



Journal Homepage: -www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI:10.21474/IJAR01/10489
DOI URL: <http://dx.doi.org/10.21474/IJAR01/10489>



RESEARCH ARTICLE

KNOWLEDGE AND AWARENESS OF NEEDLESTICK INJURIES AMONG HEALTHCARE WORKERS IN THE EMERGENCY DEPARTMENT IN A TERTIARY HEALTH CARE CENTRE IN KOLKATA

Dr. Uvesh Vaja, Dr. Indraneel Dasgupta and Dr. Sambit Maiti

Institute of Emergency Medicine Peerless Hospital and B.K. Roy Research Centre Kolkata.

Manuscript Info

Abstract

Manuscript History

Received: 10 December 2019

Final Accepted: 12 January 2020

Published: February 2020

Copy Right, IJAR, 2020,. All rights reserved.

Introduction:-

Needle-stick injuries (NSIs) are among the hazards and problems that can expose health workers to infections¹. Hepatitis B and C and HIV are some of biological hazards threatening the health of thousands of healthcare workers. The most common mode of transmission of these diseases is via needle stick injury (NSI)². In America, it is estimated that 600,000 to one million needle sticks occur annually among which about 16,000 of these needles are infected with HIV. According to the centers for disease control only 10% of such injuries are reported³. Of each 6 NSIs, one person is infected with hepatitis B, of each 10 injuries, one person is infected with hepatitis C and in every 300 injuries, a person is infected with HIV³. Also, based on the world health organization report, 2.5% of healthcare workers around the world have been infected with aids and 40% have been infected with hepatitis B and C due to occupational exposure⁴.

The results of several studies have shown that different healthcare workers have had various rates of NSIs among which the proportion of nurses has been higher than others^{5,6}. The rates of NSI s in Egypt, Germany, Pakistan, Turkey, and Australia were 66.2%, 31.4%, 45%, 45%, and 51%, respectively⁷⁻¹¹. In addition, the results of studies conducted in different provinces of Iran showed that the rates of NSI s in the hospitals of mazandaran, Kurdistan, Yasuj, Shiraz, and kashan were 57.3%, 64.9%, 39.3%, 38%, and 71%, respectively¹²⁻¹⁵. In another similar study conducted on nurses in Iran, this rate was 45.9%¹⁶. However, most of NSIs occurs when recapping the syringe needles and the centers for disease control and prevention of America estimated that 80% of these injuries were preventable¹⁷. In 1987, this center recommended the body substance isolation guideline and after a while, the universal precautions protocol was provided.

Healthcare workers (HCWs) are continually exposed to hazards from contact with blood and body fluids of patients in the course of their activities in the healthcare setting. The world health organization (WHO) in 2002 reported that 2 million HCWs experience percutaneous exposure to infectious diseases and 37.6% of hepatitis B virus (HBV), 39% of hepatitis C virus (HCV), and 4.4% of HIV/AIDS in HCWs around the world are due to needlestick injuries (NSIs)¹⁸. The national institute for occupational safety and health defines NSIs as “injuries caused by needles such as hypodermic needles, blood collection needles, intravenous (iv) stylets, and needles used to connect part of iv delivery system.”¹⁹

Corresponding Author:- Dr. Uvesh Vaja

Address:- Institute of Emergency Medicine Peerless Hospital and B.K. Roy Research Centre
Kolkata.

HCWs are exposed to NSI from unsafe practices such as recapping of needles, manipulating used needles such as bending, breaking, or cutting hypodermic needles, and passing of needles from one HCW to another. The risk of exposure to NSI by HCWs varies in different section of the hospital and from one type of procedure to the other. A cross-sectional study of HCWs in new delhi, india revealed that the most common clinical activity to cause the NSI was blood withdrawal followed by suturing and vaccination.²⁰ mbaisi et al.²¹ in Kenya reported that stitching was the most common procedure during which injuries occurred, followed by blood specimen collection and handling of iv lines while erhabor et al. In Port Harcourt, Nigeria showed in their study that exposures were more in the pediatric unit followed by the phlebotomy section of the laboratory unit and surgery unit.²²

Several previous studies focusing on HCWs in all sections of the hospital both in our environment and other parts of Nigeria have demonstrated a high prevalence of NSI and a corresponding low reporting of injuries to the relevant authorities and low uptake of postexposure prophylaxis (PEP).^{22,23,24,25,26,27,28} this situation, if appropriate and effective interventions are not put in place to prevent it, portends serious danger for the healthcare workforce in nigeria in particular and sub-saharan africa in general where there exist a weak healthcare delivery system.

Needle stick injuries (NSIs) are the injuries that are caused by needles such as hypodermic needles, blood collection needles, intravenous stylets, and needles used to connect parts of intravenous delivery systems.²⁹ NSI s are very common and in many instances unavoidable among healthcare providers when they are delivering patient care. In the healthcare sector, NSIs are one of the most preventable occupational hazards among healthcare providers.³⁰ centers for disease control (CDC) of the united states of America estimated that exposure to blood and body fluids by sharps and NSIs affect around three million health workers annually with an estimated occurrence of six million NSIs every year.³¹ the occupational exposures to NSIs are considered to be much higher in the developing world and much of the cases are not even reported.³² it is expected that around 75% of the NSIs in developing countries are not reported.³² globally, there is gross under-reporting of NSI with the actual incidence of NSIs being much higher than those reported.³³ healthcare institutions must be careful not to interpret or understand the low reporting rate as low rate of injury. Studies have shown that the NSI s that are reported through the normal hospital reporting systems are underreported to the extent of 10 times lower in many instances.³⁴

NSI s lead to a risk of developing various types of infections and healthcare providers are always under serious threat. The main problem because of underreporting of NSI s is that the people who are exposed could not be given post-exposure prophylaxis (PEP) at appropriate time to prevent the development of infection in the person who has experienced NSI. For example, PEP for HIV is shown to be 80% effective in preventing the development of the infection.³⁵ the risk of transmission of blood-borne infections, such as human immunodeficiency virus (HIV), hepatitis b virus (HBV), and hepatitis C virus (HCW), are common in NSIs, and thus, safety practices and guidelines must be practiced by all healthcare providers to protect themselves from infection.³⁰ the risk of infection for different diseases varies highly. Due to NSI the risk of infection varies from 0.5% to 40% for HIV and hbv infections, respectively.³⁶

There is evidence of best practices that should be followed to avoid NSIs. However, the knowledge about them among the healthcare providers and their implementation seems to be very less. Although published evidence recommend that contaminated needles should not be recapped, but studies from developed countries, such as the United States, showed that recapping of needles is occurring commonly among the healthcare worker.^{31,37} There are no national reporting systems for NSI s in india, but a report in 2006 showed that around 63% of the 3–6 billion injections given every year are unsafe.³⁸ NSI s have the potential to affect the health system both directly and indirectly. In developing countries with limited human resources for health, there are higher restrictions in the number of available doctors and nurses. NSI s and other health-related occupational injuries affect the health services provided by increasing the number of work days lost due to injuries and the emotional distress, which are caused to the healthcare providers due to NSI s.³⁹

The ministry of health and family welfare of the government of India recommends that the healthcare providers must be made aware of the safety precautions that must be followed for the prevention of NSIs. Adequate training to the healthcare workers to handle the sharp objects is also equally vital.⁴⁰ In addition to provision of information to healthcare providers and adequate training to them, effective reporting systems should be placed in all healthcare facilities for early reporting of cases and immediate actions to be taken to address the issue by providing adequate PEP and treatment.⁴⁰ PEP can be initiated only if there is adequate and fast reporting of data. Some institutions in India maintain a staff health service facility, which registers all cases of NSIs and holds a record for them and have

safety protocols in place to manage them and adequately monitor if the cases are being reduced.⁴⁰ Safety protocols should be always in place in all hospitals and healthcare facilities to prevent the risk of NSIs and for the enforcement of safety precautions and immediate actions to be taken in the case of any exposures.⁴⁰ There are limited data about the prevalence and attributes of NSIs in the different healthcare settings in India. This study aimed to estimate the prevalence, other correlates, and attributes of NSIs among the healthcare providers in emergency department in a tertiary health care centre and teaching hospitals in Kolkata, India.

Aim and Objective:-

1. Determining the rate of injuries.
2. Investigating the factors that cause the injuries.
3. Ensuring that injured workers receive proper treatment.
4. Identifying areas in which the prevention program needs improvement.
5. Leading to practical strategies for dealing with the problem.

Review of Literature:

A needle stick injury is the penetration of the skin by a hypodermic needle or other sharp object that has been in contact with blood, tissue or other body fluids before the exposure.⁴¹ even though the acute physiological effects of a needle stick injury are generally negligible, these injuries can lead to transmission of blood-borne diseases, placing those exposed at increased risk of contracting infectious diseases, such as hepatitis b (hbv), hepatitis c (hcv), and the human immunodeficiency virus (HIV).among healthcare workers and laboratory personnel worldwide, more than 25 blood-borne virus infections have been reported to have been caused by needle stick injuries.⁴² in addition to needle stick injuries, transmission of these viruses can also occur as a result of contamination of the mucous membranes, such as those of the eyes, with blood or body fluids, but needle stick injuries make up more than 80% of all percutaneous exposure incidents in the united states.^{41,43} various other occupations are also at increased risk of needle stick injury, including law enforcement, laborers, tattoo artists, food preparers, and agricultural workers.^{43,44}

Increasing recognition of the unique occupational hazard posed by needle stick injuries, as well as the development of efficacious interventions to minimize the largely preventable occupational risk, encouraged legislative regulation in the us, causing a decline in needle stick injuries among healthcare workers.^{45,46}

Isara ar et al⁶⁹ (2015) found that healthcare workers (HCWs) are continually exposed to hazards from contact with blood and body fluids of patients in the healthcare setting. To determine the prevalence of needle stick injuries (NSI s) and associated factors among HCWs in the accident and emergency department of the university of benin teaching hospital (ubth), benin city, nigeria. This was a cross-sectional study. Data were collected using a structured, self-administered questionnaire and analyzed using ibm spss version 20. Univariate, bivariate, and binary logistic regression analyses were done. The level of significance was set at $p < 0.05$. The prevalence of NSI s 12 months preceding the study was 51.0% (50/98). Doctors 8/10 (80.0%) and nurses 28/40 (70.0%) had the highest occurrence. Recapping of needles 19/50 (38.0%) and patient aggression 13/50 (26.0%) were responsible for most injuries. The majority 31/50 (62.0%) of the injuries were not reported. The uptake of postexposure prophylaxis (PEP) was low 11/50 (22.0%). The factors that were significantly associated with NSI include age 30 years and above (odds ratio [or] =0.28, confidence interval [ci] = 0.11–0.70), work duration of three years and above (or = 0.29, ci = 0.11–0.75), and being a nurse (or = 3.38, ci = 1.49–9.93) or a paramedic (or = 0.18, ci = 0.06–0.52). The high prevalence of NSI s among the HCWs, especially in doctors and nurses is an indication that HCWs in ubth are at great risk of contracting blood-borne infections. Efforts should be made to ensure that injuries are reported and appropriate PEP undertaken following NSI s.

Ng yw et al⁷⁰ (2007) found that needlestick injury has been recognized as one of the occupational hazards which results in transmission of blood borne pathogens. A cross-sectional study was carried out among 136 health care workers in the accident and emergency department of two teaching hospitals from august to november 2003 to determine the prevalence of cases and episodes of needlestick injury. In addition, this study also assessed the level of knowledge of blood-borne diseases and universal precautions, risk perception on the practice of universal precautions and to find out factors contributing to needle stick injury. Prevalence of needlestick injury among the health care workers in the two hospitals were found to be 31.6% (n=43) and 52.9% (n=87) respectively. Among different job categories, medical assistants appeared to face the highest risk of needlestick injury. Factors associated with needlestick injury included shorter tenure in one's job ($p < 0.05$). Findings of this study support the hypothesis

that health care workers are at risk of needlestick injury while performing procedures on patients. Therefore, comprehensive infection control strategies should be applied to effectively reduce the risk of needlestick injury.

Muralidharan et al.⁷¹ (2010) found that percutaneous injuries caused by needlesticks, pose a significant risk of occupational transmission of bloodborne pathogens. Their incidence is considerably higher than current estimates, and hence a low injury rate should not be interpreted as a non-existent problem. The present study was carried out to determine the occurrence of NSI among various categories of health care workers (HCWs), and the causal factors, the circumstances under which these occur and to, explore the possibilities of measures to prevent these through improvements in knowledge, attitude and practice. The study group consisted of 428 HCWs of various categories of a tertiary care hospital in New Delhi, and was carried out with the help of an anonymous, self-reporting questionnaire structured specifically to identify predictive factors associated with NSIs. The commonest clinical activity to cause the NSI was blood withdrawal (55%), followed by suturing (20.3%) and vaccination (11.7%). The practice of recapping needles after use was still prevalent among HCWs (66.3%). Some HCWs also revealed that they bent the needles before discarding (11.4%). It was alarming to note that only 40 per cent of the HCWs knew about the availability of PEP services in the hospital and 75 per cent of exposed nursing students did not seek PEP. The present study showed a high occurrence of NSI in HCWs with a high rate of ignorance and apathy. These issues need to be addressed, through appropriate education and other interventional strategies by the hospital infection control committee.

Goel et al.⁷² (2017) found that occupational hazards such as accidental exposure to sharp, cuts, and splashes are common among health-care workers (HCWs). To determine the occurrence of self-reported occupational exposures to these hazards and to know the prevalent practices following the exposure. The second aim was to know the baseline antibody levels against hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV) immediately after these accidents. An observational prospective study was done in the HCWs of a tertiary care academic health organization of North India from January 2011 to December 2013. At the time of self-reporting of injury, a questionnaire was administered. Blood sample of HCWs and of the source, if identified, was collected for baseline HBV, HCV, and HIV serum markers. The exposed HCWs were followed up and repeat testing was done after 3–4 weeks for seroconversion up to 6 months. A total of 476 injuries were reported. Needle stick injury of fingers was the most common. Doctors were found to have the highest exposure rate (73.7%) distantly followed by nurses (19.1%). A significant number of the HCWs (125, 26.3%) vaccinated in past had hepatitis B surface antibody (anti-HBs) titers <10 mIU/ml (protection defined as anti-HBs level \geq 10 mIU/ml). Only 44 sources were found to be seropositive (11 for HIV, 9 for HCV, and 24 for HBV). No seroconversion was seen in any of the exposed HCWs after 6 months. The incidence of needle stick and sharp injuries is most often encountered in emergency wards. Anti-HBs titers were suboptimal in many of the HCWs requiring a booster dose of HBV vaccination.

Amini et al.⁷³ (2015) found that needle-stick injuries (NSIs) are among the hazards and problems that can expose health workers to infections. This study aimed to determine the rate of NSIs in a teaching hospital in Tehran, Iran. This cross-sectional, analytical and descriptive study was conducted at one of the teaching hospitals in Tehran, Iran, in 2013. The study population was 344 employees in various occupational groups selected via census. Data were collected using a researcher-made questionnaire. The collected data were analyzed using some statistical tests, including independent-samples t-test with SPSS software version 21.0. The results showed that only 50.2% of injuries had been reported; 67.8% of all participants (n = 211) had at least one NSI. Most NSIs had been reported in the emergency department (33.5%). Most participants mentioned the injection syringe needles as the main cause of their injuries (71.1% of all NSIs). Among NSIs, those caused by insulin syringe needles (6.2%) were the second cause. In this study, females had NSIs more than males. There was a statistically significant relationship between sex and the rate of NSIs ($p < 0.05$). Considering the high rate of occupational injuries, further preventive measures should be implemented to prevent these injuries from occurring. Providing initial and continuing training for employees is very important. Directing special attention to emergency department employees may be effective in reducing occupational injuries.

