicians and nurses, the study resulted in that underreporting was a direct result of time restriction, workload pressure and an authoritative culture of quietness towards NSIs.

These results agree with the results of a study conducted by Sahmsulddin (2015) reached that the expense of needle stick injuries additionally incorporate loss of worker efficiency and time, cost of the staff members exploring the injuries, cost of lab testing, and cost of the treatment if required.

Thomas and Murray (2009) found that needle stick occurrences are related with critical hazard to HCWs health, career, patients and families which reflect the importance of reporting such cases.

Many previous studies have confirmed the importance of examining the needle-stick injuries among healthcare workers in King Abdul-Aziz University Hospital, Memish, Assiri, Eldalatony, Hathout, Alzoman & Undaya, and Memish et al. (2013) stated that the nurses were classified as the most influenced category and the utilization of instruments is the most widely recognized action related with the occurrences.

Recommendations

In the light of the results and question answers, the following recommendations are made:

- There is a need to reconsider and reflect on the appropriate standards of discarding utilized needles is the main causative practice for NSIs occurrences.
- Initiating the injury reporting system used in your workplace and documenting the exposure in detail is necessary as a post-exposure needles stick injury safety practice.
- It is important that the HCWs receiving of monitoring and following-up of (post-exposure prophylaxis PEP) post-exposure needles stick injury safety practice.
- Additional research should be carried out to gain a long-term view and insight into the needle-Stick Injuries among Healthcare Workers in King Abdul-Aziz University Hospital.
- There is a need for research to continue carrying out surveys regarding the needle-stick injuries among healthcare workers.

Suggestions for further research

From the results, the summary and recommendations of the study, the following topics could be suggested for further research:

- Similar studies should be conducted, with needle-stick injuries among Healthcare Workers in King Abdul-Aziz University Hospital.
- Extensive studies should be conducted to determine the Needle-Stick Injuries among Healthcare Workers.
- Studies should be conducted to explore other countries successful experience in needle-stick injuries among Healthcare Workers in order to take advantages of its successful experience.

Limitations

This study, like all other studies, suffers from limitations:

- The data for this study was confined to the Needle-Stick Injuries among Healthcare Workers in one country.
- The measurement results for this research were acceptable in terms of reliability and validity, but there is a need for additional work to perfect the measures. Future research can be conducted to overcome these limitations.
- Number of participants cooperated is low compared to the total number of healthcare workers in the hospital.
- Number of participants regarding to their job title and type was not significantly equivalent, which had affected the results in its extremity sometimes depending on the question.

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Declaration of independent work

I hereby declare that I wrote this thesis without any assistance and used only the aids listed. Any material taken from other works, either as a quote or idea have been indicated under ‘Sources’.

Appendix A

Questionnaire

A survey about:

Needle-Stick Injuries among Healthcare Workers in King Abdul-Aziz University Hospital

Despite the technological advances and high awareness in the health sectors, the health care workers still subjected to needle stick injuries while performing their care duties. According to the recent Saudi reports, there are several indications of a high prevalence of NSI rates that have been widely reported across its various regions alongside with the other underreported cases. Therefore, and as long as NSIs are among the most serious occupational hazards that HCWs are exposed to, this study intends to address the frequency rate of those injuries among health care workers in King Abdul-Aziz University Hospital and to assess the distribution of those injuries by gender, age, training course, occurrence location and employing health department. Furthermore, research intends to discover the health worker practices that cause NSIs occurrence and the related safety practice to be conducted after the injuries occurs.

This pioneering study will be conducted in King Abdul-Aziz University Hospital in Jeddah in KSA through the adoption of survey (questionnaire) technique. Kindly, I would like to ask you to fill out the following questionnaire in order to achieve my study data collection goal.

I would be grateful to recognize your point of view as a healthcare worker about the main care practices that cause NSIs occurrence and the related safety practices that should be done after the injuries occurs. Your reply to

the questions here will facilitate me in completing my project. I assure you that all responses to this survey will remain strictly confidential and used for academic research purposes only.

Thank you in advance for your precious time and participation in this research. Your appreciated contribution in this study will have a significant role in opening new horizons for the health care Sector in Saudi Arabia.

For further inquiries and explanation, please do not hesitate to contact me or the director of my study.

