



# Needle Stick Injury among Nurses and Prevention Strategies: A Literature Review

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## **Needle stick injury among Nurses and Prevention Strategies**

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Needlestick injury (NSI) is any injury caused by sharp needles and lancets that are contaminated with another person's body fluid. Nurses are the first level of the staff who are at risk of NSI. The risk of injuries can be reduced by various prevention methods. Prevention of NSI is the most important aspect to promotion of Nurses safety as well as patient safety.

The purpose of the study is to explore evidence-based information about the prevention of needle stick injuries among nurses. The study aims to describe the preventive measures for needle stick injury that can be applied to nurses. The research question for our study is "What is the possible prevention of needle stick injury among Nurses?"

The research method used in this thesis is descriptive literature review. Data were collected from academic nursing data including CINAHL(EBSCO), ProQuest, PubMed Central, and google scholar. By implementing thesis-related keywords in the advanced search tools of these databases and considering the inclusion and exclusion criteria, eleven articles were selected for review based on their title, abstract, and full text. Collected data were analyzed using the thematic analysis method.

The findings were categorized into three major themes which are education and training, use of safety measures and safe work practice. The study showed that safety measures such as use of engineered safety devices, avoiding the recapping of needles are more effective in preventing NSI. Moreover, providing education and training regarding the safety use of needles is a reliable approach to reducing NSI.

**Keywords:** Needle stick injury, Prevention, Nurses, Literature Review

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## 1. Introduction

Needle skin injury is a penetrating or cut wound in the skin by a needle or a sharp instrument in which the needle was contaminated with another person's blood, tissue, or other body fluids the injury (CDC 2021). Needle stick injury is recognized as an occupational health hazard among millions of healthcare workers. Nurses are at high risk of needle stick injury from syringes and intravenous (IV) equipment relative to other healthcare workers (Mengistu, Tolera & Demmu. 2021).

According to the World Health Organization (WHO) 2016, every year 16 billion injections are administered in which some of them are disposed safely but not all equipment's are disposed safely. This unsafe handling of this equipment leads to many risks of injuries. Injection is a skin perforating procedure which is done with a syringe and needle to provide a substance/ medicine for preventing, treating or recreational purposes. Injections are commonly used in medical procedures. A safe injection is one that does not harm the customer, does not expose any risk to the health provider and does not have any waste that is dangerous to the community and others. To ensure safe injection practices, health workers should use aseptic techniques throughout all aspects of injection preparations and administration (WHO 2016).

Most needle stick injuries have been found among nurses, surgeons, emergency medical technicians, surgery technologies, and laboratory technicians. Needle stick injuries do not occur with the same frequency among healthcare workers. This injury has also been found in the housekeeping personnel and people who manage and clean sharp boxes also. Needle stick injury is not only limited to hospitals as it occurs in other healthcare facilities like clinics, outpatient surgery, day surgery, urgent care centers, nursing homes, and cosmetic surgery clinics (King & Strony 2022).

Needle stick injury has many impacts among the health care members. Despite many strategies and regulations, the injuries are still prominent. The number of injuries is declining but still not totally prevented. Although the main impact of NSI is infection with serious diseases but it also has a humanistic burden, economic burden, clinical burden etc. After injury, health workers felt psychological effects like feeling anxious, depression. Not only the psychological effect and physical effect, but also the economic burden after needle stick injury is also high (Cooke & Stephens 2017).

The history of needle stick injury awareness started with the seminal study done by McCormack and Maki in 1981 when AIDS was a breakthrough all over the world. The study revealed that only 8.2% of healthcare workers have reported sharp injuries and the most injuries, 23%, occurred during the disposal of used needles. After two years of the study, one healthcare worker contracted an

occupational disease. After that incident new concepts and global awareness started and preventive strategies for needlestick injuries were made (Wakelam 2018).

Preventive measures can be taken on different levels. The evidence based preventive measure of NSI can promote the occupational safety of nurses as well as other health workers. In addition, it improves the safety of patients. Prevention of disease and promotion of health is one of the core factors of the nursing profession. More than 80% of needle stick injuries are prevented by effective safety programs. NSI are prevented by "Universal Precaution" guidelines as a safety measure (Centre for disease control and prevention (CDC) 2021).

Needle stick injuries cause a high burden of death and disability among health workers. Being as frontline health workers, nurses are always at risk of injury. Nurses are major victims to suffer needle stick injuries as they deal with sharp and cutting-edge instruments compared to other health workers (Hosseinipalangi, Golmohammadi, Ghashqhaee, Ahmadi, Hosseinifard, Mejareh, Dehnad, Aghalou, Jafarjalal, Aryankhesal, Rafiei, Khajehvand, Nasab & Kan 2021). Despite the high incidence of needle stick injury among nurses, there is less knowledge regarding prevention of NSI and low awareness of reporting injuries. In this thesis, authors are going to explore the information about the prevention of needle stick injury by using a method of descriptive literature review to fill a research gap in this topic.

## 2. Background

### 2.1. Prevalence of needle stick injuries

NSI is one of the most common and serious risk infections resulting from sharp or contaminated needles to health workers. Due to the nature of work in hospitals, nurses are at high risk of accidental needle stick injuries and sharp injuries. Around three million health workers have needlestick injuries each year. Among all healthcare workers, the prevalence of injuries caused by sharp objects is highest among nurses, compared to others (Nirmala & Suni 2019; Isada 2018). The incidence of needle stick injury is higher in nurses who have a low level of knowledge about prevention and who do not have any relevant training or education (Quadire, Ballad, Omar, Aldiabat, Shindi & Khalaf 2021).

Approximately, in Europe, 8 million healthcare workers are at risk of NSI whereas more than one million such injuries are estimated in healthcare facilities across the European Union each year (Health Management 2014). The occurrence of needlestick injuries differs in the hospitals, different units from the same hospital as injuries happen continuously in the daily work of nurses (King & Strony 2022).

In Finland, there was not any recent data about the incidence or prevalence of needlestick injury, but the study done in 2008 by Anttilla, Havi, and Taskinen has found that there is an average of 100 pricks/annum/1000 employees by accidental blood contamination at Finnish hospitals during patient care (Vuoriluoto 2008). Occupational blood-related injuries in Finland are more than one thousand per year. Among them, needlestick injuries are the most common. In the Helsinki Uusimaa Hospital, only, more than half a percentage of the injury are related to NSI (Anttilla 2019). In three years from 2006 to 2008 in three districts of Finland, over half 54 % of needle stick injuries occurred among nurses and 13 % among the doctors (Salminen & Parantainen 2012).

The incidence rate of NSI in the United Kingdom is 1,00,000, in Canada 70,000, and in Australia 18,000 per year among healthcare workers (Wakelam 2018; Medical Technology Association of Australia 2023; Isada, Tustin & Meldrum 2018). According to CDC 2021, reported cases of NSI among healthcare workers in the United States is more than 3,85,000 in a year.

Although the NSI incidence rate is based on different things, the prevalence of NSI in developing countries is higher than the developed countries (Al-Tell & Almurr2013) The prevalence of NSI in India is 69%, in Iran is 44%, in Saudi Arabia 34.8%, in Pakistan 36.9% among nurses per year ((Gupta, Saxena, Agrawal & Singh 2019; Rezaei, Hajizadeh, Zandian, Fathi, & Nouri 2017; Muhammad, Ayub, Muhammad & Hanif 2019; Abaikhail, Kabir, Elmossad, Alshwami, Alhumaydhi, Alslamah, Almoammar, Alslamah & Mahmud. 2022). The incidence rate of NSI among 113 WHO-

affiliated countries was 43% whereas Africa has the highest injury rate which was 51% (Hosseinipalangi et al. 2021).

## 2.2. Predisposing Factors of needle stick injury

The injury caused by a needle or sharp object is known as a needlestick injury. Needlestick injury occurs when administering the medicine, while preparing the medication, when recapping the needles, while carrying the medicine without proper equipment, or opening the needle cap. Other incidents when needlestick injuries occur are sudden movements of the patients, improper disposal of needles, taking blood samples or suturing, and the nurses who do not wear proper protecting equipment while using sharp instruments (Quadire et al. 2021; Kumar and Belagatti 2013; Hosseinipalangi et al. 2021)

The incidence of NSI was more frequent in women than men (Hosseinipalangi et al. 2021). Adams 2012 shows that needlestick injury occurs from a variety of factors including sharp objects, types of devices and procedures, knowledge of safer sharp use and proper disposal and lack of knowledge and awareness of the consequences of needlestick injury. NSI also occurs during the rush situation and lack of competence to use sharp objects (Vuoriluoto 2009). Lack of adequate resources and work overload is also associated with the incidence of NSI (Adams 2012).

The highest number of needlestick injuries occurred during the use of sharp objects (52.7%) and 22% occurred after use and before disposal of sharp objects or needles. Most cases of needle stick injury are caused by hypodermic needles (i.e., intramuscular, subcutaneous, or intra/dermal (injections using disposable syringes and needles world-wide. Due to the improper disposal of needles, 35.4% of injuries occur in America, 32% in European countries and 13% in Russia, and 34.6% in Saudi Arabia (Cooke & Stephens 2017).