Sriram et al.⁷⁴ (2019) found that needle stick injuries (NSIs) are the injuries that are caused by needles, such as hypodermic needles, blood collection needles, intravenous stylets, and needles used to connect parts of intravenous delivery systems. NSIs is very common and in many instances unavoidable among healthcare providers when they are delivering patient care. Around 75% of the NSIs in developing countries is not reported. This study aimed to estimate the prevalence and other correlates and attributes of NSIs among healthcare providers in a tertiary care teaching hospital in South India. This is a cross-sectional study conducted in Narayana Medical College and Hospital in

Nellore, andhra pradesh, between june 2012 and february 2013. Data using a structured questionnaire were collected among all the 1525 healthcare providers working in the teaching hospital. Around 10.81% of the total healthcare providers in the teaching hospital were exposed to NSI s. Syringe needles (75%) were the most common devices leading to NSI s. Majority of NSI s took place in the wards of the different departments (75%). Morning shift (70%) was the most common time of the day for the occurrence of NSI s. Only 65% of the healthcare providers were wearing gloves at the time of injury. Majority (82%) took immediate treatment after NSIs. Establishment of formal reporting mechanisms, immediate reporting of NSIs, and the establishment of NSI prevention program will help in the reduction in the occurrence of NSIs and help in taking immediate remedial action in the form of prophylaxis and treatment.

Garus-pakowskaa et al⁷⁵ (2019) found that needlestick and sharp injuries (NSI s) are an important element of public health and should be closely monitored. On the other hand there are no precise polish data on a number of the occupational NSIs. The aim of the study was to assess the failure to report injuries and then to estimate the actual number of NSIs among healthcare workers (HCWs) in Poland based on the collected data. Analysis of injury registers on the basis of 252 hospitals in Poland. Conducting 487 surveys among doctors, nurses and paramedics. Calculation of rates of injuries per 1000 workers per year (with 95% confidence intervals (ci)). The level of statistical significance was set at $p \leq 0.05$. in the study period, 9775 NSI s were registered in the hospitals. Majority of the NSI s were recorded among nurses (72.6%, $p < 0.01$). The needle was the tool responsible for the greatest number of the NSI s in all professional groups (79.5%, $p < 0.01$). The average annual NSI s rates based on hospital registers were: 16.0/1000 doctors, 20.5/1000 nurses, 16.8/1000 paramedics. Every second NSI s was not reported (45.2%). They estimated that there are probably 13,567 NSI s every year among hospital care workers in Poland. NSI s is a significant health problem for HCWs and should be subject to epidemiological surveillance. The purpose of the training of medical personnel should be to increase the number of injuries reported. The implementation of the epidemiological surveillance system will allow for the unification of the obtained data, which would be more comparable on the national scale as well as between different countries.

Bekele t et al⁷⁶ (2015) found that needle stick and sharps injuries are occupational hazards to healthcare workers. Every day healthcare workers are exposed to deadly blood borne pathogens through contaminated needles and other sharp objects. About twenty blood borne pathogens can be transmitted through accidental needle stick and sharp injury. The study was conducted to determine the lifetime and past one year prevalence of needle stick and sharps injuries and factors associated with the past one year injuries among hospital healthcare workers in southeast Ethiopia. An institutional based cross sectional study was conducted in December 2014 among healthcare workers in four hospitals of bale zone, southeast of Ethiopia. A total of 362 healthcare workers were selected randomly from each department in the hospitals. Data were collected using self-administered questionnaire. The collected data were entered into epi-info version 3.5 and analyzed using spss version 20.0. Multivariable logistic regression analysis was used to identify the independent effect of each independent variable on the outcome variable. Written informed consent was secured from the participants. The prevalence of lifetime needle stick and sharp injury was 37.1% with 95% ci of 32.0% to 42.5%. The prevalence of injury within the past one year was 19.1% with 95% ci of 14.9% to 23.3%. Emergency ward was a department with highest needle stick and sharp injury (31.7%). The main cause of injury was syringe needles (69.8%). Participants who practiced needle recapping had higher odds of needle stick and sharp injury within the past 12 months (aor = 3.23, 95% ci: 1.78, 5.84) compared to their counterparts. Nearly one out of five respondents had experienced needle stick and/or sharp injury at least once within past one year. There were practices and behaviors that put healthcare workers at risk of needle stick and sharp injury at the study area. Needle recapping was key modifiable risk behavior. Health policy makers and hospital administrators should formulate strategies to improve the working condition for healthcare workers and increase their adherence to universal precautions.

Salelkar s et al⁷⁷ (2010) found that a cross-sectional study was conducted among health care workers at a tertiary care hospital in goa to study the problem of needle stick injuries. A structured questionnaire was used to interview the study participants at their work place. Participants were asked to recall needle stick injuries in the preceding 12 months. Factors such as work experience, type of procedure, action taken following injury etc were also studied. Statistical analysis was done with spss software. Around 34.8% (200/575) of the health care workers had experienced a needle stick injury in the last one year. Needle stick injuries were equally distributed across different work experience periods. Hollow bore needles were responsible for 77.5% of needle stick injuries followed by suturing needles (19.2%). As far as use of personal protection was concerned only 58% of the health care workers were wearing gloves at the time of the injury. There is therefore an urgent need at the hospital level to have a

uniform needle stick injuries policy covering safe work practices, safe disposal of sharps, procedures in event of needle stick injury, training including pre-employment training, monitoring and evaluation of needle stick injuries and procedures for reporting needle stick injuries.

Rais n et al ⁷⁸ (2013) found that percutaneous exposure to contaminated needle sticks and other sharps is an occupational hazard to HCWs that causes morbidity and mortality from infections with blood borne pathogens. This study was conducted to see the prevalence of needle stick injuries among health care providers at civil hospital Karachi (chk).the objective is to study the prevalence of NSI among HCWs, the most frequent reason of injury, common causative equipment, and affected site of hand. It is a prospective observational cross sectional study at chk in its 3 units including 100 participants. Study was conducted from 2nd Jan 2012 to 28th Feb 2012. Result shows that a large percentage (77%) of HCWs reported having had one or more NSI s in their career. While 23% did not report NSI in their career. (40.3%) NSI s occurred during use of the needle. Greater part of injuries reported due to disposable syringes (45/77 or 58.4%). Finger was affected by NSI s, in 72.7% cases. Their study concluded that the occurrence of NSI was found to be very frequent among HCWs in their setup. Poor compliances to universal precautions is a risk factor for sharp injuries. Some circumstances such as pressure of work and time constraint was a contributing factor. NSI s could reduce with the use of safer designed equipment. The promotion of adequate working conditions and training programs regarding safety precautions on ongoing basis is very essential for future control of NSI s among health care workers at hospitals.

Masoumi-asl h et al ⁷⁹ (2017) found that healthcare workers (HCW) such as medical, dental, nursing and midwifery workers are at high risk for occupational exposure to blood-borne pathogens such as hepatitis b virus (hbv), hepatitis c virus (hcv) and HIV through sharp injuries of needlestick. The current study aimed to evaluate the prevalence of needle stick injuries (NSI s) among healthcare workers in milad hospital in Tehran, Iran, from 2007 to 2011 and investigate the related factors of needle sticking in the hospital in order to decrease the risk of infectious diseases transmission due to needlestick injury. This retrospective cross-sectional study was performed among healthcare workers including nursing staff, physicians, gynecologist, laboratory staff, cleaners and garbage collectors in milad hospital in tehran, iran, over a five-year period from 2007 to 2011. All of the NSI s data was obtained from infection control committee in milad hospital. Questionnaire sheets were filled up and all of the information was rechecked one more time by experts. The information included demographic questions and NSI related questions. Vaccination for hbv and titer of hepatitis b surface antibody (anti-hbs) were recorded. The association between demographic and needlestick characteristics was tested through working shifts. The current study, 608 out of 3806 hospital staff including 209 (34.3%) male and 399 (65.7%) female had NSI s over a five-year period in milad hospital. Most of the NSI s was observed in enrolled nurse, nursing sister and midwife groups 308 (50.7%) followed by servants 122 (20.1%) and the lowest was found in laboratory staff 14 (2.3%). Staff who worked in the internal medicine ward 95 (15.6%), emergency ward 72 (11.8%) and inteNSI ve care unit (ICU) 58 (9.5%) had experienced NSI s. There were uniform time patterns of NSI s by working shifts; therefore, the lowest number of the injuries occurred in the start of working shift (7:00 am, 01:00 pm and 07:00 pm) and increased along the time. Most of the NSI s occurred through taking blood and injection 182 (29.9%). Compared to NSI data by working shift, the greater number of the injuries occurred in the evening and night, but it was not statistically significant through needlestick characteristics (p value > 0.05).nurses are at the highest risk for NSI s and servants the second. Staff training, proper use of protective equipment, proper disposal of infectious waste and vaccination of all staff against hbv might be effective measures towards reduction of the number of NSI s.

Ahmed as et al ⁸⁰ (2014) found that needle stick and sharp injuries are a significant risk to the health of nurses. Every day nurses face the possibility that they may injure themselves. Although many injuries will have no adverse effect, the possibility of developing a disease such as hepatitis c, hepatitis b or HIV can cause untold psychological harm. To determine the prevalence of needle sticks and sharps injuries and its associated factors among nurses at zagazig university hospitals.A cross-sectional study was conducted on 236 nurses working at Zagazig University hospitals during 2013.the data were collected through a questionnaire includes some demographic and work characteristics and information regarding the incident of needle sticks injury. The prevalence of needle stick and sharp injuries among nurses was (74.57%) during the whole work duration, (72.8%) of nurses exposed to needle stick while (39.4%) exposed to sharp injury and (36.86%) exposed more than once. (55.93%)of studied group exposed during the last year. The most frequent causative tools were hollow –bore needle (78.03%) followed by blade (27.27%) then suture needle (23.48%). The most frequent procedures at which exposure happen were needle recapping, injection and sample drawing (62.87%, 56.06% and 43.18%) respectively. All exposed nurses used antiseptic after exposure while half of them let blood to flow. Only (6.81%) took the vaccine while no one took sero-

prophylaxis after exposure. Nurses are at a significant risk of needle stick and sharp injuries and prone to blood borne pathogens. Health education and training programs should be held regularly for nurses about occupational health hazards of NSI, protective measures, the importance of reporting of incident and sharp management training, and follow preventive practices.

Gheshlagh rg et al⁸¹ (2018) found that needle stick and sharps injuries (NSI s) are critical occupational risk among health care workers (HCWs), which is extremely worrying due to the potential risk of transmitting bloodborne pathogens (bbps). This study was carried out to evaluate the prevalence of NSI s among Iranian HCWs. In this systematic review and meta-analysis, the key terms percu* injury, needle stick injury, needle stick injury, or sharp injury were searched in the scientific information database (sid), magiran, iranmedex, google scholar, science direct, pubmed, and scopus. A prefabricated checklist, including variables: first author, publication year, study population, sample size, gender, total prevalence of needlestick in each gender, type of questionnaire, region, and type of hospitals, was used to extract data from the selected articles included which were published between 2003 and 2016. The analysis showed that the prevalence of NSI s in the Iranian HCWs was 42.5% (95% ci 37–48). Moreover, the prevalence of NSI s was more in women (47%; 95% ci 36–58) compared to men (42%; 95% ci 26–58). Given the high prevalence of NSI s, it is necessary to supply safe needles and instruments, hold training programs focused on new methods of using sharp objects safely, observe safety principles and standards, reinforce the practical skills of personnel, and pay more attention to reporting and improving occupational behaviors like avoiding needle recapping in order to reduce the prevalence of NSI s and consequently reduce potential risk of transmission of bbps.

Hashmi a et al⁸² (2012) found that an investigation estimates that needle-stick and sharps injuries affect about 3.5 million individuals on the global level. In healthcare workers nurses and physicians appear especially at risk.to examine the epidemiology of occupational sharps injuries in health care workers. It is retrospective cross-sectional study was carried out among the health care workers ofmaternity and children’s hospital, ksa from 1st january to 30th june 2012 with participation of 750 HCWs by convenient sampling technique. A total of 32 cases of sharps injuries occurred during the six months period. Nurses accounted 46.9%, constituting the largest group of the health care workers. Most frequently site of occurrence was operating/recovery room 34.4%. 64.5% of injuries occurred “during use of device.” In 90.6% of cases injuring item was contaminated.59.4% injuries occurred while wearing single pair of gloves, only 21.9% with double pair of gloves. Most common site of injury was the right hand. There can be serious consequences of needle stick injuries in hospitals as large proportion of injuries involves used needles and sharps if health care workers do not take appropriate measures of protection.

Sujatha c et al⁸³ (2017) found that needle stick injury (NSI) is a major occupational health and safety issue among healthcare workers (HCWs). In India, incidence of NSI is high, but surveillance is poor with scarce authentic data. The aim of the study is to determine the occurrence of NSI, its associated factors and assessment of knowledge and practice of preventive measures and post exposure prophylaxis among HCWs in a tertiary care hospital in kerala. A cross-sectional study was conducted among 515 HCWs who included doctors, house surgeons, final year medical students, nurses, student nurses and lab technicians of a government sector tertiary care hospital in kerala. All HCWs of the institution present during the study time were included and only those unwilling to participate excluded. Ethical clearance and administrative permission was obtained along with informed consent from subjects after ensuring confidentiality. Content validated, structured questionnaire coNSI sting of questions regarding demographic data, incidence and prevalence of needle stick injury, circumstances leading to it, response of subjects to NSI and knowledge of study subjects on post exposure prophylaxis was administered to the study subjects. The technique of data collection was self-reporting by the study subjects. Overall, 55.7% HCWs had sustained at least one NSI in this hospital, while 35% of them had a NSI during the current year. NSI s was sustained during blood withdrawal (34%), injections (20.5%), suturing (20.2%) and cannula insertion (12%). Recapping the needle (26%) was the most frequent cause followed by collision with others (24%), manipulation of needle in patient (23%) and during/in traNSI t to disposal (10%). Majority (84%) did not report the incident, 8.4% underwent post exposure follow up, 82% of the HCWs were fully hepatitis b vaccinated, 44% had received training, 62% used gloves, 49% recapped needles and 55% followed proper sharp disposal. Significant association was found between NSI and male gender ($p < 0.001$), designation ($p < 0.001$) and years of experience ($p < 0.05$) with interns and those with less than one year’s experience at greater risk. The study warns significant workplace risk for the HCWs and calls for proactive interventions along with constant surveillance. In the light of the present study findings, it is evident that NSI poses a significant risk in a HCWs’ workplace. The risk is higher when they coNSI der the lack of adequate personal protective equipment, standard protocol and proper reporting authority, which is compounded by inadequate training and experience, lack of awareness and negligence of safety conscious behavior of HCWs.

Bhardwaj et al⁸⁴ (2014) found that accidental needle-stick injuries (NSI s) are a hazard for health-care workers and general public health. Orthopaedic surgeons may be more prone to NSI s due to the prevalence of bone spikes in the operative field and the use of sharp orthopaedic instruments such as drills, saws and wires. A hospital-based cross-sectional study was conducted in the orthopaedic wards of Melaka General Hospital. The prevalence of NSI s was 32 (20.9%) and majority of it occurred during assisting in operation theatre 13 (37.4%). Among them six (18.8%) were specialist, 12 (37.5%) medical officer, 10 (31.2%) house officer and four staff nurses (12.5%). Among the respondents 142 (92.8%) had been immunized against hepatitis B and 148 (96.7%) participants had knowledge regarding universal precaution. The incidence of NSI among healthcare workers at orthopaedics ward was not any higher in comparison with the similar studies and it was found out that the prevalence was more in junior doctor's compared with specialist and staff nurses and it was statistically significant.

Jahans et al⁸⁵ (2005) found that accidental needlestick injuries sustained by health care workers are a common occupational hazard in health care settings. The aim of this study was to review the epidemiology of needle stick injuries in Buraidah Central Hospital, a 212-bed secondary care hospital in Buraidah, Saudi Arabia. They conducted a retrospective survey of all self-reported documents related to needle stick injuries, for the period January 2002 through December 2003. The data was analyzed to determine the age, sex and job category of the health care worker suffering the injury as well as the risk factors responsible for needle stick injuries. During the 2-year period, employees reported 73 injuries from needles and other sharp objects. Nurses were involved in 66% of instances, physicians in 19%, technicians in 10%, and nonclinical support staff in 5.5%. The majority (53.4%) of the injuries occurred after use and before disposal of the objects. Syringe needles were responsible for 63% of all injuries. Most injuries occurred during recapping of used needles (29%), during surgery (19%), and by collision with sharps (14%). Disposal-related (11%) causes as well as injuries by concealed sharps (5%) occurred while handling linens or trash containing improperly disposed needles. This data emphasizes the importance of increased awareness, training and education of health care workers for reporting and prevention of needle stick injuries.