Best Regards,

QUESTIONNAIRE

- **Part (1): General Information**

The purpose of this section is to obtain general information related to you as a healthcare worker in King Abdul-Aziz University Hospital. Initially, please choose the most appropriate option from the following questions by putting (√) sign beside the appropriate alternative:

1. **Gender :**

□ Male □Female

2. **Age :**

□Under 25 □25-30 □31-35 □36-40 □Over 40

3. **What is your current job?**

□Physician □Nurse □Attendant □Technician □Dental personnel □Laboratory personnel □Therapist □Emergency medical service personnel □ other, mention (……..)

4. **How many times have you been infected with Needle stick injury during the last 12 months?**

□ Never □ 1-5 □6-10 □11-15 □More than 15

5. **Where did your last Needle stick injury occur?**

□Patient room

□Emergency department

□Intensive care unit

□Operating room

□Outpatient clinical office

□Other (…….)

- **<u>Part (2): Health care worker practices that commonly cause NSIs occurrence among them.</u>**

This section has been designed to obtain information about the main health care workers' practices that cause frequent NSIs occurrence among them. Kindly read the questions carefully and tick (√) the selected choice clearly.

• Please be honest in your responses as long as this data will be important and valuable for the study.

Statement	Strongly do not agree	Do not agree	to some extent (not certain)	Agree	Strongly Agree
1) Passing needles from one worker to another is the main causative practice					

for NSIs occurrence.					
2) One of the common practices that cause NSIs occurrence is the needles' recapping.					
3) The accidently collisions between HCWs represents a common cause of NSIs occurrence in King Abdul-Aziz University Hospital					
4) Neglecting the appropriate standards of discarding utilized needles is the main causative practice for NSIs occurrences.					
5) Concealed needles in bed linens and sheets represent a common cause of NSIs occurrences.					
6) HCWs tiredness and exhaustion would represent another factor of					

NSIs commonly occurrences.					
7) HCWs uncovering of their open skin areas or lesions on hands and arms at all times is a danger practice that would increase NSIs occurrence.					
8) The utilization of inappropriate disposal containers for the collection and disposing of needles represent a common cause of NSIs occurrences.					
9) The non-utilization of Personal Protective Equipment (PPE) represents a common cause of NSIs occurrences.					
10) The non-utilization of protected needle devices, or needle-free systems with self-sealing ports and syringes is the main causative					

practice for NSIs occurrences.					
11) The inappropriate education and training of HCWs on the safe utilization of needles represent a common cause of NSIs high occurrence.					

- **Part (3): Management practices post-exposure needles stick injury.**

This section has been designed to obtain information about the related safety practices that normally applied after the injuries occur. Kindly read the questions carefully and tick (√) the selected choice clearly.

- Please be honest in your responses as long as this data will be important and valuable for the study.

Statement	Strongly do not agree	Do not agree	to some extent (not certain)	Agree	Strongly Agree
1) One of the most important practices to be taken after the occurrence of needles stick injury is to report the incident and exposure					

immediately to your employer.					
2) Initiating the injury reporting system used in your workplace and documenting the exposure in detail is necessary as a post-exposure needles stick injury safety practice.					
3) Identifying the source patient is also important to be conducted as a management practice for post-exposure needles stick injury.					
4) Reporting the location of the NSIs occurrence (patient room, operating room, emergency department, etc.) represent an important management post exposure practice.					

5) Reporting the type of needles whether its contaminated or not and the purposes of its utilization is also considered as an important management practice after NSIs occurrence.					
6) Documenting the severity of the injury (superficial, moderate or severe) is also an important safety management practice after the occurrence of NSIs.					
7) Identifying the dominant hand of the injured worker and the degree of needle's penetration during the injury (single, double or no gloves is necessary as a post-exposure					

needles stick injury safety practice.					
8) Getting confidential follow-up, post-exposure testing at six weeks, three months, and six months, and depending on the risk, at one year represents a necessary post-exposure needles stick injury safety practice.					
9) HCWs receiving of monitoring and following-up of (post-exposure prophylaxis PEP) represent a necessary post-exposure needles stick injury safety practice.					
10) Infected HCWs by NSIs must take precautionary measures to prevent exposing others until follow-					

up testing is complete represents a necessary post-exposure needles stick injury safety practice .					

Thank you very much for your time and cooperation…