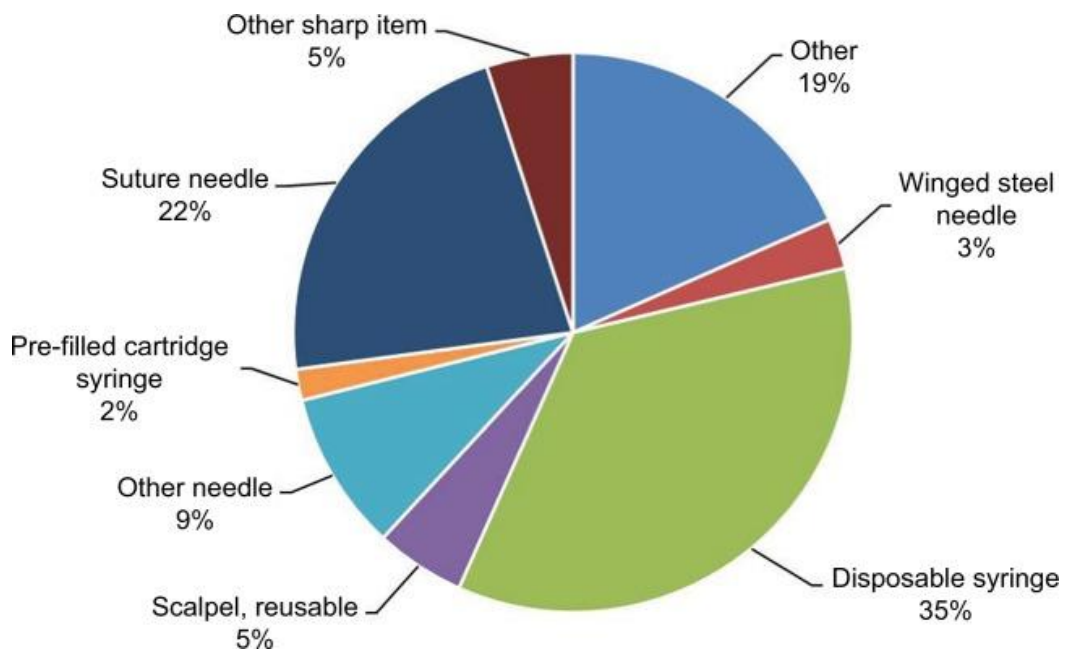


Fig 1. Frequency of needle stick injury by device. (Exposure prevention information network, 2014)

The risk factors of needle stick injury have explained that needlestick injury has been categorized into two groups modifiable and nonmodifiable. Nonmodifiable risk factors include conditions that cannot be altered. Among the healthcare workers, women, nurses, and workers between the ages of 21-30 have the highest rate of injuries. Modifiable risk factors include a poor working environment such as a shortage of staff, inadequate needle disposal procedures, and long working hours. Staff mental and physical stress related to working conditions also contribute to higher NSI rates (Cooke & Stephens 2017).

NSI mostly occurs in general medical wards, operating rooms, emergency departments, intensive care units (ICU), and critical care units (ICU). In the United States, 35% of sharp injuries occur in operating rooms whereas in Saudi Arabia 31.4% occur in patients' rooms, 17.2% in emergency rooms, and 14.7% in ICU&CCU (Cooke & Stephens 2017).

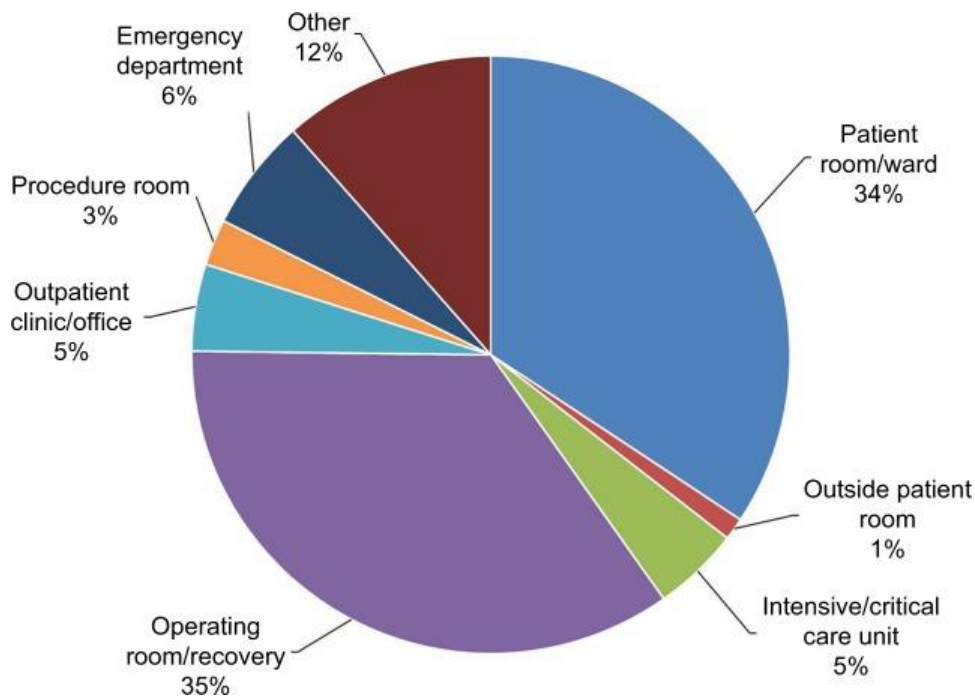


Fig 2. Work location where reported sharp injuries occurred, n=592 (Exposure prevention information network 2014)

### 2.3. Transmission of blood borne pathogens

Blood borne pathogens are infectious microorganisms that can cause disease in humans. Healthcare workers face high risk of exposure to bloodborne pathogens due to needlestick injuries. Through the needle stick injury, almost all organisms can be transmitted. But in the clinical concern, only the handful of organisms are discussed mostly (King & Strony 2022). The most common bloodborne pathogens are Human immunodeficiency virus (HIV), hepatitis B virus (HBV) and hepatitis C virus (HCV). These bloodborne infections cause serious consequences, including long term illness, disability, and death (WHO 2016). All these viruses can be transmitted by exposure to a cut or puncture of blood object or splashing of blood on the mucosal surfaces of body (King & Strony 2022). The possibility of transmitting the infection after injuries depends upon the types of devices, depth of injury, type of organism in the patient blood and prior vaccination status. The risk of transmission of HBV, after a sharp injury is lower than HCV and HIV. The risk of transferring the disease after NSI is 2-40% for HBV, 2.7-10% for HCV, and 0,3% for HIV (WHO 2016).

According to the CDC 2021, universal precautions and use of double gloving reduces the chances of transmitting HBV, HCV, and HIV viruses. The risk of transmitting the HBV virus is depends on the vaccination status of the injured health workers. Fully vaccinated Health workers with hepatitis B vaccination have developed immunity to virus and there is less risk for infection.

#### 2.4. Economic Burden of Needle Stick Injury:

Economic burden is described as the costs related to utilization of health care resources and loss of work (Hoffman 2008). In healthcare facilities, one incidence of sharp or NSI has various direct or indirect costs. The cost goes through the cost of investigation into the injury, expensive laboratory testing, loss of employee time, cost of treating infected staff and cost of hiring new staff. The estimated cost of testing and follow up treatment is up to five thousand dollars. In addition to financial cost, the emotional and mental health disorder on the affected workers and their families are beyond estimation like cost of fear and anxiety, post- traumatic stress disorder and loss of work. It is impossible to estimate the societal costs of seroconversion to HIV and HCV (Cooke & Stephens 2017; Saia, Hoffmann, Sharman & Abiteboul 2010).

The estimated annual cost due to NSI differs from country to country. Needle stick injury is very prominent in every country and the financial burden is high. The estimated annual cost of NSIs in Germany range from €4.6 million to €30 million, £6.1 million in France, €7 million in Italy, 6 million to 7 million euro in Spain, and from £4 million to £300 million England and Wales. Meanwhile the total annual cost in United States is estimated to be 110-550 million euros. The economic cost of these injuries is based on the reported number of NSI, and exact cost still cannot be estimated because larger number of injures are unreported (Saia et al. 2010).

The total burden of needle stick injury in health care worker in China was estimated to be 750 billion euros and among nurses was estimated to be half of the total cost which was 384 billion euros. The direct and indirect costs of the NSI can be different (Zhang, Ai, Liu, Bal, Gala, Erdal & Gao 2019). In Northern India, each needle injury incurs some cost exposure which includes laboratory test and treatment afterwards. The preliminary cost of each needle stick injury varies from €55.17 to €122.76 depending upon the test recommended (Jaggi, Nirwan & Chakraborty, 2020)

The cost increases with each test following up till 6 months.

Table 1: Cost of Needle stick injury in northern India (Jaggi et al.2020) (The figure shows that the cost of the NSI has increased in every follow-up in 6 months).

Cost incurred per NSI (in US\$)					
Category	Source Known				Source unknown
	Viral marker negative	HIV positive <sup>a</sup>	Hep B positive <sup>b</sup>	Hep C positive <sup>c</sup>	
On the day of incident	59.22	98.12	59.22	59.22	98.12
1st follow up	106.34	145.25	106.34	169.98	145.25
2nd follow up	153.47	192.37	153.47	153.47	192.37
Complete	200.6	239.5	200.6	264.23	239.5
No of cases prophylaxis administered	113	12	25 (1 nonimmunized)	15	46

### **3. Prevention of needle stick injury:**

#### **3.1. Prevention**

According to WHO 2023, Prevention is defined as any intervention or methods intended to lessen the possibility that a person would contract an illness or disorder, as well as to stop or reduce the progression of a disorder lowering the rate of disability. To decrease the burden of diseases and their related factors, disease prevention can also be defined as targeted, population and individual-based interventions for primary and secondary (early detection) prevention (WHO 2023).

Primary prevention refers to the measures which were taken to prevent the onset of any disability or disease. This may include actions to improve health through changing the impact of social and economic determinants on health; the provision of information on behavioral and medical health risks; consultation and measure to decrease them at personal and community level; providing education; clinical preventive services; post exposure measures for nurses exposed to the injury (WHO 2023).

Secondary prevention includes the early detection of the problems or associated factors. It focuses on the improvement of the likelihood of positive health outcomes. This includes initiatives like evidence-based screening for NSI and prevention of the disability caused by it. It also includes finding out the interventions or methods which could be effective when used at an early stage of diseases (WHO 2023).

Primary and secondary prevention strategies are very important to prevent or eliminate NSI. Needle stick injuries can be life-threatening and cause serious infection to the nurses. Nurses who use or are exposed to needles in their workplace like almost every day and possess so much risk of getting injury. NSI is important to prevent and to perform interventions as soon as possible if they occur (CDC 2021).

### 3.2. Laws and regulation:

There are also other different laws and regulation for the nurses and NSI prevention like Healthcare Act, Primary health care Act, Sickness insurance Act, Occupational Disease Act, Occupational Health Care Practice and Qualification of Professionals and Experts 2013, Decree in Medical Examination in Work, Health Protection Act, Infectious Disease Act, Act on Health Care Equipment's and Supplies, Act on Protection of Privacy in Health Care (Ministry of Health and Family affairs, 2020). The regulation related to European council directive 2010/32 EU came into force in 2013. The occupational health care and occupational safety act works together with the EU council following its directives (Finlex 317/2013).

In 2010 the European council made the directives for the prevention for sharp injury 2010/32/EU in action and all the union members harmonized the directives in their occupational safety and health act (European agency for safety and health, 2021). In 2014 the new revised regulations for sharp prevention came into action with more principles. The main objectives of the directives are to provide the safest working environment to the workers, to prevent the workers from different injuries caused by all kind of medical sharps, to protect the workers from hazard who are at main risk, to establish integrated approach for making policies in risk assessment, prevention, training, awareness raising and monitoring and to maintain channel for response and follow-up (Council Directive 2010/32/EU).