Al Jarallah et al⁸⁶ (2016) nurses are the most frequent health occupational group to suffer from needle stick and sharp injuries (NSI), which puts nurses under the risk to acquire serious blood-borne diseases. The aim of the study was to assess the incidence of NSI s among nurses, and to assess their knowledge and evaluate the effect of intervention on raising knowledge, awareness, and decreasing the incidence of NSI s. An intervention study was carried out among all nurses of both sexes working at a military hospital in Saudi Arabia during the period from February 2015 to May 2016. The study was carried out in three phases, the pre-intervention phase where data collection was carried out using a questionnaire, the second phase where health education and a training program were provided to the nurses, followed by the post-intervention assessment after 1 year of the intervention. The incidence of NSI s among nurses decreased after the intervention from 9.42 to 3.93%. Whereas the total knowledge score increased from 54.45 to 91.57%. After intervention, all incidents were reported and had proper management after exposure, whereas before intervention 66.67% reported the incident and 55.56% had proper management after exposure. Health education and training program provided to the nurses about NSI s had a great effect on decreasing the incidence and raising the knowledge and awareness of nurses toward reporting and proper management after exposure.

Kruger et al⁸⁷ (2012) found that needlestick injury in healthcare settings is a global issue, with the preponderance of these injuries among nursing staff being a common occurrence. A cross-sectional study was conducted on 202 nurses in a regional hospital using a 17-item anonymous self-administered questionnaire to describe the epidemiology of self-reported needlestick injury in a one-year period. 38 nurses (18.8%) indicated that they had had needlestick injuries in the previous 12 months. Most (78.3%) needlestick injuries occurred in wards with syringe needles being the most common causative device, while 28.9% occurred during recapping of needles. The majority of respondents (90.1%) were aware of the hospital policy on needlestick injury. Although needlestick injuries were prevalent at a low rate, only 50% were reported. It remains an important workplace hazard that needs on-going attention such as training, as it could be the cause for diseases, for example HIV and hepatitis B, among nurses.

Lyra et al⁸⁸ (2019) found that needle stick injuries (NSI s) are the injuries that are caused by needles, such as hypodermic needles, blood collection needles, intravenous styles, and needles used to connect parts of intravenous delivery systems. NSI s are very common and in many instances unavoidable among healthcare providers when they are delivering patient care. Around 75% of the NSI s in developing countries is not reported. This study aimed to

estimate the prevalence and other correlates and attributes of NSIs among healthcare providers in a tertiary care teaching hospital in south India. An observational prospective study was conducted at East Point College of medical sciences & research centre, Bangalore during a period of January 2017 to December 2018. They analyzed the data of all the HCWs who voluntarily reported injuries by needle stick, sharps such as cannulas, broken vials and splashes on cuts, and mucous membranes by potentially infectious materials such as blood and other body fluids. 48 NSI events were reported during the study period of two years. Among these 36 (75%) were females and 12 (25%) were males. Percutaneous injuries (45, 93.7%) were more common as compared to mucocutaneous exposures (3, 6.3%). In their study the highest incidence of needle stick injuries were among the nursing staff (31.2%) and nursing students (27.1%). Injuries were most commonly reported from wards (16, 33.3%) followed by emergency department (11, 22.9%). Majority of the NSI occurred during procedures (n=35, 73%). Syringe needles (41.7%) were the most common devices leading to NSIs. 22 (45.8%) of the HCW had completed 3 doses of hepatitis B vaccination, while 17 (35.4%) had completed 2 doses, 8 (16.6%) had completed the first dose and 1 (2.2%) was unvaccinated. Only 22 (45.8%) of the HCWs were using gloves, at the time of exposure. Cleaning the injury site with running water was the most frequently used first aid measure in over 75% of the injured HCWs. Source patient could be identified in 39 (81.3%) exposures. Establishment of formal reporting mechanisms, immediate reporting of NSIs, and the establishment of a comprehensive NSI prevention program will help in the reduction in the occurrence of NSIs and help in taking immediate remedial action in the form of prophylaxis and treatment.

Matsubara et al.⁸⁹ (2017) found that health care workers (HCWs) face risks of needle stick and sharp injuries (NSIs). Most NSIs occur in developing countries; however, no epidemiological study on NSIs is publicly available in Laos. The objective of this study is to identify the prevalence and risk factors of NSIs among HCWs in Laos. This cross-sectional study was designed to determine the prevalence and risk factors of NSIs among four tertiary hospitals in Vientiane, Laos People's Democratic Republic. Six months before the survey, 11.4% (106/932) of hospital staff had experienced NSIs, while 42.1% did in their entire career. Key protective factors of NSIs among nurses included adequate availability of needles, syringes, and sharp equipment ($p = 0.042$; odds ratio [OR], 0.47) and attendance to educational or refresher courses on safety regarding NSIs ($p = 0.038$; OR, 0.50). As an on-site practice, single-handed recapping was prevalent (46.7%, 257/550) among participants. The result showed that high rates of NSIs persist among HCWs. The findings of this research call for comprehensive health and injection safety programs for HCWs involved in clinical practice.

Materials and Method:-

Study setting:

The study was conducted among health care workers of emergency department of tertiary health care centre of Kolkata including, both male and female and including those professionals who normally deal with needles—all consultants, SRs, JRs, interns, nursing staff and students, and paramedics of tertiary health care centres, which have organized emergency department. The expected duration of the study was approximately 1½ year between April 2018 to September 2019.

Study design:

The author proposes to conduct a prospective, cross-sectional study, after obtaining the institutional ethical committee clearance. The focus of the study is to assess the level of awareness regarding needle stick injuries among health care workers and to study the practices followed by them regarding needle stick injuries through a multiple-choice questionnaire. The questionnaire is semi-structured with prior pilot study being done. Written informed consent was taken from the subjects prior to the study. One-time assessment was done as it's a cross-sectional study designed to know their level of knowledge. The responses were noted, coded and entered in an Excel sheet and analyzed accordingly.

The questionnaire was directed in the understanding:

Knowledge and awareness regarding needle stick injuries among health care workers of emergency department.

Inclusion criteria:

Health care workers of emergency department of tertiary health care centre of Kolkata including, both male and female and including those professionals who normally deal with needles—all consultants, SRs, JRs, interns, nursing staff and students, and paramedics.

Exclusion criteria:

Staff who doesn't give consent for the study.

Study population:

It is important for the researcher to identify the population from which the data can be collected. Population can be number of units from which data can be potentially collected. For the purpose of this thesis, the data will be collected from the health care workers of emergency department of tertiary health care centres of Kolkata including, both male and female and including those professionals who normally deal with needles-all consultants, SRs, JRs, interns, nursing staff and students, and paramedics.

Study Sample:

A sample plan is an important feature of a qualitative research. According to parahoo (1997) one of the crucial task in designing a research project is to decide on the number and characteristics of the respondent who will be invited to take part in study.

According to polit & hunger (2001) in quantitative research the larger the sample the more representative of the population it is likely to be. For the purpose of this proposal, data was collected, from all participants fulfilling the inclusion criteria.

Study protocol:

The study was prospective cross-sectional questionnaire base study and questionnaire was distributed among the subjects included in the inclusion criteria and then was analysed by the statistician and then was formulated accordingly.

Questionnaire format (appendix i):

For the purpose of this proposal, a closed question format to collect data was used. Closed questions yield data that allow for comparison between respondents as all the responses are in the same format, this additionally allows for the collection of valid and reliable data. They can be answered quickly and therefore improve response rates and can be pre-coded, thereby making analysis easier. The limitations of closed question format, is that an appropriate response may be omitted thereby obtaining an invalid response. It is proposed that the questionnaire initially asks demographics questions. To determine knowledge level a multiple-choice format was used. Multiple-choice offers the participant a list of responses, from which they select the one most appropriate.

Statistical analysis:

For statistical analysis data were entered into a Microsoft excel spreadsheet and then analyzed by spss (version 25.0; spss inc., Chicago, Il, usa) and graphpad prism version 5. Data had been summarized as mean and standard deviation for numerical variables and count and percentages for categorical variables. Two-sample t-tests for a difference in mean involved independent samples or unpaired samples. Paired t-tests were a form of blocking and had greater power than unpaired tests. A chi-squared test (χ^2 test) was any statistical hypothesis test wherein the sampling distribution of the test statistic is a chi-squared distribution when the null hypothesis is true. Without other qualification, 'chi-squared test' often is used as short for Pearson's chi-squared test. Unpaired proportions were compared by chi-square test or Fischer's exact test, as appropriate.

Explicit expressions that can be used to carry out various t-tests are given below. In each case, the formula for a test statistic that either exactly follows or closely approximates a t-distribution under the null hypothesis is given. Also, the appropriate degrees of freedom are given in each case. Each of these statistics can be used to carry out either a one-tailed test or a two-tailed test.

Once a t value is determined, a p-value can be found using a table of values from student's t-distribution. If the calculated p-value is below the threshold chosen for statistical significance (usually the 0.10, the 0.05, or 0.01 level), then the null hypothesis is rejected in favour of the alternative hypothesis. P-value ≤ 0.05 was considered for statistically significant.

Result and Analysis:-

Table:- Distribution of age in years.

Age in years	Frequency	Percent
--------------	-----------	---------

<30	92	38.3%
≥30	148	61.7%
Total	240	100.0%

92(38.3%) subjects were <30 years old and 148(61.7%) subjects were ≥30 years old.

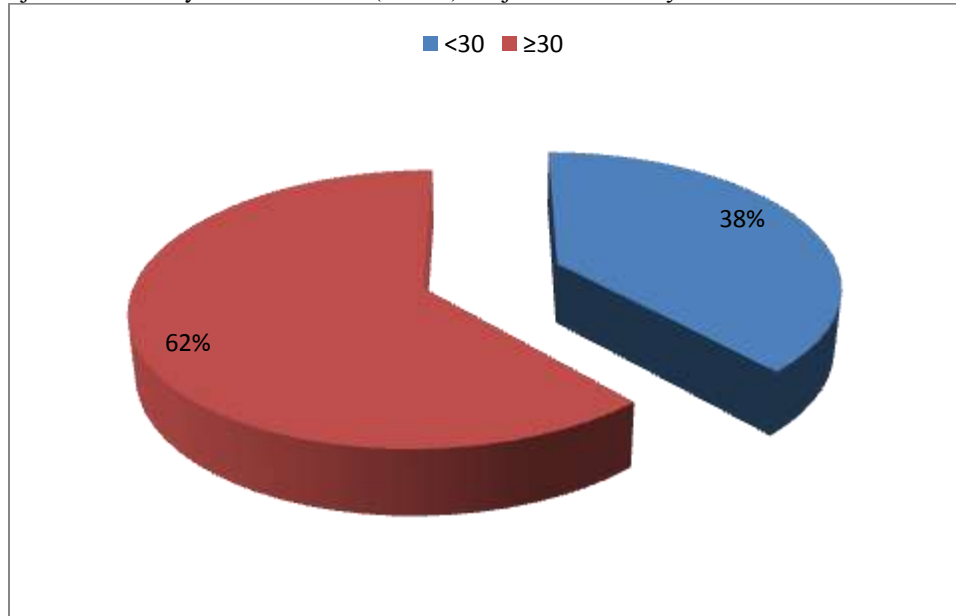


Table:- Distribution of sex.

Sex	Frequency	Percent
Female	134	55.8%
Male	106	44.2%
Total	240	100.0%

134(55.8%) subjects were female and 106(44.2%) subjects were male.

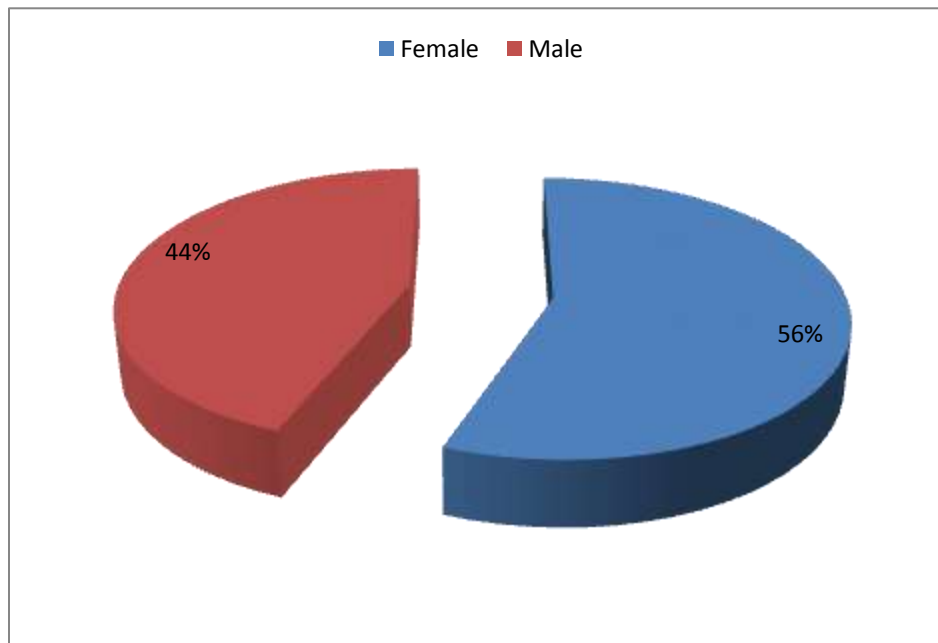


Table:- Distribution of occupation.

Occupation	Frequency	Percent
Doctor	90	37.5%
Nurse	111	46.3%
Paramedic	39	16.3%
Total	240	100.0%

90(37.5%) subjects were doctor, 111(46.3%) subjects were nurse and 39(16.3%) subjects were paramedic.

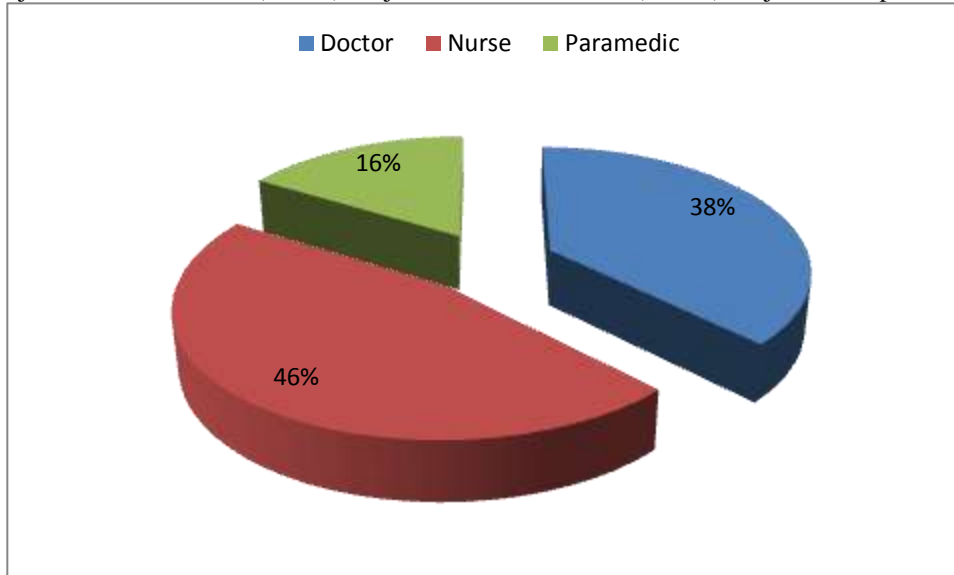


Table:- Distribution of work duration (years) group.

Work duration (years) group	Frequency	Percent
Work duration group 1(<3 years)	35	14.6%
Work duration group 2(3-5 years)	94	39.2%
Work duration group 3(>5years)	111	46.3%
Total	240	100.0%

35(14.6%) subjects were under work duration group 1(<3 years), 94(39.2%) subjects were under work duration group 2(3-5 years) and 111(46.3%) subjects were under work duration group 3(>5years).