In the US they have Needle stick prevention and Safety Act of 2000 and other revised Acts related to occupational safety and health are present for the proper management of NSI (NIOSH, 2015). In United Kingdom there are four laws which works for the prevention of NSI: Health and Safety Act 2013, Control of Substances Hazardous to health regulations (COSHH) 2002, Management of Health and Safety Regulations 1999 and Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) 2013 (Health and Safety Executive (HSE), 2023). Similarly in Namibia, Africa they started their first occupational safety health profile in 2014. Under that it comes Labor Act 1992 which includes health and safety at work Act. This act provides and maintains the occupational health of the workers (Ministry of labor, Industrial Relation and Employment Creation, Namibia, 2013/2014). In India, government has made different protocols under Infection Prevention and Control (IPC) along with collaboration with WHO which also includes the regulations for the NSI prevention (Ministry of Health and Family Affair 2020).

The regulation and legislation regarding the health is made by Ministry of Health and Social Affairs in Finland. The occupational safety and health act (738/2002, amendments up to 755/2021) was followed in Finland which focuses on providing proper working environment and good working

conditions to prevent from different occupational accidents and diseases and to remove other risks from the work (Finlex,2022).

#### **4. Purpose, Aim and Research Questions:**

##### **4.1. Purpose:**

The purpose of the study is to explore information about the prevention of needle stick injury among nurses.

##### **4.2. Research Question:**

What are the possible preventions of needle stick injury among nurses?

##### **4.3. Aim**

The aim of the study is to describe the preventive measures of needle stick injury that can be applied for nurses.

## 5. Methodology

### 5.1. Descriptive Literature Review

The methodology applied for this thesis is a descriptive literature review which is used to systematically review the results of previous research works or studies on a chosen topic. Literature reviews documents and states the art with respect to the chosen topic (Royal Literary Fund 2020).

Literature Review is a comprehensive study and interpretation of literature that relates to a particular question. In other words, it is a summary of existing research which is relevant to the selected topic which facilitates the full combination of understanding, interpretation, analysis, clarity of thought and development of arguments (Aveyard, 2019).

Literature Review is an analysis of selected existing research which is relevant to the chosen topic. It explains and justifies the answer to some of the questions. Literature Review is a process involving sourcing, reading, organizing, and analyzing literature and a product involving communication and the interpretation of the literature of chosen topic. It helps to analyze the own results, find the research process and the production of final literature review. It helps to explain the evidence-based findings of the chosen topic (University of Reading, 2022).

It is important to being updated with recent research and developments for healthcare professionals. Literature is increasing in this field. Literature Review facilities the gaining knowledge for healthcare workers by providing synthesized information. (Aveyard,2019)

## 5.2. Data retrieval Criteria:

For data retrieval, inclusion and exclusion criteria were set, then applied in the article search process. The inclusion-exclusion criteria are crucial for filtering unnecessary research papers that are not relevant to this work.

Table 2: Inclusion and Exclusion criteria

Inclusion Criteria	Exclusion Criteria
Articles published between 2010 to 2022.	Articles published older than 2010.
Articles with full text	Articles which are not available online as free text.
Articles published only in English language	Articles other than English language.
Relevant to the research questions in line with the search terms.	Articles not relevant to the study topic
Scientific and research articles, master thesis or dissertation.	Magazines, bachelor thesis and unreliable material online.

### 5.3. Literature search

The data has been acquired from electronic databases accessed through Laurea Finna. The databases were Academic search from like CINAHL, ProQuest centra, PubMed, google scholar. While searching the information, inclusion and exclusion criteria have been used at the beginning of the information search. The three main keywords are used to search the literature are Needle stick injury, Nurses, Prevention. To combine these words, a Boolean moderator “And” was used. The keywords and combinations are “Needle stick injury” and “Nurses” and “Prevention.”

An illustration of the literature research and data collection process are mentioned in the table below:

Table 3: Data Search process

Databases	Search (Key word)	Results	Accepted with topic	Accepted with abstract	Accepted articles with full text
CINAHL	“Needle stick injury” And “Nurses” And “Prevention”	46	15	7	4 (1 was like the ones which has been already selected)
PubMed	“Needle stick injury” “Nurses” “Prevention”	18	4	4	3
ProQuest Central	“Needle stick injury” “Nurses” “Prevention”	431	15	4	2
Google scholar	“Needle stick injury” AND “Nurses” AND “Prevention”	1250	15	6	4 (1 was like the ones which has been already selected)
Total		745	49	21	11

#### 5.4. Data Analysis

The concepts of Thematic Content analysis have been followed for analyzing the collected data in this thesis. Eleven articles have been reviewed to respond to the research question “How can needle stick injury be prevented among nurses?”

The data are collected from the online published articles. The articles were selected from both qualitative and quantitative features. So, thematic content analysis is done in this thesis.

Thematic analysis is a method of identifying, analyzing, and organizing and reporting the data set. It helps to identify the meaning, based on the research question. It is the method of describing the data by selecting codes and developing themes (Braun & Clarke 2006).

Thematic analysis is a process where information is searched from the existing data and extracted as raw new data. Collected information is analysis according to the themes which is used to get the new useful information. Thematic analysis is a descriptive method where researchers identify themes by studying data. In the thematic analysis, it is not necessary to find every theme of the data. It focuses on the key concepts related to research questions. It enables the researcher to get the systematic format of data from the larger volumes of data. (Crosley 2021).

Thematic analysis allows the researcher to find the key aspects from the large data set by sorting them into the themes. It is usually applied in the text, interview, experiences, or transcripts. Researchers closely examine the data to identify the themes (Caulfield 2019). Data related to prevention of needle stick injury among nurses has been collected using the database of Laurea Finna. The databases were used Academic search complete EBSCO, PubMed, ProQuest Central and Google scholar. While, both authors reviewed all the articles gathered. And Approval articles were kept in different folders. Useful, relevant, and important information were highlighted in different colors to make it easy. The articles were read repeatedly. The raw data was finalized, and themes were identified which answers the research question. Thus, in the reporting phase, themes and subthemes are described from the data in a meaningful way which answered the research question.

Table 4: Data search chart

Number of articles	Author, Year and Country	Research tittle, Purpose, and Aim of the Study	Participants of the study(N)	Data collection and analysis methods	Theme of study/Findings
1	Aziz, A, M. 2012, United Kingdom	<p>Reducing needlestick injuries: a review of community service.</p> <p>The study was undertaken to monitor compliance in sharps management and investigated how community nurses were administering IM injections.</p>	Data was collected from 8 different clinics in a period of 2 months.	<p>Data was collected by inspection and prearranging the visit.</p> <p>Data was gathered using proforma technique.</p>	<p>Safety Needles devices</p> <p>Safety Non-touch technique</p> <p>Training</p>
2	Asiye, D. & Kargin, C. 2016, Turkey	<p>Needle stick and sharp injury among nurses</p> <p>Aim is to determine the causes of sharp and needle stick injury in nurses and the use of safety practice exposure, to</p>	201 nurses working in three hospitals in Izmir.	<p>Cross-sectional study</p> <p>Sample was chosen from Random sample method by using questionnaire.</p> <p>Data analysis was done by</p>	<p>Avoiding recapping of needles</p> <p>Disposal systems</p> <p>Use of personal protective equipment's</p>

		blood and blood containing material and contributing factors.		descriptive statistics and paramedic test comparison.	Reporting injuries
3	Balouchi A., Shahdadi, H., Ahmadidarrehshima, S.& Rafiemanesh, H. 2015, South of Iran	A cross sectional study: The frequency, causes and prevention of needlestick injuries in nurses of Kerman hospital.  Aim is to assess prevalence, causes and preventive measures of NSI among nurses in Kerman hospital.	Sample data was 240 nurses working in two hospitals in Kerman.	Samples were collected from Simple Random sampling.  Data was collected through questionnaires.  Analysis was done by using descriptive analytical test.	Training  Proper disposal of needle  Proper rest
4	Calikoglu, E., Bedir, B., Hilal, A. & Gumus, A. 2019, Turkey	Needle stick and sharp injuries among nurses and their practices at Ataturk University research hospital  The aim is to evaluate the frequency of NSI	Data sample was done among 555 nurses.	Cross-sectional study.  Data was collected by using questionnaires.  Analysis of data was done by using SPSS and Chi-square.	Use of personal protective equipment's  Vaccination  Proper rest and work schedule

		among nurses with the elaboration of the utilization of effective preventive measures used for infection control as well as the affecting factor.			
5	Carli, G., Agestra, A., Lecce, M., Marchegiano, P., Micheloni, G., Sossai, D., Campo, G., Tomao, P., Vonesch, N., Leone, S., Puro, V. & The studio Italiano Rischio Ocuupazionale da HIV(SIROH) group, 2022, Italy	Prevention from sharp injuries in the hospital sector: An Italian national observatory on the implementation of the council directive 2010/32/EU before and during the COVID-19 pandemic  Aim is to evaluate the prevention strategy of EU directives in pandemic time	330 nurses and 285 safety managers	Data was collected through an interview.  Data analysis was done by comparing safety managers and nurses.	Use of safety engineered sharps device.  Education and training  Vaccination  Reporting injuries.

6	Huang, H., Chein, H., Lin, W., Chang, C., Chang, M., Su, J.& Mu, P. 2021 Taiwan	Prevention of needle stick injury among nurses in an acute ward of a hospital: a best practice implementation project.  To identify barriers leading to injuries (NSI) and to develop implementation strategies to prevent NSIs in the acute ward of a Taiwan hospital.	Sample size was 177 nurses of Five acute wards.	Data collection was done by using JBI application of clinical evidence system (PACES) and getting research into practice (Grip) approach.  Data analysis was done by Audit technique.	Training and Education  Use of safety engineered devices.  Proper disposal of syringe
7	Kahriman, I., Polat, S., Ghaniye, E.& Kaptan, D 2016; Turkey	Injury experiences and Precautions taken by nurses working in Pediatric wards.  To determine experiences of nurses who are working in the pediatrics clinics of a university hospital and injured with	Seventy-two pediatric nurses	A descriptive study.  Data was collected through the questionnaire.  The data was analysis by using numbers, Percentage, and chi-square.	Education and Training  Vaccination  Use of personal protective equipment's

		penetrative tools and the precautions taken by them.			
8	Mostafa, B., Rostami, K., Marzeih, M. & Shahrzad, Y 2018, Tehran Iran	<p>Evaluating the effectiveness of a continuing education program for prevention of occupational exposure to NSI in nurses based on Kirkpatrick's Model.</p> <p>Aim is to evaluate the effectiveness of a continuing education program about the prevention of occupational exposure to NSI in nurses.</p>	120 nurses using experimental and control groups.	<p>Experimental study</p> <p>Data was evaluated by using four levels (reaction, learning behaviors, results) of Kirkpatrick's model.</p> <p>Data analysis was done by using persons correlation coefficient, chi square test, paired t-test, independent sample t-test and descriptive statistics.</p>	Continuing education program and training
9	Mehdi, J., Rostamabadi, A., Hoboubi, N. & Neda, T. 2016 Iran	Needle stick injuries and their related	Sample data was 168 Iranian nurses who works in	<p>Cross sectional study</p> <p>Data collected by using</p>	Use of engineered safe devices.

		<p>safety measures among nurses.</p> <p>Aim is to determine the prevalence and factors related to NSI and assess related to safety measures among a sample of Iranian nurses</p>	<p>different wards of shiraz university of medical science hospital.</p>	<p>anonymous questionnaires and checklist based on observational methods.</p> <p>Data analysis was done by SPSS method.</p>	<p>Improving injection practices</p> <p>Puncture resistant disposal containers.</p> <p>Use of personal protective equipment's</p> <p>Flexible work schedule</p> <p>Training and continuing education program</p>
10	MacDonald, C. 2016, USA	<p>Needle stick injuries prevention and education</p> <p>The aim is to increase the staff's knowledge related to needle stick injury.</p>	<p>The sample was 17 participants of which 14 completed all surveys.</p> <p>Participants include medical doctors and nurse practitioners.</p>	<p>Data collected was done by doing surveys and seminars and pre and posttest.</p> <p>Data analysis was done by descriptive by using SPSS.</p>	<p>Education regarding prevention and management of injuries.</p> <p>Decreased use of unnecessary needles.</p>

11	Yang, H., Zhang, H, Lu, Y., Gu, Y., Zhou, J. & Bai,.2020 China	<p>A program to improve the knowledge, attitude, and Practice of needlestick and sharp injury through bundled interventions among: An KAP model Based approach to intervention.</p> <p>The aim is to improve the nurse's knowledge, attitude, and practice in NSI.</p>	Sample size was 741 nurses.	Data was collected by using a self-rating anonymous questionnaire based on knowledge, attitude, and Practice (KAP). Data analysis was done by using statistical Package for social science (SPSS) V.18.0.	<p>Training for infection prevention</p> <p>Knowledge regarding infection prevention</p> <p>Using Safety needle device.</p>
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Table 5: Data analysis

Content area	Codes	Themes
<p>Providing informative activities on biological risk and preventive measures related to use of sharps (5,6,11). After education and training, the incidence of NSI is decreasing (8,11). Staff are educated about safe use of needles and disposal of sharps (6) Use of safety engineered injection devices such as syringe with shields or retractable needles and needles with safety features (6,8,10,11).</p>	<p>Education</p>	<p>Education, training, and Awareness</p>
<p>Training regarding use of safety engineered devices, use of sharp instruments and disposal of needles in sharp containers (6,8,11). Training should be provided to nurses to ensure their practice is effective and safe (1,3,11). Training includes lectures, questionnaire and answer sessions, videos, and demonstration (5,6,8)</p>	<p>Training</p>	
<p>Introduced safety engineered devices like peripheral venous and arterial catheters, lancets, syringes, blood gas syringes, insulins pens (5). Safety needle devices have protection mechanisms that reduce exposure to sharp and prevent injuries (1). Availability and use of safety devices (9,11). Avoiding the recapping of needles after use (2,3)</p>	<p>Safety engineered devices</p>	<p>Safety measures</p>
<p>Avoid the use of needles if other safe and alternative methods are available (2).Plan for safe handling of needles before any procedure using needles (2).Use of paper tray, kidney tray</p>	<p>Non-touch methods</p>	

for carrying the sharp instruments, maintaining aseptic technique (1) when it is used correctly, it prevents transmission of infection to the patients and nurses (1) sharps instrument and syringe always carried in a tray (1). Avoiding unnecessary touch to sharp (1). Decreased use of unnecessary needles and sharp instruments (10).		
Use of sharp disposal container helps to reduce injury and infection (2,6). Disposal of used needles in appropriate containers (2,3). Disposal Container should be available in-patient room, workstation, and trolley (5,6)	Use of Puncture Resistant Disposal devices	Work practice Control
Use of double gloves and safety glasses prevents spilling blood (7,9) Prevents bloodborne pathogens (7) Fit properly to the workers (7) Organization provided PPE to protect from work accidents (4)	Use of Personal protective Equipment's (PPE).	
Prevents life threatening diseases like hepatitis B (7) Vaccination should be provided to all healthcare workers (4,5,7) The risk of infection is less after vaccination (5,7).	Vaccination	
Adequate staffing and proper rest (3) Flexible working hours and flexible shifts (11)	Work schedule	
Reporting the injuries as soon as possible (2, 5,10) Procedure, time, date, and type of device should be specified (5)	Reporting injuries	

## 6. Result

In this section after the proper study of articles, data was retrieved from articles which were in connection to the whole topics. In reference to the research question “What are the possible preventions of needle stick injury among nurses?”. The author has divided the findings into subthemes and themes. The themes of the study are education, training and awareness, safety measures and work practice control. All the major themes were collected by analyzing the major findings from their research.

Major themes of Finding:

### 6.1. Education, Training and Awareness:

Seven articles focused on education, training, and awareness to prevent NSI (Aziz 2012, Huang et al. 2022, Balouchi et al. 2022, Mostafa et al. 2018, Macdonald 2016, Carli et al. 2022, Kahrman et al. 2016, Yang et al. 2020). The training and education to the nurses gives positive impact in awareness. Nursing staff should receive continued education and training to prevent the NSI (Aziz 2012). Continuing education and training are necessary to upgrade their knowledge in timely (Carli et al. 2022). Education and training regarding use of safety engineered devices, proper handling and use of sharp instruments, biological risk of NSI, following organizational procedures for sharp disposal, avoiding recapping needles after use, and discarding the needles in sharp container, use of PPE must provide to health workers to prevent the NSI from time to time (Huang et al. 2022, Balouchi et al. 2015, Mostafa et al. 2018, Macdonald 2016). Training and education will be more effective by using different lectures, questionnaire and answer sessions, objectives based clinical examinations (OSCE), videos and demonstrations, postures, meetings, posters, publications on hospital websites, emails and by brochures distribution (Carli et al. 2022, Mostafa et al. 2018, Huang et al. 2022).

After the education and training activities regarding the prevention of NSI, there was a significant increase in knowledge and the exposure of NSI was decreased from 35% to 30% (Mostafa et al. 2018). Similarly in the study of Yang et al. 2020, after the education and training activities, the exposure to NSI had been decreased by 2,2% in 3 months. In a study by Mcdonald 2016, Proper education and training regarding the prevention of the NSI would help to gain optimum health and decrease the risk of NSI. The awareness program regarding the change in clinical setting, puncture risks, attentiveness while using the needles and need of the new educational contents regarding prevention of NSI has also been effective in preventing the exposure and increase the knowledge regarding NSI among nurses (Huang et al. 2022).

## 6.2. Safety Measures:

Nine of the articles focused on the use of Safety measures in prevention of NSI (Kahriman et al. 2016; Carli et al. 2022; Aziz 2012; Huang et al. 2021; Yang et al. 2020; Mehdi et al. 2016; Asiye & Kargin 2016; Calikoglu et al. 2019; Mcdonald 2016). The use of safety measures is a universal precaution for health workers to reduce harm (Kahriman et al. 2016). Safety measures include the use of safety engineered syringes, availability of safety syringes, avoiding recapping needles and non-touch techniques. Safety engineered syringe like syringes with shields or retractable needles, blunt tip-blood collection needles, auto-disable syringe, peripheral venous and arterial catheters, lancets, blood gas syringes, insulin pens are used in the prevention of NSI (Carli et al. 2022, Aziz 2012, Huang et al. 2021). All the conventional syringes and needles should be replaced with safety devices. The use of the safety engineered devices has reduced the risk of NSI among the nurses (Huang et al. 2021, Carli et al. 2022). The use of safety engineered devices helps to enhance injection safety as well as protect from injuries and the exposure of bloodborne pathogens or chemical hazards (Yang et al. 2020, Aziz 2012).

Five of the articles reported that NSI occurs while recapping the needles, unsafe handling of the needles and unavailability of safety devices (Mehdi et al. 2016, Asiye & Kargin 2016, Calikoglu et al. 2019, Aziz 2012, Macdonald 2016). The strategy of avoiding recapping the needles after use and use of safety engineered devices decreases the incidence of NSI (Carli et al. 2022, Mehdi et al. 2016, Huang et al. 2021). Safety non-touch techniques like carrying the sharp equipment in a secure way, using paper or kidney tray to hold the instruments, and carrying sharp box along with it. Using aseptic techniques and avoiding the unnecessary use of needles has been shown to be effective to prevent the NSI among nurses due to unsafe handling (Aziz 2012, Macdonald 2016 and Asiye & Kargin 2016). An adequate number of safety facilities like safety boxes and engineered safety equipment is necessary to control and prevent NSI (Mehdi et al. 2016).

## 6.3. Work practice control

Eight of the studies focused on use of work practice control in preventing NSI (Asiye & Kargin 2016; Balouchi et al. 2015; Yang et al. 2020; Carli et al. 2022; Kahriman et al. 2016, Calikoglu et al. 2019; Mehdi et al. 2016 & Macdonald 2016). Safe Work practice include having proper protocol to prevent NSI like proper disposal system, use of personal protective equipment's, vaccination, work schedule and reporting of injuries. Two of the articles emphasized that proper work practice protocol is very important to reduce the NSI in clinical setting (Asiye & Kargin 2016; Balouchi et al. 2015). In Yang et al. 2020, the implementation of different hospital work practice standard like following standard medical waste practice, promotion of safe work procedure, providing safety devices to the staffs,

training and educating staffs and providing safe working environment to the staff had reduced the rate of NSI from 42 to 15 in 3 months.