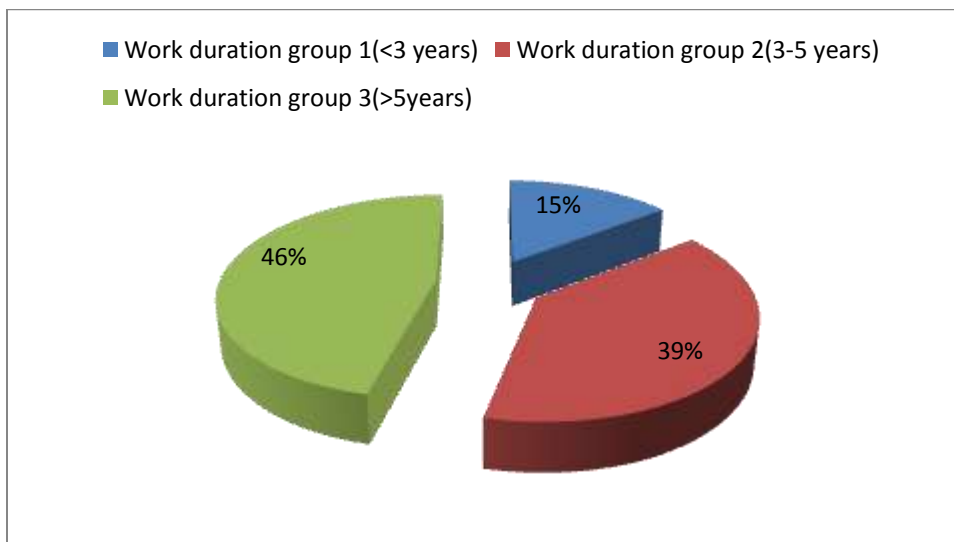


Table:- Distribution of NSI.

NSI	Frequency	Percent
No	103	42.9%
Yes	137	57.1%
Total	240	100.0%

137(57.1%) subjects had NSI.

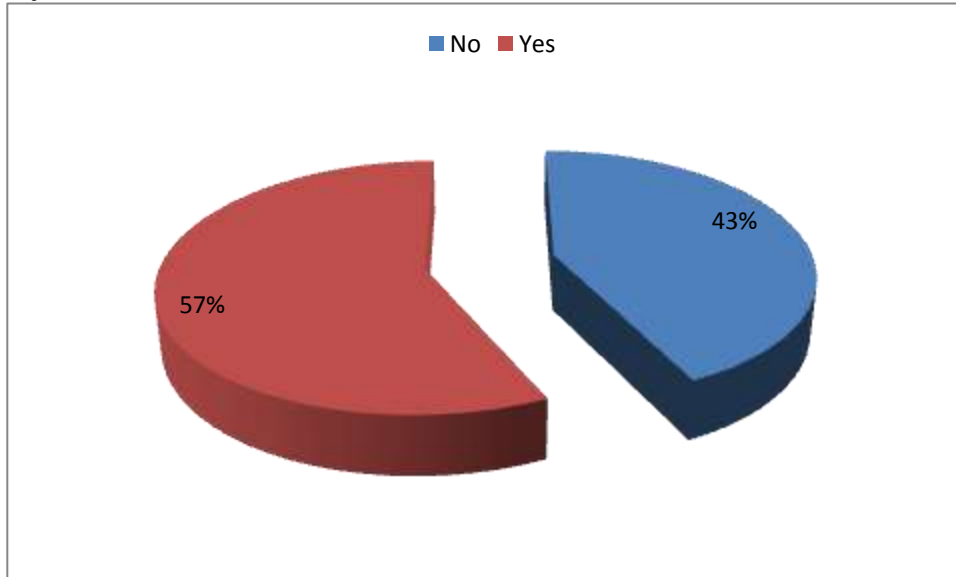


Table:- Distribution of number of NSI.

Number of NSI	Frequency	Percent
1	46	33.6%
2	40	29.2%
3	28	20.4%
4	11	8.0%
5	5	3.6%
6	7	5.1%
Total	137	100.0%

46(33.6%) subjects had NSI once , 40(29.2%) subjects had NSI twice , 28(20.4%) subjects had NSI thrice, 11(8.0%) subjects had NSI four times, 5(3.6%) subjects had NSI five times and 7(5.1%) subjects had NSI six times.

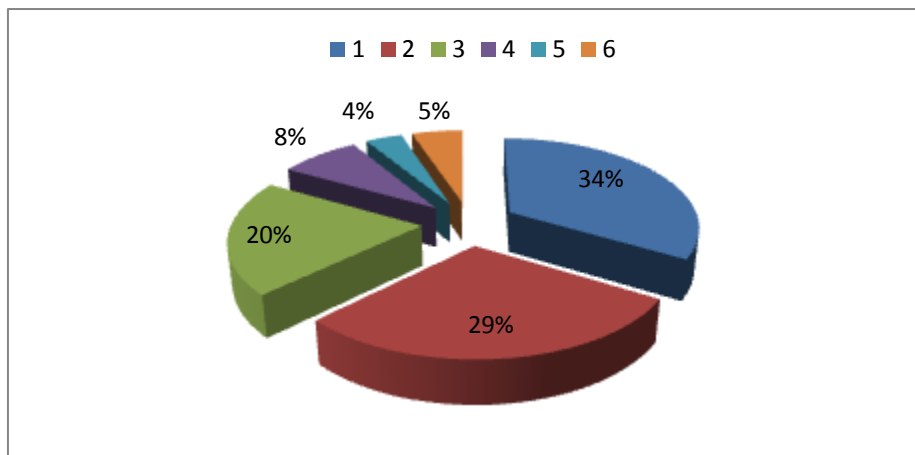


Table:- Distribution of circumstances leading to NSI.

Circumstances leading to NSI	Frequency	Percent
Accidental prick from other HCWs	17	12.4%
Handling/transferring specimen	17	12.4%
Patient aggression	35	25.5%
Recapping of needle	59	43.1%
Using needle	9	6.6%
Total	137	100.0%

17(12.4%) subjects had accidental prick from other HCWs, 17(12.4%) subjects were handling/transferring specimen, 35(25.5%) subjects had NSI due to patient aggression, 59(43.1%) subjects had NSI due to recapping of needle and 9(6.6%) subjects had NSI while using needle.

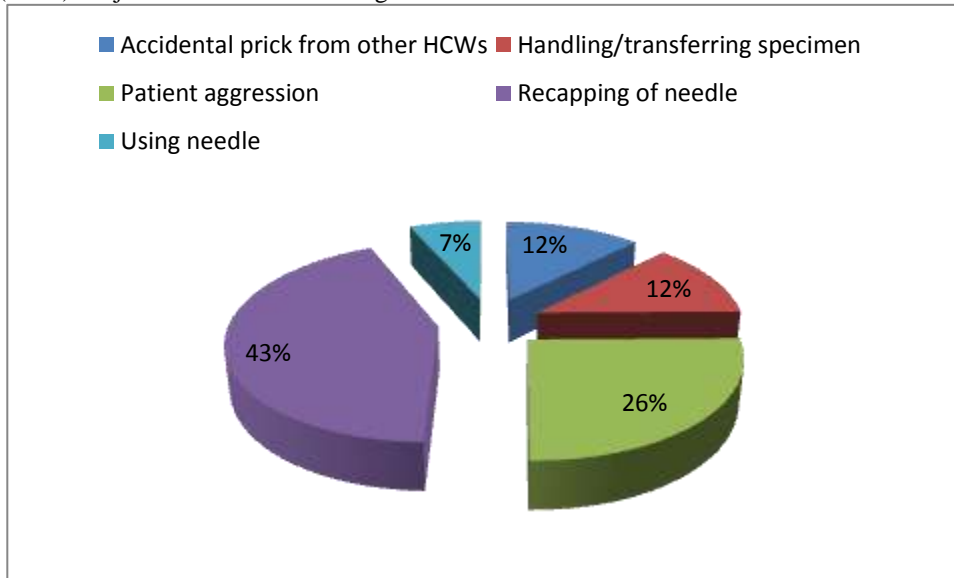


Table:- Distribution of report of NSI.

Report of NSI	Frequency	Percent
No	99	72.3%
Yes	38	27.7%
Total	137	100.0%

38(27.7%) subjects had report of NSI .

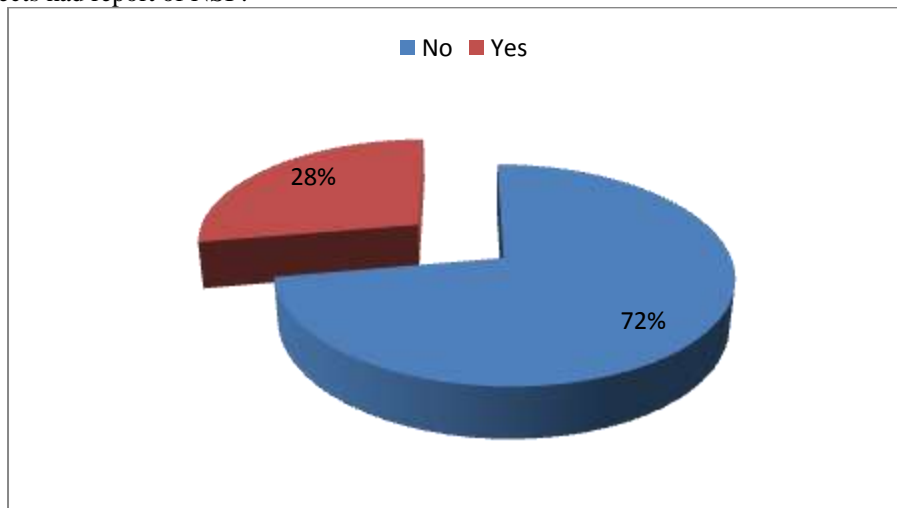


Table:- Distribution of whom did you report.

Whom did you report	Frequency	Percent
Infection control	17	44.7%
Line manager	6	15.8%
Occupational health	12	31.6%
Other	3	7.9%
Total	38	100.0%

17(44.7%) subjects were report to infection control, 6(15.8%) subjects were report to line manager, 12(31.6%) subjects were report to occupational health and 3(7.9%) subjects were report to other.

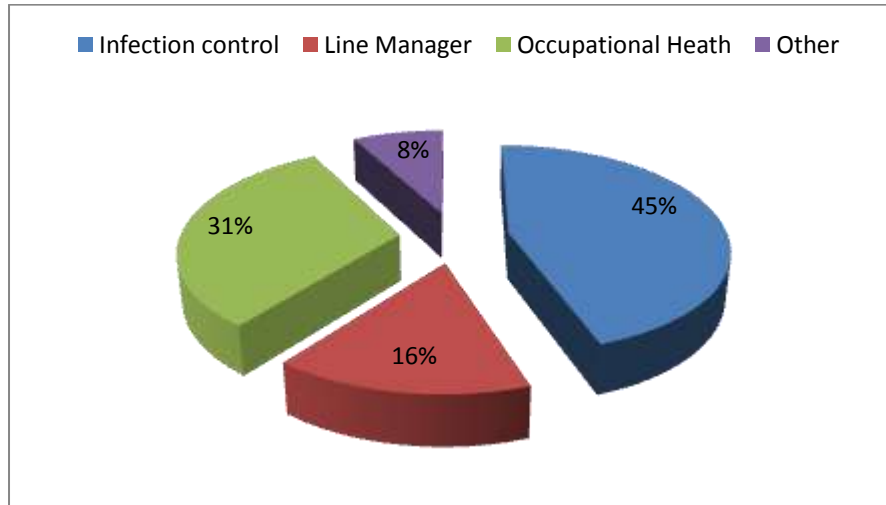


Table:- Distribution of reason for not reporting.

Reason for not reporting	Frequency	Percent
Do not know who to report to	12	12.1%
Not at risk of contacting blood born disease	46	46.5%
Not necessary	29	29.3%
Not willing to do serology test	12	12.1%
Total	99	100.0%

12(12.1%) subjects do not know who to report to, 46(46.5%) subjects thought that they were not at risk of contacting blood born disease, 29(29.3%) subjects thought that it was not necessary and 12(12.1%) subjects were not willing to do serology test.

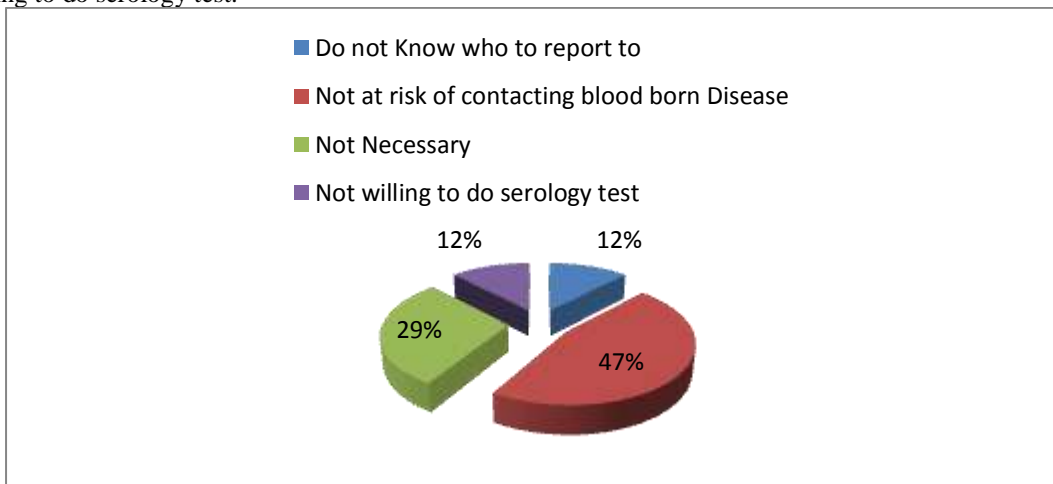


Table:- Distribution of do you fill an incident report.

Do you fill an incident report	Frequency	Percent
Cannot remember	9	6.6%
No	83	60.6%
Yes	45	32.8%
Total	137	100.0%

45(32.8%) subjects fill an incident report, 83(60.6%) subjects did not fill an incident report and 9(6.6%) subjects cannot remember to fill an incident report.

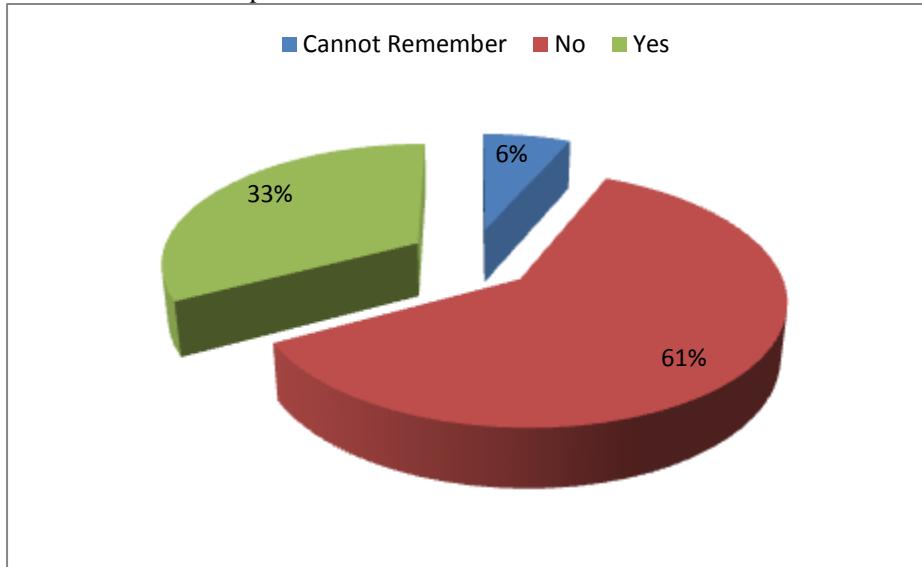


Table:- Distribution of incident report should be completed following.

Incident report should be completed following	Frequency	Percent
Both	47	19.6%
Unused NSI	39	16.3%
Used NSI	154	64.2%
Total	240	100.0%

47(19.6%) subjects had completed both incident report, 39(16.3%) subjects had completed unused NSI report and 154(64.2%) subjects had completed used NSI report.

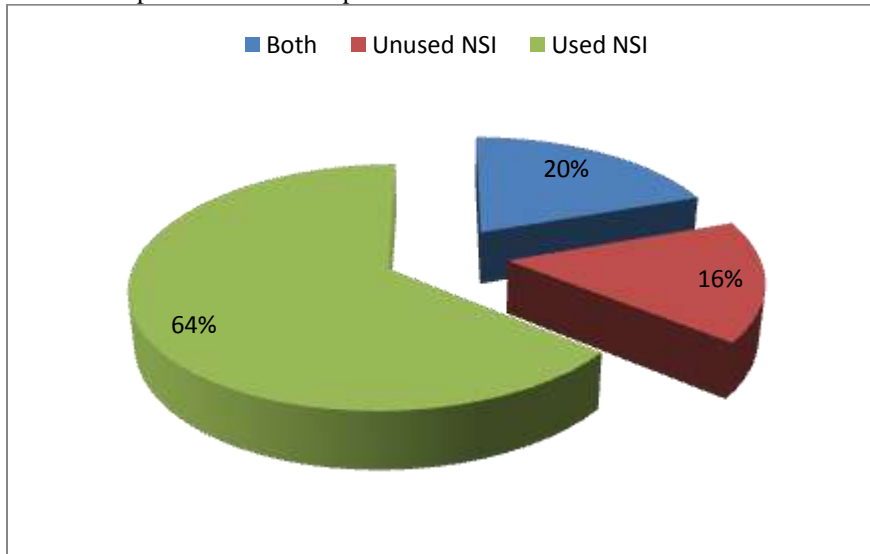


Table:- Distribution of uptake of PEP.