Used sharp needles should be disposed in puncture resistant disposable container (Asiye & Kargin 2016, Balouchi et al. 2015, Mehdi et al. 2016). Before any procedures, proper planning of sharp instruments must be done for safe handling and disposal system (Asiye & Kargin 2016). The availability of sharp disposable containers in injection procedure trolleys, every patient's room and in workstation reduces the risk of injuries and infection from sharps (Balouchi et al. 2015, Carli et al. 2022). The use of Personal protective equipment's prevents from the transmission of bloodborne disease which occurs through unsafety injections (Kahriman et al. 2016, Calikoglu et al. 2019, Asiye & Kargin 2016, Mehdi et al. 2016). Personal protective equipment's include gloves, double gloves with different colors, glasses, gown, and proper handwashing. Training should be provided to proper use of PPE (Calikoglu et al. 2019).

Three of the studies has also emphasized in providing the vaccination to the nurses against the infectious disease can prevent from the risk of getting life-threatening disease from NSI (Kahriman et al. 2016, Calikoglu et al. 2019, Carli et al. 2022). The rate of getting Hepatitis B and C, HIV and other diseases is high after NSI. Only way to prevent from hepatitis B is vaccination. The nurses should have proper vaccination against the diseases and the post-immunity status of the staff after the vaccination should be checked timely (Calikoglu et al. 2019, Carli et al. 2022, Kahriman et al. 2016)

Adequate staffing and having a proper work schedule have a positive effect on prevention of NSI (Balouchi et al. 2015, Calikoglu et al.2019). Adequacy of the staff whereas the work schedule should be modified by maintaining flexible working hours, providing sufficient human resources, and modifying the number of shifts is helpful in reducing injuries (Calikoglu et al. 2019, Mehdi et al. 2016). Every organization needs to have reporting policies and proper follow up to identify the injuries and minimize the harm (Asiye & Kargin 2016, Mcdonald 2016). The purpose of reporting the injuries was to identify the exposure or accident, analyzing the root cause and finding proper actions (Carli et al. 2022). Although there is high incidence of NSI, reporting of injuries in concern authorizes is less which leads to the higher risk (Asiye & Kargin 2016, Kahriman et al. 2016, Calikoglu et al. 2019, Mehdi et al. 2016). These Safe work practice activities are the key factor to enhancing the knowledge and behaviors of nurses to prevent NSI.

## 7. Discussion

This analysis supports the theory that different primary and secondary approaches can be used to prevent NSI among nurses and helped to reach our aim to explore the possible information about the prevention of NSI. This study looked at different ways of needlestick prevention that have been suggested in literature. The research findings suggested that there are various interventions available to prevent NSI in healthcare professionals. Through a literature review, three primary themes were identified using thematic content analysis: Education, Training and Awareness, Safety Measures and Safe Work Practice.

Eight of the articles reviewed in this study focused on the effectiveness of the continued education, training, and awareness programs in preventing NSI and found a positive correlation between such programs and a reduction in the incidence (2-5%) of NSI. This study is consistent with the latest study done by Cheetham, Ngo, Liira, J.& Liira, H 2021; that there was significant decrease in the incidence of NSI (by 9%) after providing education and training to the staff. The EU directive has also included mandatory education and training for the staff according to need and modernization (Council directives, 2010). This result highlights the importance of continuing education, training, and awareness programs in reducing NSI among nurses. It can be used by healthcare organizations to develop effective training programs and ensure their staff members are adequately trained and have skills.

Education, training, and awareness program incorporating with variety of teaching methods and resources like interactive lectures, question, and answer sessions, OSCE, meetings using different posters, using different media has found to be effective in preventing NSI along with training regarding use of sharp instruments, proper handling, and use of sharps. This result is in line with the study done by Aljaloud, Elshnaweil & Al-Garnil 2022 who reported that after the education program the knowledge of the nurses regarding NSI has increased after two weeks of study. They had also found a significant positive relationship between educational activities and good work practice among nurses (Aljaloud et al.2022). This suggests that education and training help to improve the nurses' skills in handling sharps, increase their knowledge about risk of NSI and by using different methods the nurses can easily understand the procedure, hence helping to prevent NSI.

Five articles supported that the use of engineered safety measures is more effective to reduce NSI. Safety engineered devices must be available in adequate quantity and the nurses should be trained to use the engineered safety devices. Continuous follow-up should be taken when there is the introduction of new devices. The result is consistent with the NIOSH article in 1999, that the use of improved engineered controls had controlled NSI and reduced harm to health workers. In contrast to this result, study done by Carli et al.2022 has also argued that there is underuse of safety devices

among health workers due to various reasons such as devices not being replaced and the expensive cost of engineered devices (Carli et al. 2022). This suggested that the use of safety devices is very important in preventing NSI, but proper availability of such instruments and training regarding its use is also necessary. This also highlights the importance of addressing the barriers to the implementation of safety devices in health care settings.

The result of the study also suggested that avoiding recapping, using safety devices, and proper availability of the devices has decreased the incidence of NSI. Similarly, use of safety engineered devices like auto-disposable syringe, lancets, insulin pens, syringes with shields, blunt tip collection needles, peripheral venous and arterial catheters also has shown to be effective in preventing NSI. This study is consistent with the study done by Hoffmann, Buchholz & Schnitzler 2013, that after the introduction of the safety devices like peripheral venous catheter, hypodermic needle and stapling system for wound sealing has shown reduction in the incidence rate of NSI among health workers. This emphasizes the importance of using safety devices and ensuring their proper availability to prevent NSI in healthcare settings. These findings can also be used to inform the policy makers aimed at reducing incidence of NSI among healthcare workers.

The study also demonstrated that safe work practice control like having proper protocol for proper disposal of sharps, Using PPE, having proper work schedules, vaccinations, reporting system is very important and has shown effective in preventing NSI. Three of the articles focused on proper work protocol and standard can help in reduction of NSI. This result is in line with the EU directives as it mentioned that good work protocols like flexible work schedule, sufficient human resources, proper rest, modifying the number of work shifts, safe working environment, no blame protocol, proper system for reporting and prevention, treatment and follow-up policies is helpful to prevent the injuries from occurring (EU directive 2010). Similarly in the study of Hanafi, Mohammed, Kassem & Shawki 2011, had found while finding the effectiveness of existing control measures, one of the factors that has decreased the incidence of NSI was having proper work practices and control. These findings underscore the significance of having proper work practices and controls to prevent NSI in healthcare settings and could be used in making proper policies and practices in hospital settings.

Three of the articles focused on proper disposal of sharps, four articles mentioned the use of PPE to the staff members and three articles mentioned the vaccination for the staff members could be effective in prevention of NSI. However, the findings of the Hanafi et al.2011, reported that the factor that did not affect the risk of NSI was use of PPE, full vaccination against HBV, location of disposable container. Another study had argued that vaccination itself is also one of the causes of NSI because it uses the needle to administrate the product and it further increases the risk with different working conditions. Following the proper protocols of hierarchy and providing specific health and safety training in the workplace is mandatory along with vaccinations to the workers (Persaud & Mitchell,

2015). It suggested that following proper protocols and providing specific health and safety training in the workplace is mandatory along with vaccination. It also focused on need for continued research to determine the most effective interventions for preventing NSI in healthcare settings and underscores the importance of implementing comprehensive training and protocols to ensure the safety of healthcare workers.

Reporting the injuries to responsible authorities is especially important to find out the root cause and to prevent and manage the possible risk from the diseases. Reporting the injuries is helpful to find out the risk of NSI. Many nurses do not report injuries because of worrying about being criticized, the instruments were unused, and some of the organizations do not have proper reporting protocols. Every organization should have a good protocol system to report the injury and postexposure follow-up system. This finding is consistent with the article by the National Occupational Research Agenda (NORA). It states that reporting injuries to the authorities is essential to minimize the risk of similar injuries occurring again. While reporting, date, time, procedure or action during the injury and type of device or brand (if known) should be clearly specified. This emphasized the importance of clearly specifying date, time, procedure or action during injury and type of device or brand (if known). This helps authorities to find out the source of injury and develop strategies to prevent future occurrence. Overall, reporting NSI is critical for ensuring the safety of staff and minimizing the risk of infectious disease.

Several studies reviewed from above had emphasized different preventive interventions for the prevention of NSI. The use of safety engineered devices such as safety needles, safety IV catheters and blunt tip needles can significantly reduce the incidence of NSIs. Moreover, the use of safety devices has been recommended by different organizations like OSHA and WHO as an effective strategy for preventing NSI. (WHO 2023) On the other hand, education and training programs have also been shown to be effective in reducing incidence of NSI. These programs aim to educate the healthcare workers on safe injection practices, the proper use of safety devices and the importance of reporting incidence of NSIs. Combining education and safety devices is the most effective way to prevent NSI. Overall preventing NSI requires a multifaced approach that involves the use of safety devices education and training programs, safe work practices.

## **8. Conclusion and Recommendations:**

Needle stick injury is one of the dangerous occupational hazards for the nurses so proper prevention measures are essential. It is a global hazard in healthcare. The main aim of the studies was to explore needle stick injury among nurses and its prevention strategies.

The main findings of the study have been divided into three themes: Education, Training and Awareness, Safety Measures and Safe Work Practice. Studies concluded the availability and use of safety engineered devices, avoiding the recapping of needles, safe handling of syringes before, during and after use, Proper puncture proof disposal, availability of PPE and proper use of PPE, getting a full dose Hepatitis B vaccine, proper protocols for prevention of injuries, reporting and follow procedures were the best measures to prevent NSI. Planning of education and training to nurses related to the use of safety engineered devices, proper disposal of sharp instruments and infection prevention to promote safe injection practice. Studies believe that the training and education of nurses is the major milestone to upgrade the knowledge and skills of nurses regarding NSI. Strict occupational health and safety policies and protocols should be followed by organizations to prevent the incidence of NSI.

Even studies have stated the use protocols, but still many nurses do not have proper knowledge regarding the safe handling and proper disposal of sharps. Many nurses do not dispose it properly even though they have knowledge due to many reasons like busy shifts, Due to heavy workload and shortage of staffs the nurses, inadequate supply of safety devices. Still there are many hospitals who does not have proper protocols and policies for the management of injuries. So, the author recommends using engineering safety devices, avoiding recapping needles, proper staff management, continued training and education, adequate policies, safe environment, and proper documentation of the hazards in the future.

## **9. Ethical Consideration**

According to the definition of Oxford dictionary, 2022, Ethics refers to the moral principles which guide the people's behavior to perform any activity and to distinguish what is right and wrong. The ethics in research is generally based on applying the fundamental ethical principles to different research activities which include planning, designing, implementing research, respecting the society and the people involved in the research, use of research and outputs, scientific misconduct, and regulation of research. (University of Stirling 2022)

For this thesis all the principles of literature review i.e., proper referencing, using our own words as much as possible, avoiding plagiarisms, integrity, data were evaluated for its accuracy and reliability. From the start of the thesis to the final presentation, the author has focused on maintaining and following the proper scientific method, analysis method and giving proper credibility to the thesis. The author has followed all the rules and guidelines of Laurea University to prevent biases and conflict. The recommendation from the opposition is followed and corrected as much as possible. References were also written by following Laurea guidelines.

## **10. Limitation**

The aim of the research is to explore needle stick injury among nurses and its prevention. There were some limitations that authors have faced while conducting the thesis. The limitation of the thesis was that the data sample was only limited to nurses. Some of the good scientific articles could not be used due to inclusion and exclusion criteria. English language inclusion requirements were restricted in such ways that research performed in other different languages have not used in research process. Some of the books related to the topic could not be retrieved from Laurea database. The findings of the study may suffer from researcher subjectivity even descriptive literature review method was conducted as the findings of this thesis are interpreted by the author. This study is done only for prevention strategies. In further, the author recommends exploring the management after Needlestick injuries. This is a small-scale study which was conducted for partial fulfillment of academic requirements and results cannot be generalized in all settings. Only eleven articles were selected and the possibility of finding new evidence with different databases is possible.

## 11. References

- Abailkhail, A., Kabir, R., Elmossad, Y., Alshwami, A., Alhumaydhi, F., Alslamah, T., Almoammar, K., Alsalamah, Y. & Mahmud, I. 2022. Needle Stick and Sharp Injuries among Hospital Healthcare Workers in Saudi Arabia: A cross sectional survey. *National Library of Medicine. International journal of research and public health*, 19(10), 6342. Accessed on 26.01.2023. <https://doi.org/10.3390/ijerph19106342>
- Adams, D. 2012. Needlestick and sharps injuries: Practice update. *Nursing Standard (through 2013)*, 26(37), 49-57, quiz 58. Accessed on 10.10.2022. <https://www.proquest.com/central/docview/1015774948/5E2E5424A7A74662PQ/408?accountid=12003>
- Aljaloud, O., Elshnaweil, H. & Al-Garnil, R. 2022. The effect of Needle Stick Injury Educational Program on Nursing Interns Competencies. *International Journal of Healthcare Sciences*, 10(2). Accessed on 17.04.23. <https://www.researchpublish.com/upload/book/The%20Effect%20of%20Needle%20Stick-20022023-3.pdf>
- Al-tell, M. & Almurr, B. 2013. Prevalence of SI and NSI among nurses in northern west bank hospital/ Palestine. *International journal of science and research*, 5(3). Assessed on 23.12.2022. [https://www.researchgate.net/publication/303497387\\_Prevalence\\_of\\_SI\\_and\\_NSI\\_among\\_Nurses\\_in\\_Northern\\_West\\_Bank\\_Hospitals\\_Palestine](https://www.researchgate.net/publication/303497387_Prevalence_of_SI_and_NSI_among_Nurses_in_Northern_West_Bank_Hospitals_Palestine)
- Anttilla J. 2019. Needle Stick Injury. *Duodecim*, Helsinki, 135(2). Assessed on 31.08.2022, <https://www.duodecimlehti.fi/duo14731>
- Asiye, D. & Kargin, C. 2016. Needle stick and sharp injury among nurses. *Global Journal of nursing & Forensic Studies*, 1(4). Accessed on: 22.10.2022 [https://www.researchgate.net/publication/315054715\\_Needle\\_Stick\\_and\\_Sharp\\_Injuries\\_among\\_Nurses](https://www.researchgate.net/publication/315054715_Needle_Stick_and_Sharp_Injuries_among_Nurses)
- Aveyard, H. 2019. *Doing a Literature Review in Health & Social Care. A Practical Guide Second edition.* McGraw-Hil. *Nurse researcher*, 18(4), 45. Assessed on 7.11.22. DOI: 10.7748/nr.18.4.45. s2
- Aziz, A. 2012. Reducing needlestick injuries: A review of community service. *British Journal of Nursing*, 21(8). Accessed on 22.10.2022. <https://doi.org/10.12968/bjon.2012.21.Sup8.S4>
- Balouchi A., Shahdadi, H., Ahmadidarrehsima, S. & Rafiemanesh, H. 2015. The Frequency, Causes and Prevention of Needlestick Injuries in Nurses of Kerman: A Cross-Sectional Study, 9(12). Accessed on 22.10.2022. <https://pubmed.ncbi.nlm.nih.gov/26816889>
- Braun, V. & Clarke, V. 2006. Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77-101. <https://sci-hub.hkvisa.net/10.1191/1478088706qp063oa>
- Calikoglu, E.O., Bedir, B., Akcay, H.B. & Gumus, A. 2019. Needle stick and sharp injuries among nurses at Ataturk university research hospital and their practices after injury. *The European Research Journal*, 5(1), 128-133. Accesses on 22.10.2022 <https://www.proquest.com/central/docview/2330760761/5E2E5424A7A74662PQ/143?accountid=1200>

Carli, G., Agestra, A., Lecce, M., Marchegiano, P., Micheloni, G., Sossai, D., Campo, G., Tomao, P., Vonesch, N., Leone, S., Puro, V. & The studio Italiano Rischio Occupazionale da HIV (SIROH) group. 2022. Prevention from Sharp Injuries in the Hospital Sector: An Italian National Observatory on the Implementation of the Council Directive 2010/32/EU before and during the COVID-19 Pandemic. *International Journal of Environmental Research and Public Health*, 19(17). Assessed on 20.10.2022. <http://dx.doi.org/10.3390/ijerph191711144>

Caulfield, J. 2019. How to Do Thematic Analysis | Step-by-Step Guide & Examples. Accessed on 13.01. 2023. <https://www.scribbr.com/methodology/thematic-analysis/>

Center for Disease Control and Prevention. 2021. Needle stick injuries are preventable. National Institute of Occupational Safety and Health. Assessed on 31.10.2022. [https://www.cdc.gov/niosh/newsroom/feature/needlestick\\_disposal.html](https://www.cdc.gov/niosh/newsroom/feature/needlestick_disposal.html)

Cheetham, S., Ngo, H., Liira, J. & Liira, H. et al. 2021. Education and training for preventing sharp injuries and splash exposure in healthcare workers. *The Cochrane database of systematic review*. 4(4). Assessed on 06.02.2023. <https://doi.org/10.1002/14651858.CD012060.pub>

Cooke, C.E. & Stephens, J.M. 2017. Clinical, economical, and humanistic burden of needle stick injuries in healthcare workers. *Medical devices (Auckland, N.Z)*, 10, 225-235. Assessed on 02.11.22. <https://doi.org/10.2147/MDER.S140846>

Council Directive 2010/32/EU. 2010. Implementing the Framework Agreement on prevention from sharp injuries in the hospital and healthcare sector concluded by HOSPEEM and EPSU, Council of European Union. Assessed on 02.12.2022. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32010L0032>

Crosley, J. 2021. What is thematic analysis? Accessed on 19.1.2023. <https://gradcoach.com/what-is-thematic-analysis/>

European agency for Safety and Health at Work. 2021. Directive 2010/32/EU- prevention from sharp injuries in the hospital and healthcare sector. Assessed on 13.10.2022. <https://osha.europa.eu/en/legislation/directives/council-directive-2010-32-eu-prevention-from-sharp-injuries-in-the-hospital-and-healthcare-sector#:~:text=Employers%20and%20workers'%20representatives%20shall,prevention%20via%20information%20and%20consultation.>

Exposure prevention information network. 2014. Report on Needle Stick and Sharp injury, International Safety Centre. Accessed on 30.11.22. <https://internationalsafetycenter.org/wp-content/uploads/2016/08/Official-2014-NeedleSummary.pdf>

Finlex 317/2013. 2013. Decree of Government on Preventing Accidents Caused by Sharp Instruments in Healthcare Sector, Assessed on 30.11.22. <https://www.finlex.fi/fi/laki/alkup/2013/20130317>

Finlex. 2022. Occupational Safety and Health Act, Page 1(38), Assessed on 30.10.22, <https://www.finlex.fi/en/laki/kaannokset/2002/en20020738.pdf>

Gupta, D., Saxena, S., Agrawal, V. & Singh, M. 2019. Study of knowledge, attitude, and practice of needle stick injury among nurses in tertiary care hospital. *International journal of Community Medicine and Public Health*, 6(2),868. Accessed on 26.01.2023. [https://www.researchgate.net/publication/330611099\\_Study\\_of\\_knowledge\\_attitude\\_and\\_practice\\_of\\_needle\\_stick\\_injury\\_among\\_nurses\\_in\\_a\\_tertiary\\_care\\_hospital](https://www.researchgate.net/publication/330611099_Study_of_knowledge_attitude_and_practice_of_needle_stick_injury_among_nurses_in_a_tertiary_care_hospital)

Hanafi, M., Mohammed, A., Kassem, M. & Shawki, M. 2011. Needle stick injury among health care workers of University of Alexandria Hospital. *Eastern Mediterranean health journal*, 17(1), 26-35. Assessed on 17.04.23.  
[https://apps.who.int/iris/bitstream/handle/10665/118074/17\\_1\\_2011\\_0026\\_0035.pdf?sequence=1&isAllowed=y](https://apps.who.int/iris/bitstream/handle/10665/118074/17_1_2011_0026_0035.pdf?sequence=1&isAllowed=y)

Health Management. 2014. How much does Europe care about needlestick injuries, 14(4) Accessed on 31.8.2022. <https://healthmanagement.org/c/healthmanagement/issuearticle/how-much-does-europe-care-about-needlestick-injuries>

Health and Safety Executive. 2023. Sharp Injuries. Assessed on 10.01.23.  
<https://www.hse.gov.uk/healthservices/needlesticks/>