Uptake of PEP	Frequency	Percent
No	102	74.5%
Yes	35	25.5%
Total	137	100.0%

35(25.5%) subjects had uptake of PEP.

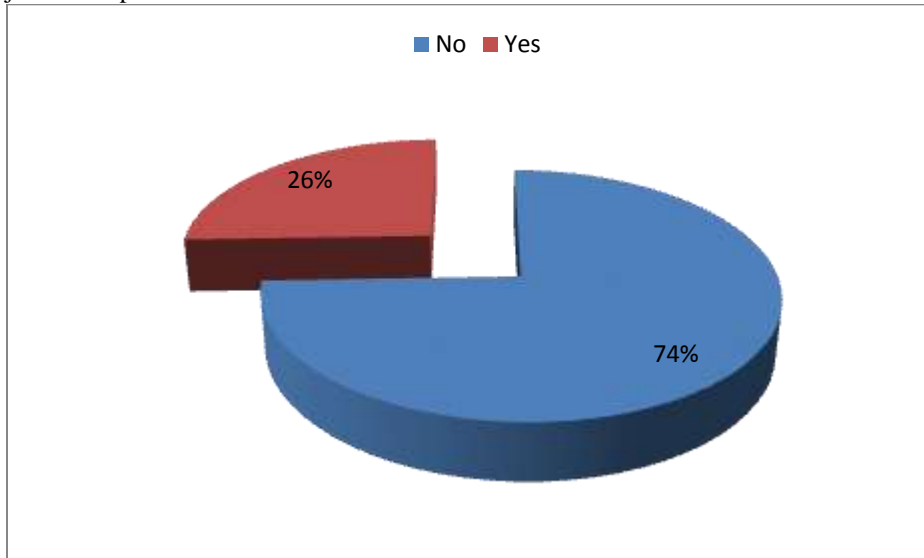


Table: Distribution of reason for not accessing PEP

Reason for not accessing PEP	Frequency	Percent
Fear of side effects	18	17.6%
Not necessary	32	31.4%
Not willing to know HIV status	12	11.8%
Source person is HIV negative	40	39.2%
Total	102	100.0%

18(17.6%) subjects were not accessing PEP for fear of side effects, 32(31.4%) subjects were not accessing PEP as not necessary, 12(11.8%) subjects were not accessing PEP as not willing to know HIV status and 40(39.2%) subjects were not accessing PEP as source person is HIV negative.

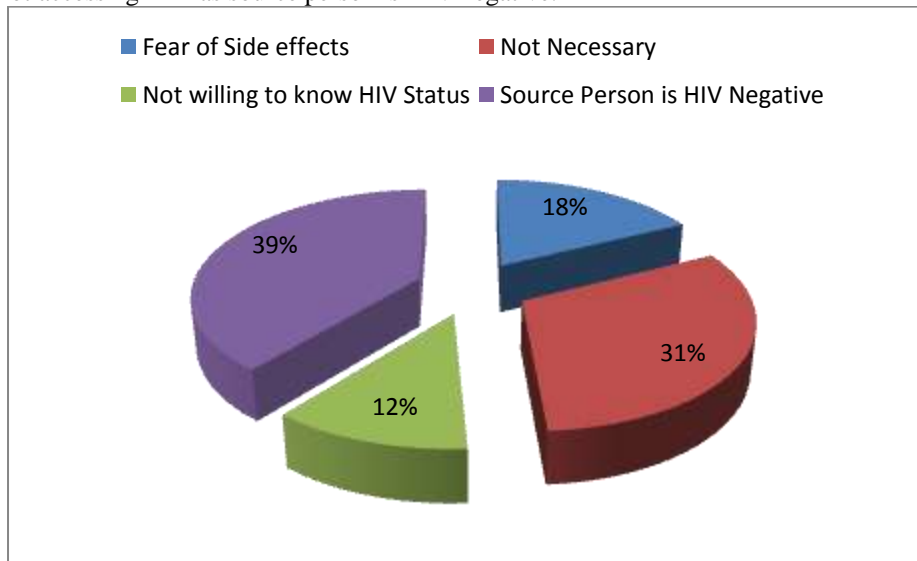


Table:- Distribution of fully inoculated against hep-B.

Fully inoculated against hep-b	Frequency	Percent
No	152	63.3%
Not sure	31	12.9%
Yes	57	23.8%
Total	240	100.0%

57(23.8%) subjects were fully inoculated against hepatitis band 31(12.9%) subjects were not sure.

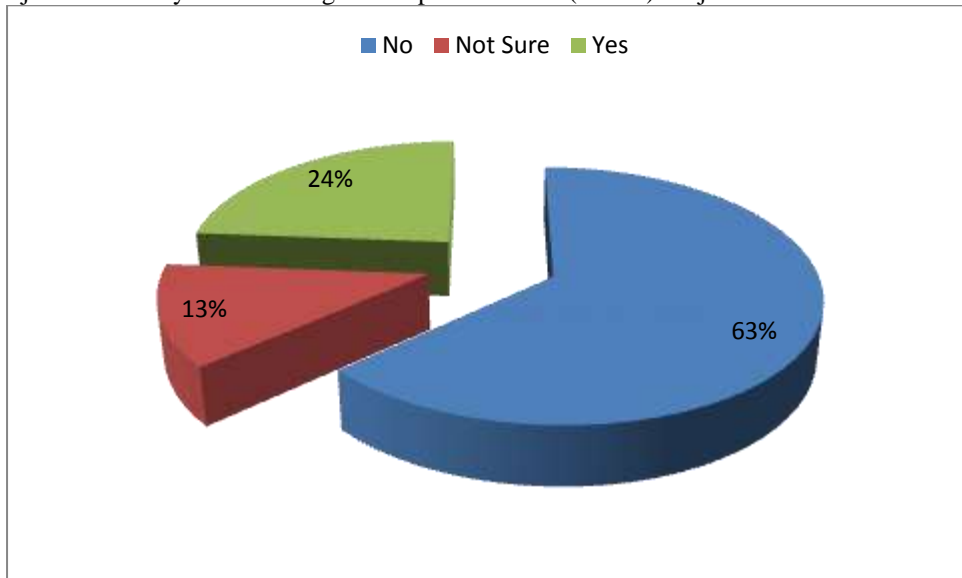


Table:- Distribution of know the guideline NSI management.

Know the guideline NSI management	Frequency	Percent
No	196	81.7%
Yes	44	18.3%
Total	240	100.0%

44(18.3%) subjects had known the guideline of NSI management.

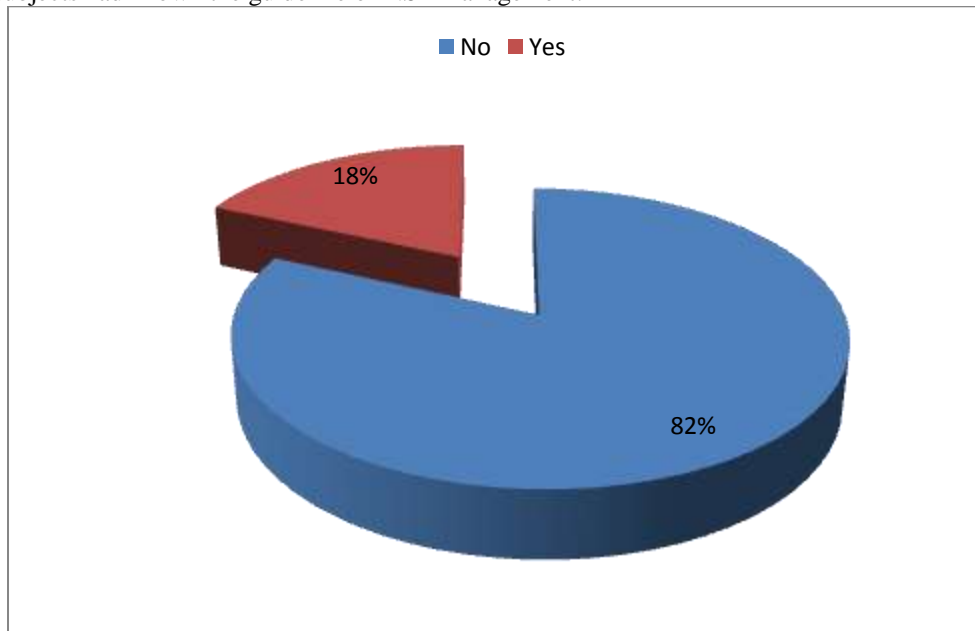


Table:- Distribution of attend a biosafety course.

Attend a biosafety course	Frequency	Percent
No	169	70.4%
Yes	71	29.6%
Total	240	100.0%

71(29.6%) subjects were attended a biosafety course.

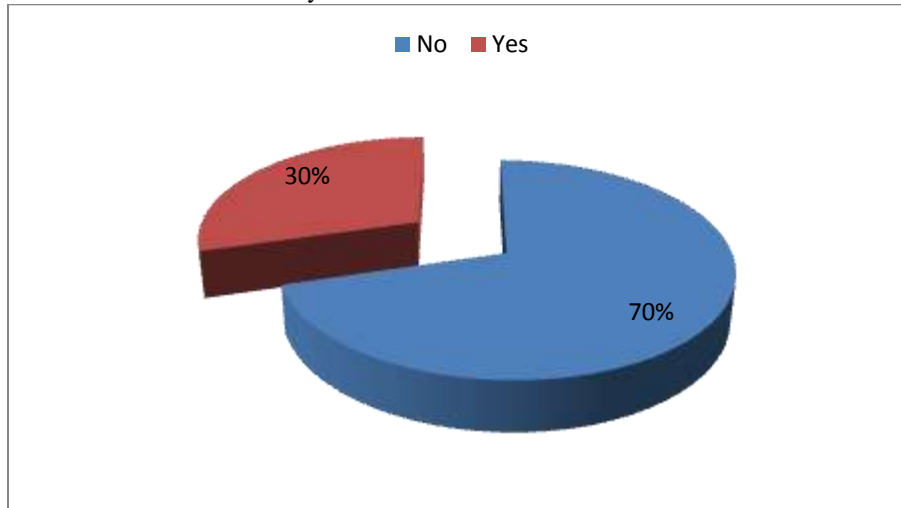


Table: Distribution of followed what you had been trained in biosafety

Followed what you had been trained in biosafety	Frequency	Percent
Always	23	9.6%
Most of the time	55	22.9%
Never	15	6.3%
Rarely	12	5.0%
Some time	135	56.3%
Total	240	100.0%

23(9.6%) subjects were always followed what had been trained in biosafety, 55(22.9%) subjects were most of the time followed what had been trained in biosafety, 15(6.3%) subjects were never followed what had been trained in biosafety, 12(5.0%) subjects were rarely followed what had been trained in biosafety and 135(56.3%) subjects were some time followed what had been trained in biosafety.

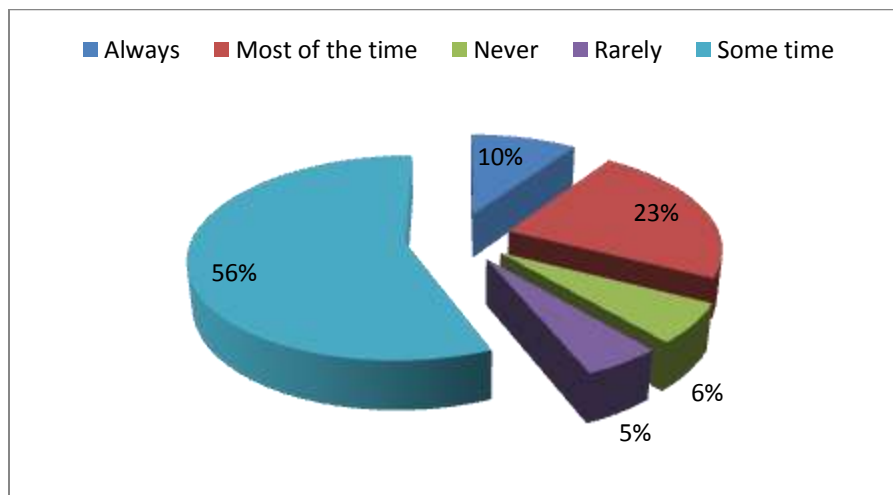


Table:- Distribution of main source of information NSI.

Main source of information NSI	Frequency	Percent
College curriculum	81	33.8%
Hospital	67	27.9%
Others	23	9.6%
Training course	69	28.8%
Total	240	100.0%

81(33.8%) subjects had got information from college curriculum, 67(27.8%) subjects had got information from hospital, 23(9.6%) subjects had got information from others source and 69(28.8%) subjects had got information from training course.

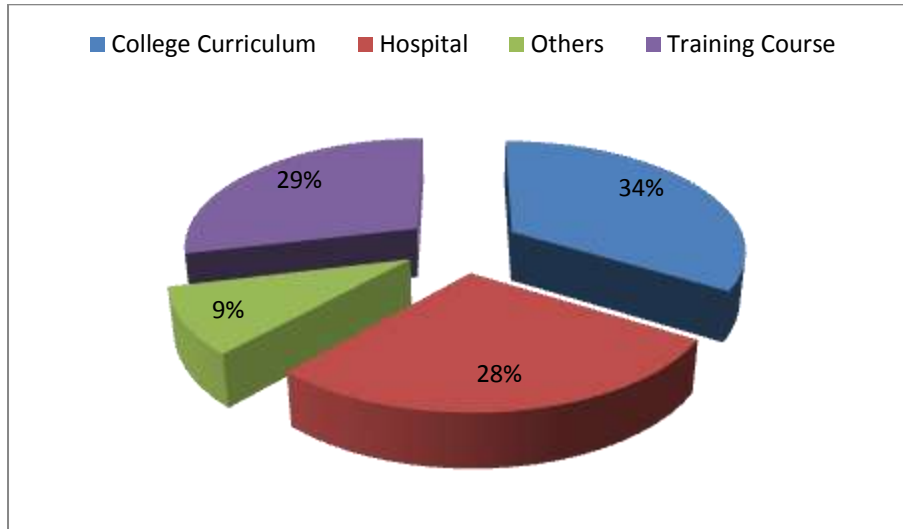


Table:- Distribution of use gloves when deal with needles.

Use gloves when deal with needles	Frequency	Percent
No	46	19.2%
Yes	194	80.8%
Total	240	100.0%

194(80.8%) subjects were use gloves when deal with needles.

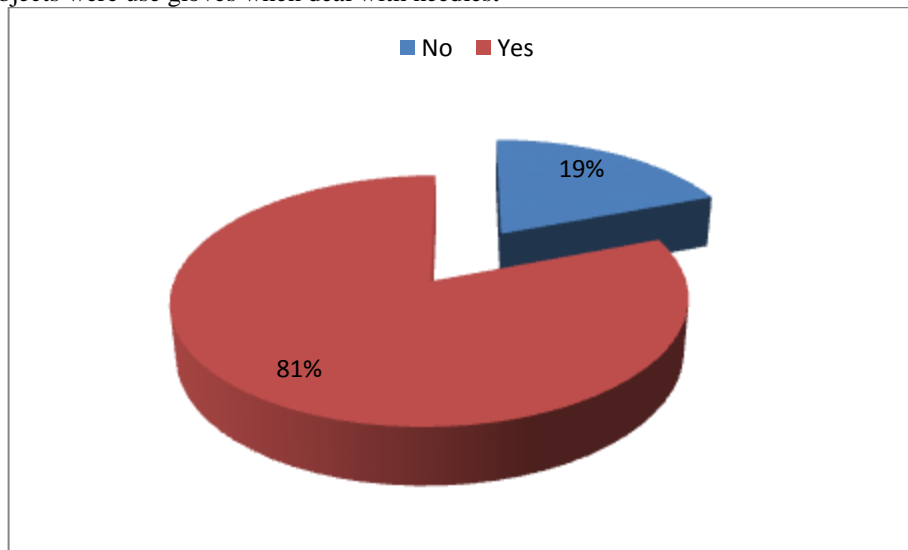


Table:- Association between age in years: NSI.