Hosseinipalangi, Z., Golmohammadi, Z., Ghashqhaee, A., Ahmadi, N., Hosseinifard, H., Mejahreh, Z., Dehnad, A., Aghalou, S., Jafarjalal, E., Aryankhesal, A., Rafiei, S., Khajehvand A., Nasab, M. & Kan, F. 2021. Global, regional, and national incidence and causes of needlestick injuries, a systematic review and meta-analysis. *Eastern Mediterranean health journal*, 28(3), 233-241- Assessed on 31.08.2022. <http://www.emro.who.int/in-press/reviews/global-regional-and-national-incidence-and-causes-of-needlestick-injuries-a-systematic-review-and-meta-analysis.html>

Hoffman, C., Buchholz, L. & Schnitzler, P. 2013. Reduction of needlestick injuries in healthcare personnel at a university hospital using safety devices. *Journal of occupational medicine and toxicology*, 8(20). Assessed on 17.04.23. <https://doi.org/10.1186/1745-6673-8-20>

Hoffman D., Dukes, E.M & Wittchen, H. 2008. Human and economic burden of generalized anxiety disorder. *Depression and anxiety*, 25(1), 72-90. Assessed on 01.10.2022 <https://pubmed.ncbi.nlm.nih.gov/17146763/>

Huang, H., Chein, H., Lin, W., Chang, C., Chang, M., Su, J. & Mu, P. 2021. Prevention of needle-stick injury among nurses in an acute ward of a hospital: a best practice implementation project. *JBI evidence implementation*, 20(2), 134-143 Accessed on 22.10.2022.  
[https://journals.lww.com/ijebh/Fulltext/2022/06000/Prevention\\_of\\_needle\\_stick\\_injury\\_among\\_nurses\\_in.5.aspx?casa\\_token=wqkVBdwxA00AAAAA:punctXEuFa9io9rUGmkUpDFycYudfWaeDbDz\\_jk42ERXMiHXhGFNPpQPXDh7UOYwSeigJ7obWlcfT-B0wNTZR1OZ3FQ](https://journals.lww.com/ijebh/Fulltext/2022/06000/Prevention_of_needle_stick_injury_among_nurses_in.5.aspx?casa_token=wqkVBdwxA00AAAAA:punctXEuFa9io9rUGmkUpDFycYudfWaeDbDz_jk42ERXMiHXhGFNPpQPXDh7UOYwSeigJ7obWlcfT-B0wNTZR1OZ3FQ)

Isada, M., Tustin, J. & Meldrum, R. 2018. An analysis of Needle stick and sharp injury among Hospital Employees. School of Occupational and Public Health. Ryerson University. Canada.  
<https://www.torontomu.ca/occupational-public-health/PosterPDFs/2018/2018-melissa-isada-needle-sticks-hospital-employees.pdf>

Jaggi, N., Nirwan, P. & Chakraborty, M. 2020. Process improvement of effectively manage and reduce sharps injuries in a Tertiary hospital in Northern India. *Journal of Health care and Quality Research*, 35(3). Assessed on 02.10.2022. <https://www.elsevier.es/en-revista-journal-healthcare-quality-research-257-articulo-process-improvement-effectively-manage-reduce-S2603647920300506>

Kahrman, I., Polat, S., Ghaniye, E. & Kaptan, D. 2016. Injury Experiences and Precautions Taken by Nurses Working in Pediatric Wards. *International Journal of Caring Sciences*, 9(2). Accessed on 22.10.2022 <https://web.p.ebscohost.com/ehost/command/detail?vid=8&sid=b2aa87ad-cdb9-45fe-bd47-54c033178579%40redis&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ%3d%3d#AN=117593050&db=c8>

King, C. and Strony, R. 2022. Needlestick. National library of Medicine. Accessed on: 23.8.2022.  
<https://www.ncbi.nlm.nih.gov/books/NBK493147/>

Kumar, M.C.H. & Belagatti, S.L. 2013. A Study of Needle stick injuries in a Medical College Hospital in Northern District of Karnataka. *Indian Journal of Public Health Research and Development*, 4(4),75-78. Accessed on 10.10.2022  
<https://www.proquest.com/central/docview/1498935277/5E2E5424A7A74662PQ/372?accountid=12003>

Macdonald, C. 2016. Needle stick injuries prevention and education. The University of Alabama in Huntsville. Accessed on 22.10.2022.  
<https://www.proquest.com/central/pagepdf/1849322165/Record/5E2E5424A7A74662PQ/270?accountid=12003>

Medical Technology Association of Australia. 2023. Use of Safety engineered medical device to improve the prevention of Needle stick and Sharp Injury in healthcare settings. North Sydney, New South Wales, Australia. Accessed on 31.01.23.  
<https://www.mtaa.org.au/sites/default/files/uploaded-content/website-content/Sharpsv5.pdf>

Mehdi, J., Rostamabadi, A., Hoboubi, N. & Neda, T. 2016. Needle Stick Injuries and their Related Safety Measures among Nurses in a University Hospital. *Safety and Health at work*, 7(1), 72-77. Accessed on: 22.10.2022.  
<https://www.sciencedirect.com/science/article/pii/S2093791115000621>

Mengitsu, D., Tolera, S. and Demmu, Y. 2021. Worldwide Prevalence of Occupational Exposure to NSI among Healthcare Workers: A systematic review and Meta-analysis. *Canadian journal infectious disease and medical microbiology*, Article ID 9019534. Accessed on 22.08.2022.  
<https://www.hindawi.com/journals/cjidmm/2021/9019534/>

Ministry of labor, Industrial Relation, and Employment Creation. 2014. National profile in Occupational Safety and health, Namibia, Africa. Page no. 2, 9, Accessed on 10.01.23  
[https://www.ilo.org/wcmsp5/groups/public/---ed\\_protect/---protrav/---safe\\_work/documents/publication/wcms\\_722427.pdf](https://www.ilo.org/wcmsp5/groups/public/---ed_protect/---protrav/---safe_work/documents/publication/wcms_722427.pdf)

Mostafa, B., Rostami, K., Marzeih, M. & Shahrzad, Y. 2018. Evaluating the Effectiveness of a Continuing Education Program for Prevention of Occupational Exposure to Needle Stick Injuries in Nursing Staff Based on Kirkpatrick's Model. *Journal of the National Medical Association*, 110(5), 458-463. Accessed on 22.10.2022.  
<https://www.sciencedirect.com/science/article/abs/pii/S0027968417301724>

Muhammad, A., Ayub, Z., Muhammad, N. & Hanif, A. 2019. Needle Stick Injury among Health care Workers. *Journal of Sharif Medical and Dental College*, 5(1), 20-23. Accessed on 26.01.2023.  
<http://www.jsmdc.pk/wp-content/uploads/2019/06/Needlestick-Injuries-among-Healthcare-Workers.pdf>

National Institute of Occupational Safety and Health. 2022. Hierarchy of control theory; Centre for Disease Prevention. Accessed on 21.11.2022.  
<https://www.cdc.gov/niosh/topics/hierarchy/default.html>

National Institute for occupational safety and Health. 1999. Preventing Needlestick injuries in Health care settings. Accessed on 7.9.2022. <https://www.cdc.gov/niosh/docs/2000-108/pdfs/2000-108.pdf?id=10.26616/NIOSH PUB2000108>

National Institute for occupational safety and Health. 2022. Reducing Work-Related Needlestick and Other Sharps Injuries Among Law Enforcement Officers. Accessed on 7.9.2022.  
<https://www.cdc.gov/niosh/docs/wp-solutions/2022-154/pdfs/2022-154.pdf?id=10.26616/NIOSH PUB2022154>

National Institute for occupational health and safety. 2015. Needle stick prevention. Assessed on 10.01.23.

<https://www.cdc.gov/niosh/updates/needleless.html#:~:text=Under%20the%20Needlestick%20Safety%20and,reduce%20the%20risk%20of%20needlesticks.>

National occupational Research Agenda (NORA). 2019. Stop Stick Campaign. Assessed on 10.01.2023. <https://www.cdc.gov/nora/councils/hcsa/stopsticks/injuryreport.html>

Nirmala, V. & Suni, M. 2019. Nursing Student Awareness and Occurrence of Needle Stick Injuries. *International journal of nursing*, 11(3), Assessed on 21.08.2022. <https://web-s-ebSCOhost-com.nelli.laurea.fi/ehost/detail/detail?vid=6&sid=584b6ab5-5e16-4c7f-b3bd-859e838e3f56%40redis&bdata=JnNpdGU9ZWWhvc3QtbGl2ZQ%3d%3d#AN=137636465&db=c8h>

Orengo, I., Pielop, J. & Ransdell, B. 2003. The use of a "No-Touch" Technique to reduce the incidence of Glove perforation during suture. *Dermatology surgery*, 29(12), 1215-1216. Assessed on 5.1.2023 [https://journals.lww.com/dermatologicsurgery/Citation/2003/12000/The\\_Use\\_of\\_a\\_No\\_Touch\\_Technique\\_to\\_Reduce\\_the.15.aspx](https://journals.lww.com/dermatologicsurgery/Citation/2003/12000/The_Use_of_a_No_Touch_Technique_to_Reduce_the.15.aspx)

Oxford dictionary. 2022. Ethics versus Moral. Oxford learning college, Assessed on 08.09.2022. <https://www.oxfordcollege.ac/news/ethics-versus-morals/#:~:text=The%20Oxford%20Dictionary%20definition%20of,also%20enter%20into%20the%20question>

Persaud, E. and Mitchell, A. 2015. Needlestick Injuries Among HealthCare Workers Administrating COVID-19 Vaccinations in the United States. *Journal of Environment and Occupational Health Policy*, 31(1). Assessed on 12.01.23. <https://journals.sagepub.com/doi/full/10.1177/10482911211001483>

Quadire, M., Ballad, C., Omar, O., Aldiabat, K., Shindi, Y. & Khalaf, A. 2021. Prevalence, Student Nurses knowledge and practices of needle stick injuries during clinical training: a cross sectional survey. *BMC Nursing*, 20(1), 1-7. Accessed on: 31.8.2022. <https://web.p.ebscohost.com/ehost/detail/detail?vid=0&sid=cee0ea20-e3e0-4086-ba76-601bc82d7bc7%40redis&bdata=JnNpdGU9ZWWhvc3QtbGl2ZQ%3d%3d#AN=152790623&db=c8h>

Rezaei, S., Hajizadeh, M., Zandian, H., Fathi, A. & Nouri, B. 2017. Period Prevalence and Reporting rate of Needle Stick Injury to Nurses in Iran: A systematic review and meta-analysis. *Research in Nursing and Health*, 40(4), 311-322. Accessed on 26.01.2023. <https://pubmed.ncbi.nlm.nih.gov/28556925/>