NSI			
Age in years	No	Yes	Total
<30	42	50	92
row %	45.7	54.3	100.0
col %	40.8	36.5	38.3
≥30	61	87	148
row %	41.2	58.8	100.0
col %	59.2	63.5	61.7
Total	103	137	240
row %	42.9	57.1	100.0
col %	100.0	100.0	100.0

Chi-square value: 0.4557**P-value:**0.4996

In NSI , 50(36.5%) subjects were under <30 years and 87(63.5%) subjects were under ≥30 years. The association between age vs NSI was not statistically significant (p=0.4996).

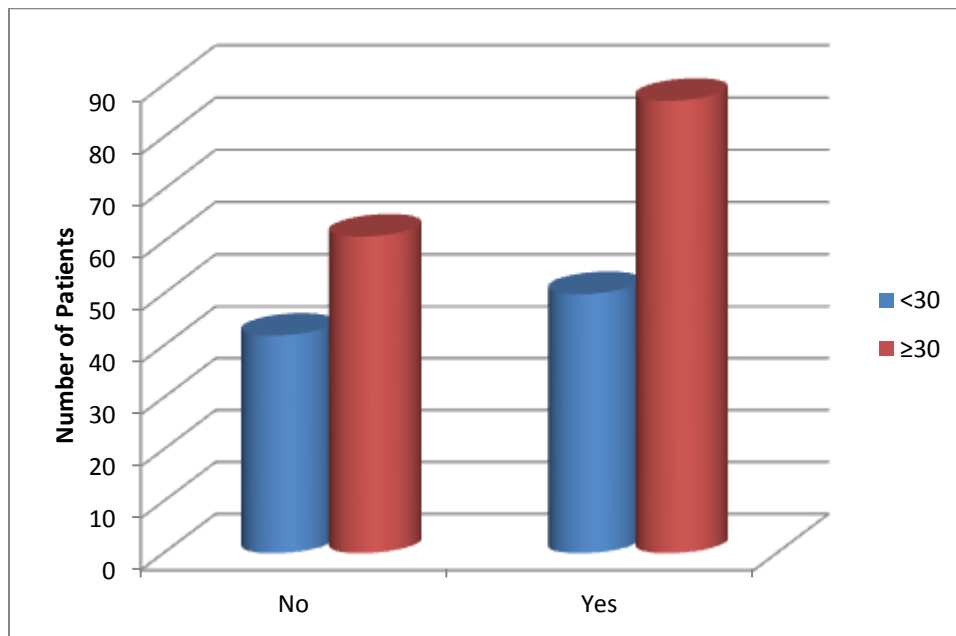


Table: Association between sex: NSI

NSI			
Sex	No	Yes	Total
Female	88	46	134
row %	65.7	34.3	100.0
col %	85.4	33.6	55.8
Male	15	91	106
row %	14.2	85.8	100.0
col %	14.6	66.4	44.2
Total	103	137	240
row %	42.9	57.1	100.0
col %	100.0	100.0	100.0

Chi-square value: 64.1250**p-value:**<0.0001

In NSI , 46(33.6%) subjects were female and 91(66.4%) subjects were male. The association between sex vs NSI was statistically significant (p<0.0001).

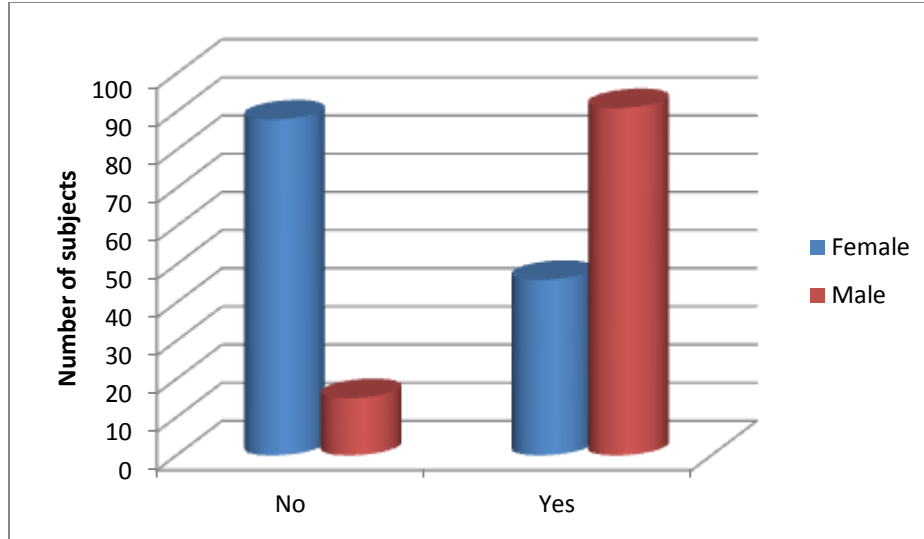


Table: Association between occupation: NSI

NSI			
Occupation	No	Yes	Total
Doctor	36	54	90
row %	40.0	60.0	100.0
col %	35.0	39.4	37.5
Nurse	42	69	111
row %	37.8	62.2	100.0
col %	40.8	50.4	46.3
Paramedic	25	14	39
row %	64.1	35.9	100.0
col %	24.3	10.2	16.3
Total	103	137	240
row %	42.9	57.1	100.0
col %	100.0	100.0	100.0

Chi-square value: 8.6266; **p-value:**0.0134

In NSI , 54(39.4%) subjects were doctor, 69(50.4%) subjects were nurse and 14(10.2%) subjects were paramedic. The association between occupation vs NSI was statistically significant (p=0.0134).

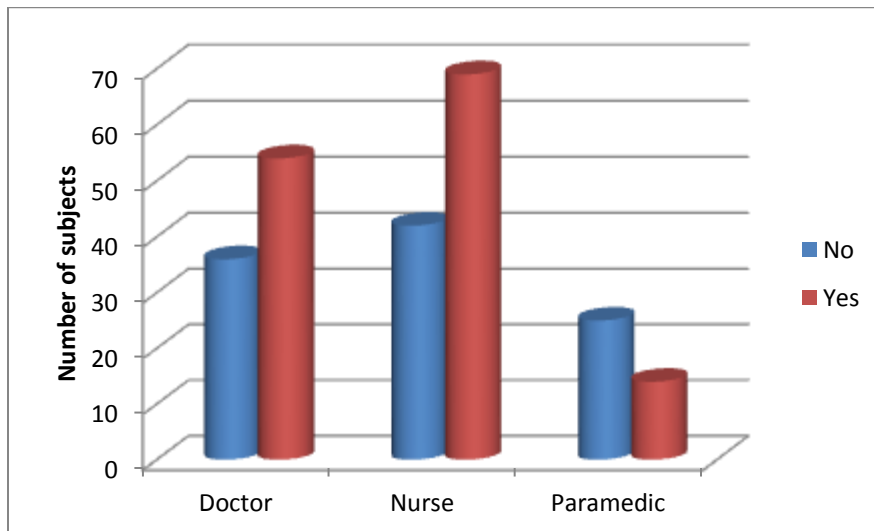


Table:- Association between work duration (years) group : NSI.

NSI				No	Yes	Total
Work duration (years) group						
Work duration group 1(<3 years)				15	20	35
row %				42.9	57.1	100.0
col %				14.6	14.6	14.6
Work duration group 2(3-5 years)				37	57	94
row %				39.4	60.6	100.0
col %				35.9	41.6	39.2
Work duration group 3(>5years)				51	60	111
row %				45.9	54.1	100.0
col %				49.5	43.8	46.3
Total				103	137	240
row %				42.9	57.1	100.0
col %				100.0	100.0	100.0

Chi-square value: .9007; p-value: 0.6374

In NSI , 20(14.6%) subjects were under work duration group 1(<3 years), 57(41.6%) subjects were under work duration group 2(3-5 years) and 60(43.8%) subjects were under work duration group 3(>5years). The association between work duration vs NSI was not statistically significant (p=0.6374).

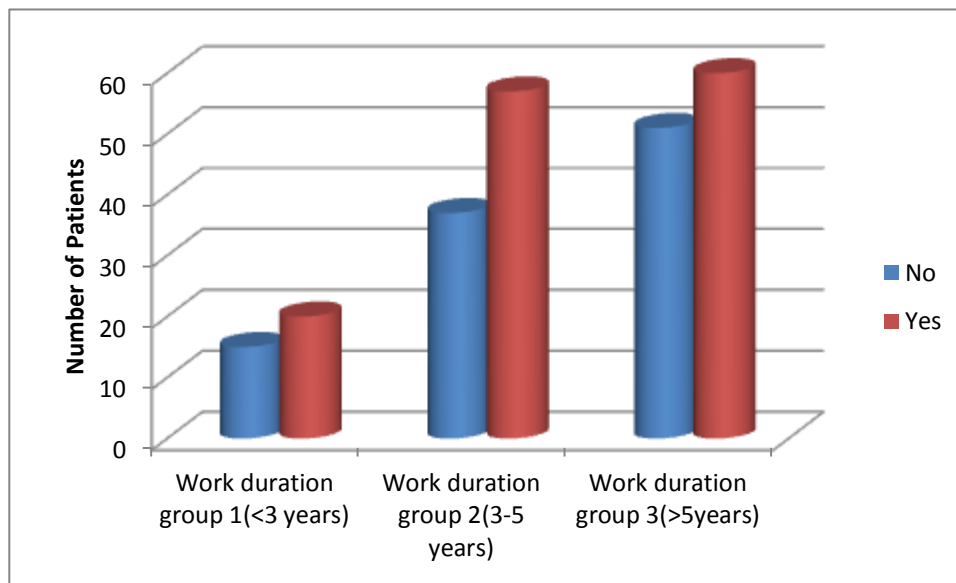


Table:- Association between fully inoculated against hep-B : NSI.

NSI				No	Yes	Total
Fully inoculated against hep-b						
No				65	87	152
row %				42.8	57.2	100.0
col %				63.1	63.5	63.3
Not sure				14	17	31
row %				45.2	54.8	100.0
col %				13.6	12.4	12.9
Yes				24	33	57
row %				42.1	57.9	100.0
col %				23.3	24.1	23.8
Total				103	137	240
row %				42.9	57.1	100.0

col %	100.0	100.0	100.0
-------	-------	-------	-------

Chi-square value: .0805; p-value: 0.9605

In NSI , 33(24.1%) subjects were fully inoculated against hepatitis-b and 17(12.4%) subjects were not sure. The association between fully inoculated against hepatitis-b vs NSI was not statistically significant (p=0.9605).

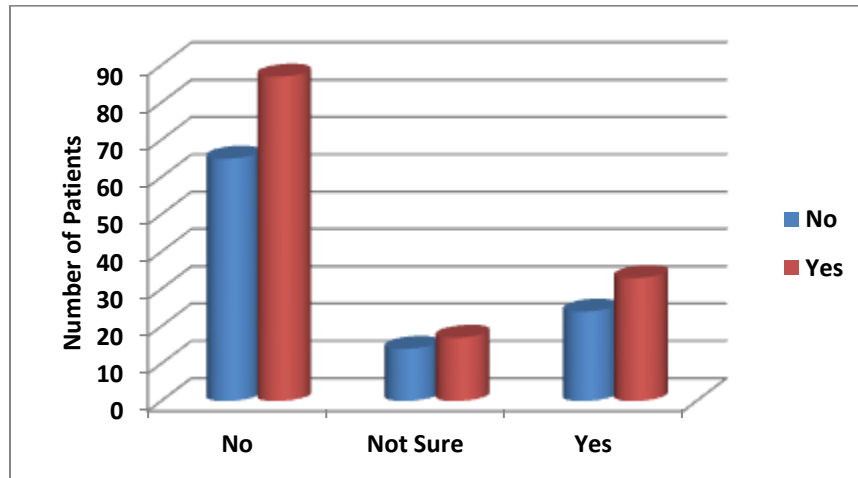


Table:- Association between know the guideline NSI management: NSI.

NSI					
Know the guideline NSI management		No	Yes	Total	
No	row	85	111	196	
	col %	43.4	56.6	100.0	
	col %	82.5	81.0	81.7	
Yes	row	18	26	44	
	col %	40.9	59.1	100.0	
	col %	17.5	19.0	18.3	
Total	row	103	137	240	
	col %	42.9	57.1	100.0	
	col %	100.0	100.0	100.0	

Chi-square value: 0.0886; p-value: 0.7659

In NSI , 26(19.0%) subjects had known the guideline of NSI management. The association between know the guideline of NSI management vs NSI was not statistically significant (p=0.7659).

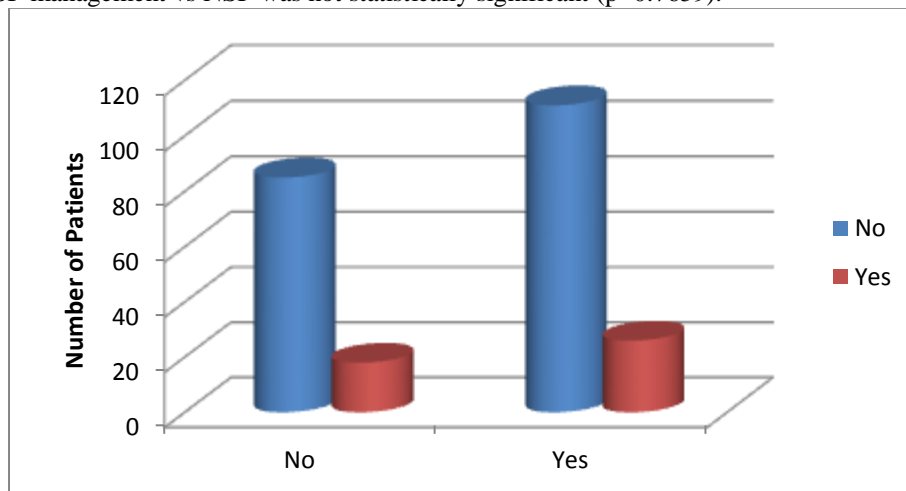


Table:- Association between attend a biosafety course: NSI.

NSI			
Attend a biosafety course	No	Yes	Total
No	70	99	169
row %	41.4	58.6	100.0
col %	68.0	72.3	70.4
Yes	33	38	71
row %	46.5	53.5	100.0
col %	32.0	27.7	29.6
Total	103	137	240
row %	42.9	57.1	100.0
col %	100.0	100.0	100.0

Chi-square value: 0.5223; **p-value:**0.46988

In NSI , 38(27.7%) subjects were attended a biosafety course. The association between attend a biosafety course vs NSI was not statistically significant (p=0.46988).

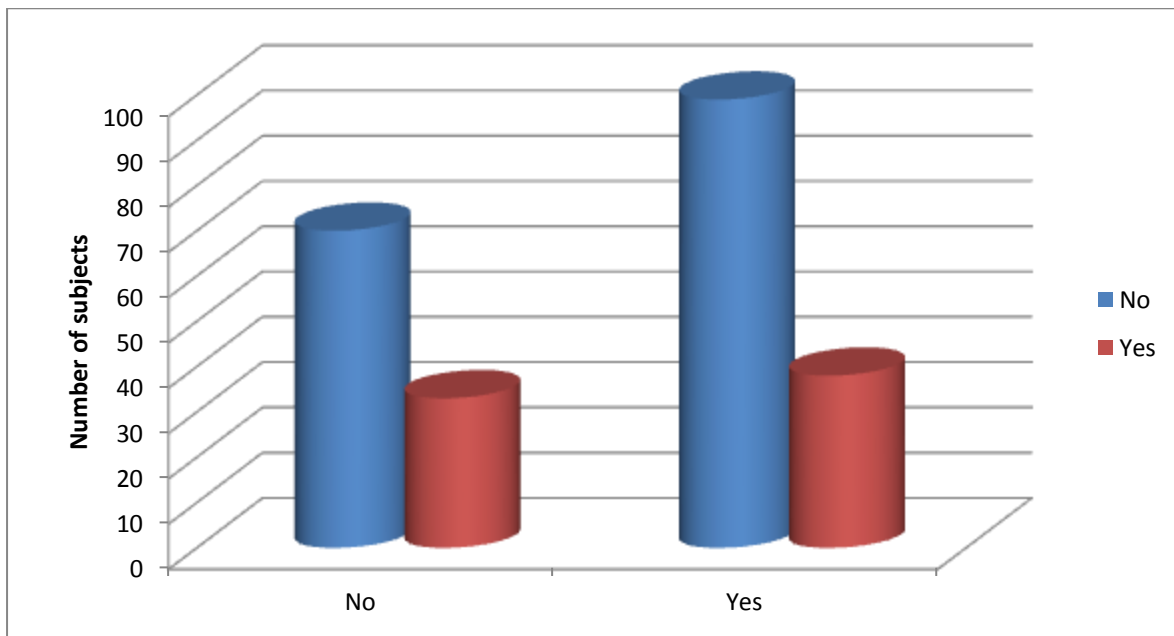


Table:- Association between followed what you had been trained in biosafety: NSI.

NSI			
Followed what you had been trained in biosafety	No	Yes	Total
Always	9	14	23
row %	39.1	60.9	100.0
col %	8.7	10.2	9.6
Most of the time	23	32	55
row %	41.8	58.2	100.0
col %	22.3	23.4	22.9
Never	6	9	15
row %	40.0	60.0	100.0
col %	5.8	6.6	6.3
Rarely	5	7	12
row %	41.7	58.3	100.0
col %	4.9	5.1	5.0
Some time	60	75	135
row %	44.4	55.6	100.0

col %		58.3	54.7	56.3
Total		103	137	240
row	%	42.9	57.1	100.0
col %		100.0	100.0	100.0

Chi-square value: .3500; p-value: 0.9864

In NSI , 14(10.2%) subjects were always followed what had been trained in biosafety, 32(23.4%) subjects were most of the time followed what had been trained in biosafety, 9(6.6%) subjects were never followed what had been trained in biosafety, 7(5.1%) subjects were rarely followed what had been trained in biosafety and 75(54.7%) subjects were some time followed what had been trained in biosafety. The association between followed what you had been trained in biosafety vs NSI was not statistically significant (p=0.9864).

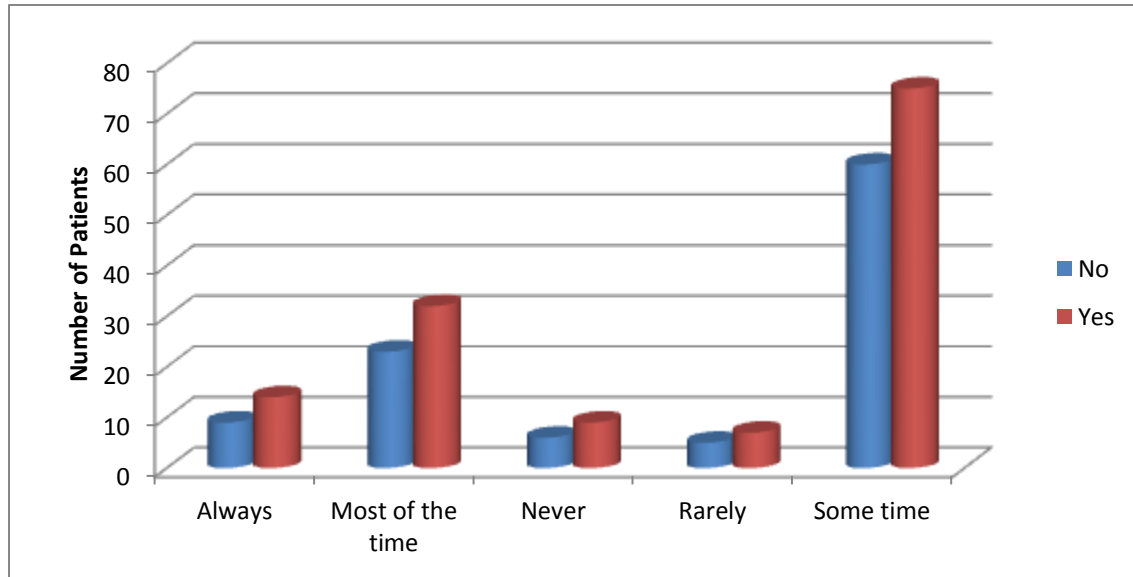


Table:- Association between main source of information NSI : NSI.

NSI				
Main source of information NSI		No	Yes	Total
College curriculum		36	45	81
row	%	44.4	55.6	100.0
col %		35.0	32.8	33.8
Hospital		30	37	67
row	%	44.8	55.2	100.0
col %		29.1	27.0	27.9
Others		9	14	23
row	%	39.1	60.9	100.0
col %		8.7	10.2	9.6
Training course		28	41	69
row	%	40.6	59.4	100.0
col %		27.2	29.9	28.8
Total		103	137	240
row	%	42.9	57.1	100.0
col %		100.0	100.0	100.0

Chi-square value: .4601; p-value: 0.9276

In NSI , 45(32.8%) subjects had got information from college curriculum, 37(27.0%) subjects had got information from hospital, 14(10.2%) subjects had got information from others source and 41(29.9%) subjects had got information from training course. The association between main source of information NSI vs NSI was not statistically significant (p=0.9276).

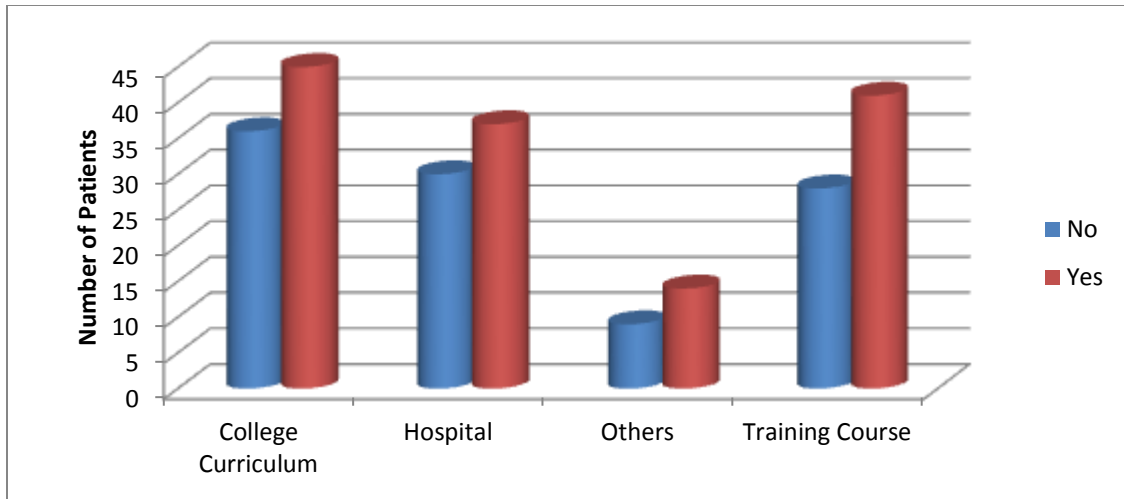


Table:- Association between use gloves when deal with needles: NSI.

NSI			
Use gloves when deal with needles	No	Yes	Total
No	19	27	46
row %	41.3	58.7	100.0
col %	18.4	19.7	19.2
Yes	84	110	194
row %	43.3	56.7	100.0
col %	81.6	80.3	80.8
Total	103	137	240
row %	42.9	57.1	100.0
col %	100.0	100.0	100.0

Chi-square value: 0.0604; **p-value:** 0.8058

In NSI, 110(80.3%) subjects were use gloves when deal with needles. The association between use gloves when deal with needles vs NSI was not statistically significant (p=0.8058).

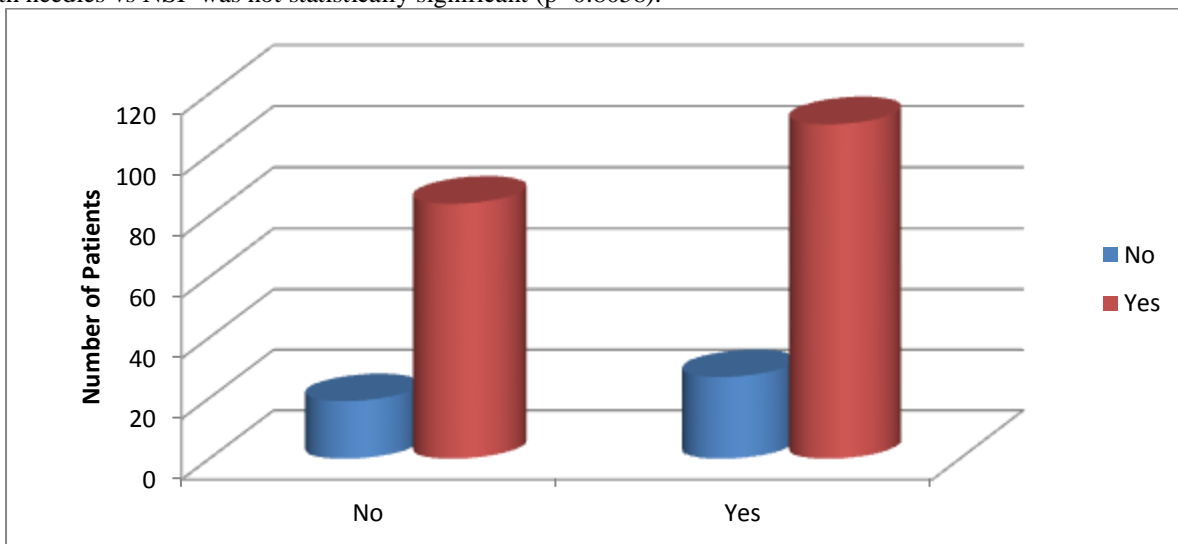


Table:- Association between incident report should be completed following vs NSI.

NSI			
Incident report should be completed following	No	Yes	Total
Both	18	29	47

row	%	38.3	61.7	100.0
col %		17.5	21.2	19.6
Unused	NSI	18	21	39
row	%	46.2	53.8	100.0
col %		17.5	15.3	16.3
Used	NSI	67	87	154
row	%	43.5	56.5	100.0
col %		65.0	63.5	64.2
Total		103	137	240
row	%	42.9	57.1	100.0
col %		100.0	100.0	100.0

Chi-square value: 0.5980; p-value:0.7416

In NSI , 29(21.2%) subjects had completed both incident report, 21(15.3%) subjects had completed unused NSI incident report and 87(63.5%) subjects had completed used NSI incident report. The association between incident report should be completed vs NSI was not statistically significant (p=0.7416).

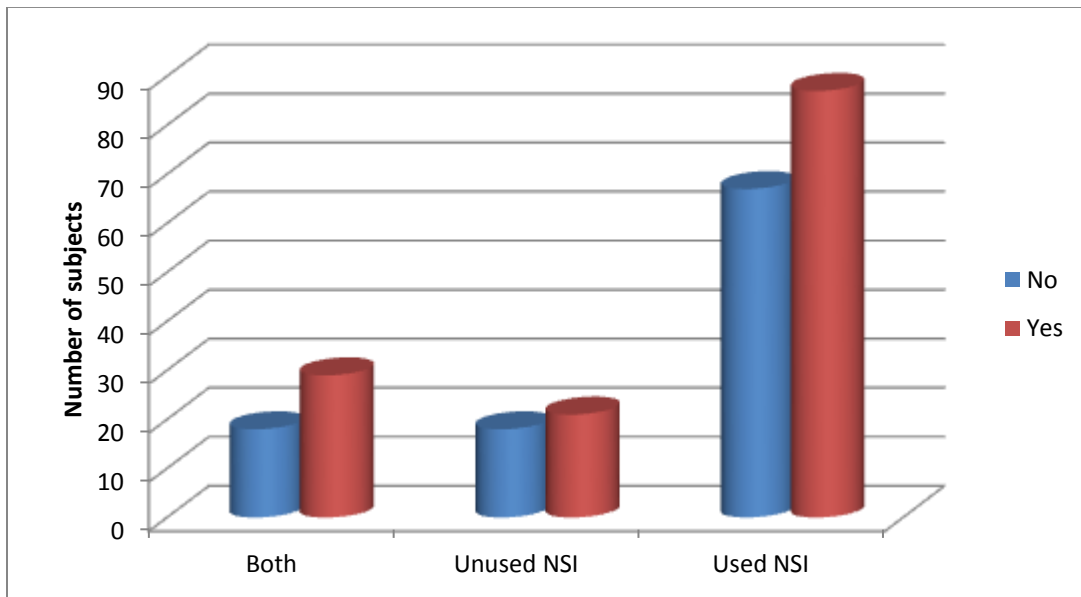


Table:- Distribution of mean age: NSI.

		Number	Mean	Sd	Minimum	Maximum	Median	P-value
Age(year)	No	103	35.0097	8.5881	23.0000	52.0000	33.0000	0.8983
	Yes	137	35.1533	8.6108	23.0000	52.0000	34.0000	

In NSI , the mean age (mean± s.d.) Of patients was 35.1533 ± 8.6108 years. The difference of mean age with NSI was not statistically significant (p=0.8983).

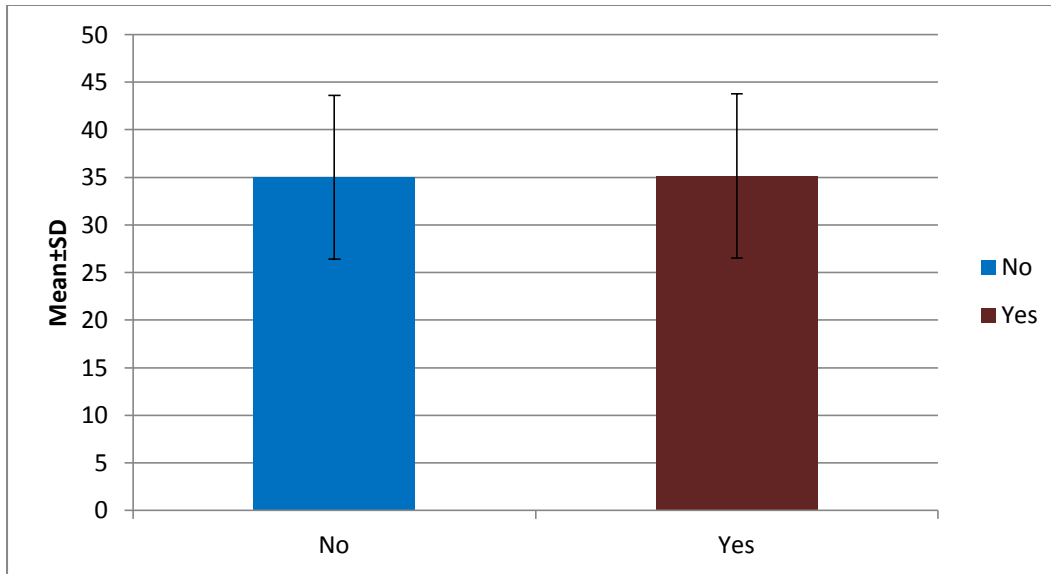
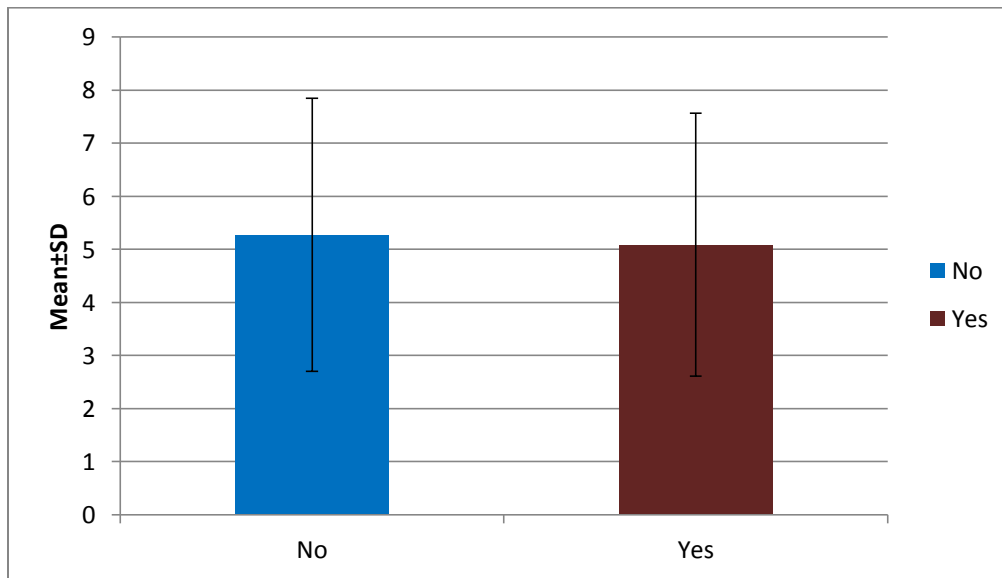


Table: Distribution of mean work duration (years) : NSI

		Number	Mean	Sd	Minimum	Maximum	Median	P-value
Work duration (years)	No	103	5.2718	2.5751	1.0000	12.0000	5.0000	0.5756
	Yes	137	5.0876	2.4778	1.0000	12.0000	5.0000	

In NSI , the mean work duration (mean± s.d.) Of patients was 5.0876± 2.4778years. The difference of mean work duration with NSI was not statistically significant (p=0.5756).