Royal Literary fund. 2020. What is Literature review. Accessed on 23.8.2022. <https://www.rlf.org.uk/resources/what-is-a-literature-review/>

Saia, M., Hoffmann, F., Sharman, J. & Abiteboul, D. 2010. Needle stick injuries: Incidence and cost in the United States, United Kingdom, Germany, France, Italy, and Spain. *Biomedicine International*, 1, 41-49. Assessed on 01.10.22. [https://www.researchgate.net/publication/285310698\\_Needlestick\\_injuries\\_Incidence\\_and\\_cost\\_in\\_the\\_United\\_States\\_United\\_Kingdom\\_Germany\\_France\\_Italy\\_and\\_Spain](https://www.researchgate.net/publication/285310698_Needlestick_injuries_Incidence_and_cost_in_the_United_States_United_Kingdom_Germany_France_Italy_and_Spain)

Salminen, S. & Parantainen, A. 2012. Injuries of three health care districts employees in Finland. *Open Journal of Safety Science and Technology*, 2, 108-112. Assessed on 02.10.22. [https://www.researchgate.net/publication/269796523\\_Injuries\\_of\\_Three\\_Health\\_Care\\_Districts\\_Employees\\_in\\_Finland](https://www.researchgate.net/publication/269796523_Injuries_of_Three_Health_Care_Districts_Employees_in_Finland)

University of reading. 2022. Literature reviews. Accessed on 23.8.2022. [https://libguides.reading.ac.uk/ld.php?content\\_id=32363096](https://libguides.reading.ac.uk/ld.php?content_id=32363096)

University of Stirling, 2022, Understanding ethics, Accessed on 08.09.2022  
<https://www.stir.ac.uk/research/research-ethics-and-integrity/understanding-ethics/#:~:text=Definition%20of%20ethics&text=Research%20ethics%20involves%20the%20application,and%20the%20regulation%20of%20research>

Vuoriluoto, I. 2009. Do not let a needlestick get you by surprise Accident Hazard-Tehy study on needlesticks and injuries that occurred due to sharp objects. They publication, 3. Accessed on. 24.11. 2022. [http://hospeem.org/wp-content/uploads/2013/10/Finnish\\_study\\_on\\_needlestick\\_injuries\\_-\\_Tehy.pdf](http://hospeem.org/wp-content/uploads/2013/10/Finnish_study_on_needlestick_injuries_-_Tehy.pdf)

World Health Organization. 2016. World Health Organization guidelines on the use of safety-engineered syringes for intramuscular, intradermal, and subcutaneous injections in health care settings. Accessed on 23.8.2022.  
<http://apps.who.int/iris/bitstream/handle/10665/250144/9789241549820-eng.pdf?sequence=1>

World Health Organization. 2016. Injection safety. Assessed on 15.08.2022.  
[https://cdn.who.int/media/docs/default-source/integrated-health-services-\(ihs\)/injection-safety/is\\_questions-answers.pdf?sfvrsn=3f282f31\\_5](https://cdn.who.int/media/docs/default-source/integrated-health-services-(ihs)/injection-safety/is_questions-answers.pdf?sfvrsn=3f282f31_5)

World Health Organization. 2018. Health care waste: sharp related. Assessed on 15.08.2022.  
<https://www.who.int/news-room/fact-sheets/detail/health-care-waste>

World Health Organization. 2023. Health promotion and disease prevention through population-based interventions, including action to address social determinants and health inequity. Assessed on 10.02.23. <https://www.emro.who.int/about-who/public-health-functions/health-promotion-disease-prevention.html>

Wakelam, L. 2018. Sharp Injury Awareness. A Brief History, Daniels Health. Assessed on 31.10.22.  
<https://www.danielshealth.com/knowledge-center/SI-awareness>

Yang, H., Zhang, H, Lu, Y., Gu, Y., Zhou, J. & Bai, Y 2020. A program to improve the knowledge, attitudes and practices of needle stick and sharp injuries through bundled interventions among nurses: A KAP Mode-Based Approach to intervention. *Psychology, health & medicine*, 27(5), 999-1010. Accessed on 22.10.2022.  
<https://web.s.ebscohost.com/ehost/command/detail?vid=7&sid=3ab4741d-0c75-4393-94df-a57020a9f7aa%40redis&bdata=JnNpdGU9ZWwhvc3QtbGl2ZQ%3d%3d#AN=156866013&db=c8h>

Zhang, L., Ai, Y., Liu, J., Bal, V., Gala, S., Erdal, E. & Gao, X. 2019. Economic burden of needle stick injuries among health care workers in China. *Journal of medical economics*, 23(7), Assessed on 01.10.2022, <https://www.tandfonline.com/doi/full/10.1080/13696998.2020.1737534>

### List of references of articles

Aziz, A. 2012. Reducing needlestick injuries: A review of community service. *British Journal of Nursing*, 21(8). Accessed on 22.10.2022. <https://doi.org/10.12968/bjon.2012.21.Sup8.S4>

Asiye, D. & Kargin, C. 2016. Needle stick and sharp injury among nurses. *Global Journal of nursing & Forensic Studies*, 1(4). Accessed on: 22.10.2022 [https://www.researchgate.net/profile/Asiye-Akyol/publication/315054715\\_Needle\\_Stick\\_and\\_Sharp\\_Injuries\\_among\\_Nurses/links/58c932dcaca2721e6679eb98/Needle-Stick-and-Sharp-Injuries-among-Nurses.pdf](https://www.researchgate.net/profile/Asiye-Akyol/publication/315054715_Needle_Stick_and_Sharp_Injuries_among_Nurses/links/58c932dcaca2721e6679eb98/Needle-Stick-and-Sharp-Injuries-among-Nurses.pdf)

Balouchi A., Shahdadi, H., Ahmadidarrehsima, S.& Rafiemanesh, H. 2015. The Frequency, Causes and Prevention of Needlestick Injuries in Nurses of Kerman: A Cross-Sectional Study, 9(12). Accessed on 22.10.2022. <https://pubmed.ncbi.nlm.nih.gov/26816889>

Calikoglu, E.O., Bedir, B., Akcay, H.B. & Gumus, A. 2019. Needle stick and sharp injuries among nurses at Ataturk university research hospital and their practices after injury. *The European Research Journal*, 5(1), 128-133. Accessed on 22.10.2022 <https://www.proquest.com/central/docview/2330760761/5E2E5424A7A74662PQ/143?accountid=1200>

Carli, G., Agestra, A., Lecce, M., Marchegiano, P., Micheloni, G., Sossai, D., Campo, G., Tomao, P., Vonesch, N., Leone, S., Puro, V. & The studio Italiano Rischio Occupazionale da HIV (SIROH) group. 2022. Prevention from Sharp Injuries in the Hospital Sector: An Italian National Observatory on the Implementation of the Council Directive 2010/32/EU before and during the COVID-19 Pandemic. *International Journal of Environmental Research and Public Health*, 19(17). Accessed on 20.10.2022. <http://dx.doi.org/10.3390/ijerph191711144>

Huang, H., Chein, H., Lin, W., Chang, C., Chang, M., Su, J. & Mu, P. 2021. Prevention of needle-stick injury among nurses in an acute ward of a hospital: a best practice implementation project. *JBI evidence implementation*, 20(2), 134-143 Accessed on 22.10.2022. [https://journals.lww.com/ijebh/Fulltext/2022/06000/Prevention\\_of\\_needle\\_stick\\_injury\\_among\\_nurses\\_in.5.aspx?casa\\_token=wqkVBdwxA00AAAAA:punctXEuFa9io9rUGmkUpDFycYudfWaeDbDz\\_jk42ERXMiHXhGFNPpQPXDh7UOYwSeigJ7obWlcfT-B0wNTZR1OZ3FQ](https://journals.lww.com/ijebh/Fulltext/2022/06000/Prevention_of_needle_stick_injury_among_nurses_in.5.aspx?casa_token=wqkVBdwxA00AAAAA:punctXEuFa9io9rUGmkUpDFycYudfWaeDbDz_jk42ERXMiHXhGFNPpQPXDh7UOYwSeigJ7obWlcfT-B0wNTZR1OZ3FQ)

Kahrman, I., Polat, S., Ghaniye, E. & Kaptan, D. 2016. Injury Experiences and Precautions Taken by Nurses Working in Pediatric Wards. *International Journal of Caring Sciences*, 9(2). Accessed on 22.10.2022 <https://web.p.ebscohost.com/ehost/command/detail?vid=8&sid=b2aa87ad-cdb9-45fe-bd47-54c033178579%40redis&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ%3d%3d#AN=117593050&db=c>

Mostafa, B., Rostami, K., Marzeih, M. & Shahrzad, Y. 2018. Evaluating the Effectiveness of a Continuing Education Program for Prevention of Occupational Exposure to Needle Stick Injuries in Nursing Staff Based on Kirkpatrick's Model. *Journal of the National Medical Association*, 110(5), 458-463. Accessed on 22.10.2022. <https://www.sciencedirect.com/science/article/abs/pii/S0027968417301724>

Mehdi, J., Rostamabadi, A., Hoboubi, N. & Neda, T. 2016. Needle Stick Injuries and their Related Safety Measures among Nurses in a University Hospital. *Safety and Health at work*, 7(1), 72-77. Accessed on: 22.10.2022. <https://www.sciencedirect.com/science/article/pii/S2093791115000621>

Macdonald, C. 2016. Needle stick injuries prevention and education. The University of Alabama in Huntsville. Accessed on 22.10.2022. <https://www.proquest.com/central/pagepdf/1849322165/Record/5E2E5424A7A74662PQ/270?accountid=12003>

Yang, H., Zhang, H, Lu, Y., Gu, Y., Zhou, J. & Bai, Y 2020. A program to improve the knowledge, attitudes and practices of needle stick and sharp injuries through bundled interventions among nurses: A KAP Mode-Based Approach to intervention. *Psychology, health & medicine*, 27(5), 999-1010. Accessed on 22.10.2022.  
<https://web.s.ebscohost.com/ehost/command/detail?vid=7&sid=3ab4741d-0c75-4393-94df-a57020a9f7aa%40redis&bdata=JnNpdGU9ZWwhvc3QtbGl2ZQ%3d%3d#AN=156866013&db=c8h>

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