Discussion:-

Out of 240, 137(57.1%) subjects had NSI . 38(27.7%) subjects had report of NSI . We found that prevalence of needle stick injuries was 57.1%. Kruger Wh et al ⁸⁷ (2012) found that needle stick injuries were prevalent at a low rate, only 50% were reported.

It was found that 92(38.3%) subjects were <30 years old and 148(61.7%) subjects were ≥30 years old. The mean age (mean± s.d.) of needle stick injury was 35.1533 ± 8.6108 years. The difference of mean age with NSI was not statistically significant (p=0.8983). 50(36.5%) subjects were under <30 years with needle stick injury and 87(63.5%)

subjects were under ≥ 30 years with needle stick injury. The association between age vs. Needle stick injury was not statistically significant ($p=0.4996$).

We found that 134(55.8%) subjects were female out of which 46(33.6%) had needle stick injury and 106(44.2%) subjects were male out of which 91(66.4%) subjects had needle stick injury.

Our study showed that 90(37.5%) subjects were doctor out of which 54(39.4%) had needle stick injury. 111(46.3%) subjects were nurse out of which 69(50.4%) had needle stick injury. 39(16.3%) subjects were paramedic out of which 14(10.2%) had needle stick injury. The association between occupation vs. NSI was statistically significant ($p=0.0134$).

Goel v et al ⁷² (2017) found that needle stick injury of fingers was the most common. Doctors were found to have the highest exposure rate (73.7%) distantly followed by nurses (19.1%).

Lyra pr et al ⁸⁸ (2019) found that the highest incidence of needle stick injuries were among the nursing staff (31.2%) and nursing students (27.1 %). Injuries were most commonly reported from wards (16, 33.3 %) followed by emergency department (11, 22.9%). Syringe needles (41.7%) were the most common devices leading to NSI s. Only 22 (45.8%) of the HCWs were using gloves, at the time of exposure.

Garus-pakowskaa et al ⁷⁵ (2019) found that majority of the NSI s were recorded among nurses (72.6%, $p < 0.01$). The needle was the tool responsible for the greatest number of the NSI s in all professional groups (79.5%, $p < 0.01$). Every second NSI s was not reported (45.2%). They estimated that there are probably 13,567 NSI s every year among hospital care.

Isara ar et al ⁶⁹ (2015) found that healthcare workers (HCWs) are continually exposed to hazards from contact with blood and body fluids of patients in the healthcare setting. The prevalence of NSI s 12 months preceding the study was 51.0% (50/98). Doctors 8/10 (80.0%) and nurses 28/40 (70.0%) had the highest occurrence.

We found that 35(14.6%) subjects were under work duration group 1(<3 years) out of which 20(14.6%) had needle stick injury, 94(39.2%) subjects were under work duration group 2(3-5 years) out of which 57(41.6%) had needle stick injury and 111(46.3%) subjects were under work duration group 3(>5years) out of which 60(43.8%) had needle stick injury. The association between work duration vs. NSI was not statistically significant ($p=0.6374$). In NSI , the mean work duration (mean \pm s.d.) of patients was 5.0876 \pm 2.4778years. The difference of mean work duration with NSI was not statistically significant ($p=0.5756$).

We found that 17(12.4%) subjects had accidental prick from other HCWs, 17(12.4%) subjects had needle stick injury while handling/transferring specimen, 35(25.5%) subjects had needle stick injury due to patient aggression, 59(43.1%) subjects had needle stick injury during recapping of needle and 9(6.6%) subjects had needle stick injury while using needle.

Muralidhar s et al ⁷¹ (2010) found that the commonest clinical activity to cause the NSI was blood withdrawal (55%), followed by suturing (20.3%) and vaccination (11.7%). The practice of recapping needles after use was still prevalent among HCWs (66.3%). Some HCWs also revealed that they bent the needles before discarding (11.4%). It was alarming to note that only 40 per cent of the HCWs knew about the availability of PEP services in the hospital and 75 per cent of exposed nursing students did not seek PEP. The present study showed a high occurrence of NSI in HCWs with a high rate of ignorance and apathy.

Bekele t et al ⁷⁶ (2015) found that emergency ward was a department with highest needle stick and sharp injury (31.7%).

Our study found that 17(44.7%) subjects reported to infection control, 6(15.8%) subjects reported to line manager, 12(31.6%) subjects reported to occupational health and 3(7.9%) subjects reported to other.

Our study found that 12(12.1%) subjects do not know who to report to, 46(46.5%) subjects thought that they were not at risk of contacting blood born disease, 29(29.3%) subjects thought reporting was not necessary and 12(12.1%)

subjects were not willing to do serology test. 45(32.8%) subjects had filled an incident report, 83(60.6%) subjects did not fill an incident report and 9(6.6%) subjects cannot remember.

We found that 47(19.6%) subjects think that incident report should be filled in both case whether used needle or unused needle causing needle stick injury, 39(16.3%) subjects think that incident report should be filled in case of needle stick injury caused by only unused needle and 154(64.2%) subjects think that incident report should be filled in case of needle stick injury caused by only used needle. 29(21.2%) subjects who had needle stick injury had completed incident report for both used needle as well as unused needle that had caused needle stick injury, 21(15.3%) subjects had completed incident report in case of needle stick injury caused by unused needle only and 87(63.5%) subjects had completed incident report in case of needle stick injury caused by used needle only. The association between incident report should be completed vs. NSI was not statistically significant ($p=0.7416$).

Amini m et al ⁷³ (2015) found the results showed that only 50.2% of injuries had been reported; 67.8% of all participants ($n = 211$) had at least one NSI. Most NSI s had been reported in the emergency department (33.5%). Most participants mentioned the injection syringe needles as the main cause of their injuries (71.1% of all NSI s).

In our study 35(25.5%) subjects had uptake of PEP.

Present study found that 18(17.6%) subjects were not accessing PEP for fear of side effects, 32(31.4%) subjects were not accessing PEP as they think it is not necessary, 12(11.8%) subjects were not accessing PEP as they are not willing to know HIV status and 40(39.2%) subjects were not accessing PEP as they themselves thought that source person is HIV negative. The association between fully inoculated against hepatitis-B vs. NSI was not statistically significant ($p=0.9605$). 44(18.3%) subjects know the guideline of NSI management out of which 26(19.0%) subjects had needle stick injury. The association between know the guideline of NSI management vs. NSI was not statistically significant ($p=0.7659$).

Isara ar et al ⁶⁹ (2015) found that the uptake of post-exposure prophylaxis (PEP) was low 11/50 (22.0%).

Ahmed as et al ⁸⁰ (2014) found that only (6.81%) took the vaccine while no one took sero-prophylaxis after exposure. Nurses are at a significant risk of needle stick and sharp injuries and prone to blood borne pathogens. Health education and training programs should be held regularly for nurses about occupational health hazards of NSI, protective measures, the importance of reporting.

Goel v et al ⁷² (2017) found that the incidence of needle stick and sharp injuries is most often encountered in emergency wards. Anti-HBs titers were suboptimal in many of the HCWs requiring a booster dose of HBV vaccination.

Sujatha c et al ⁸³ (2017) found that NSI s were sustained during blood withdrawal (34%), injections (20.5%), suturing (20.2%) and cannula insertion (12%). Recapping the needle (26%) was the most frequent cause followed by collision with others (24%), manipulation of needle in patient (23%) and during/in traNSI t to disposal (10%). Majority (84%) did not report the incident, 8.4% underwent post exposure follow up, 82% of the HCWs were fully hepatitis B vaccinated, 44% had received training, 62% used gloves, 49% recapped needles and 55% followed proper sharp disposal. Significant association was found between NSI and male gender ($p < 0.001$), designation ($p < 0.001$) and years of experience ($p < 0.05$) with interns and those with less than one year's experience at greater risk.

We found that 71(29.6%) subjects attended the biosafety course out of which 38(27.7%) subjects had needle stick injury. The association between those who attended the biosafety course vs. NSI was not statistically significant ($p=0.46988$). The association between followed what you had been trained in biosafety vs. NSI was not statistically significant ($p=0.9864$). 81(33.8%) subjects had got information from college curriculum out of which 45(32.8%) had needle stick injury, 67(27.8%) subjects had got information from hospital out of which 37(27.0%) had needle stick injury, 23(9.6%) subjects had got information from others source out of which 14(10.2%) had needle stick injury and 69(28.8%) subjects had got information from training course out of which 41(29.9%) had needle stick injury. The association between main source of information of NSI vs. NSI was not statistically significant ($p=0.9276$).

We found that 194(80.8%) subjects use gloves when deal with needles out of which 110(80.3%) had needle stick injury. The association between use gloves when deal with needles vs. NSI was not statistically significant ($p=0.8058$).

Matsubara c et al⁸⁹ (2017) found that key protective factors of NSI s among nurses included adequate availability of needles, syringes, and sharp equipment ($p = 0.042$; odds ratio [or], 0.47) and attendance to educational or refresher courses on safety regarding NSI s ($p = 0.038$; or, 0.50).

Summary and Conclusion:-

We found that the high prevalence of NSI s among the HCWs, especially in doctors and nurses is an indication that HCWs in the emergency department of tertiary health care centres in kolkata are at great risk of contracting blood-borne infections. Efforts should be made to ensure that injuries are reported to the relevant authorities in the hospital and appropriate PEP undertaken by the HCWs following NSI s. There is a need for the hospital management to strengthen its infection control policies and ensure implementation of standard precautions as to prevent NSI s among the HCWs.

Our study supported that health care workers of emergency department are at risk of needle stick injury because of continue patient flow in emergency department and exposure to needle and patient and performing different procedures on patients including suturing, collection of blood samples etc. leading to NSI .

CoNSI dering the high rate of occupational injuries, further preventive measures should be implemented to prevent these injuries from occurring. Providing initial and continuing training for employees is very important. Directing special attention to emergency department employees may be effective in reducing occupational injuries.

Establishment of formal reporting mechanisms, immediate reporting of NSI s and the establishment of a comprehensive NSI prevention program will help in the reduction in the occurrence of NSI s and help in taking immediate remedial action in the form of prophylaxis and treatment.

Given the high prevalence of NSI s, it is necessary to supply safe needles and instruments, hold training programs focused on new methods of using sharp objects safely, observe safety principles and standards, reinforce the practical skills of personnel, and pay more attention to reporting and improving occupational behaviors like avoiding needle recapping in order to reduce the prevalence of NSI s and consequently reduce potential risk of transmission of blood-borne infections.

Limitations of the Study:

In spite of every sincere effort my study has lacunae.

The notable short comings of this study are:

1. The sample size was very small. Only 240 cases are not sufficient for this kind of study.
2. The study population is being tested upon a confined set of questionnaire and it may not cover the entire range of questions.
3. The study was carried out in a tertiary care hospital, so hospital bias cannot be ruled out.

Reference:-

1. Ebrahimi h, khosravi a. Needlestick injuries among nurses. J res health sci. 2007;7(2):56–62.
2. Joseph nm, elan s, vadivu s, kanungo r. Needlestick injuries among healthcare workers of a tertiary care hospital in south india. Infect control hosp epidemiol. 2014;35(1):103–5. Doi: 10.1086/674402.
3. Wilburn s. Health and safety: preventing needlestick injuries. The American journal of nursing. 1999;99(1):71. Doi: 10.2307/3472041.
4. Ramos-gomez f, ellison j, greenspan d, bird w, lowe s, gerberding jl. Accidental exposures to blood and body fluids among health care workers in dental teaching clinics: a prospective study. J am dent assoc. 1997;128(9):1253–61.
5. Clarke sp, sloane dm, aiken lh. Effects of hospital staffing and organizational climate on needlestick injuries to nurses. Am j public health. 2002;92(7):1115–9.

6. Nsubuga fm, jaakkola ms. Needle stick injuries among nurses in sub-saharan africa. *Trop med int health*. 2005;10(8):773–81.
7. Azap a, ergonul o, memikoglu ko, yesilkaya a, altunsoy a, bozkurt gy, et al. Occupational exposure to blood and body fluids among health care workers in ankara, turkey. *Am j infect control*. 2005;33(1):48–52.
8. Bi p, tully pj, pearce s, hillier je. Occupational blood and body fluid exposure in an australian teaching hospital. *Epidemiol infect*. 2006;134(3):465–71.
9. Ismail na, aboul ftouh am, el-shoubary wh, mahaba h. Safe injection practice among health-care workers in gharbiya governorate, egypt. *East mediterr health j*. 2007;13(4):893–906.
10. Wicker s, jung j, allwinn r, gottschalk r, rabenau hf. Prevalence and prevention of needlestick injuries among health care workers in a german university hospital. *Int arch occup environ health*. 2008;81(3):347–54.
11. Zafar a, aslam n, nasir n, meraj r, mehraj v. Knowledge, attitudes and practices of health care workers regarding needle stick injuries at a tertiary care hospital in pakistan. *J pak med assoc*. 2008;58(2):57–60.
12. Adib-hajbaghery m, lotfi ms. Behavior of healthcare workers after injuries from sharp instruments. *Trauma mon*. 2013;18(2):75–80. Doi: 10.5812/traumamon.12779.
13. Askarian m, malekmakan l. The prevalence of needle stick injuries in medical, dental, nursing and midwifery students at the university teaching hospitals of shiraz, iran. *Indian j med sci*. 2006;60(6):227–32.
14. Babamahmoodi f. Study of hepatitis b and c in razi and hazrat fatemeh zahra hospital staff of Mazandaran University of medical sciences in 1375. *Journal of mazandaran university of medical sciences*. 2000;9(25):25–30.
15. Mobasherizadeh s, ebnesahidi sa, mohammadi na, abazari f. Intervention study of needle stick injury in iran. *Saudi med j*. 2005;26(8):1225–7.
16. Azadi a, anoosheh m, delpisheh a. Frequency and barriers of underreported needlestick injuries amongst iranian nurses, a questionnaire survey. *J clin nurs*. 2011;20(3-4):488–93.
17. Pomfret j. Back injuries. *American journal of nursing*. 1999;99(7):24.
18. World health organization. *Who world health report 2002: protecting health-care workers – preventing needlestick injuries*. Geneva: who; 2002.
19. Centres for disease control and prevention. *Preventing needlestick injuries in healthcare settings*. [last accessed on 2015 feb 20]. Available from: <http://www.cdc.gov/niosh/docs/2000-108/pdf>.
20. Muralidhar s, singh pk, jain rk, malhotra m, bala m. Needle stick injuries among health care workers in a tertiary care hospital of india. *Indian j med res*. 2010;131:405–10.
21. Mbaisi em, ng'ang'a z, wanzala p, omolo j. Prevalence and factors associated with percutaneous injuries and splash exposures among health-care workers in a provincial hospital, kenya, 2010. *Pan afr med j*. 2013;14:10.
22. Erhabor o, ejele oa, nwauche ca. Epidemiology and management of occupational exposure to blood borne viral infections in a resource poor setting: the case for availability of post exposure prophylaxis. *Niger j clin pract*. 2007;10:100–4.
23. Ibekwe ru, adam vy. Injection safety practices among resident doctors in a tertiary health facility in benin city. *Niger j clin pract*. 2014;17:403–6.
24. Omorogbe ve, omuemu vo, isara ar. Injection safety practices among nursing staff of mission hospitals in benin city, nigeria. *Ann afr med*. 2012;11:36–41.
25. Isara ar, ofili an. Prevalence of occupational accidents/injuries among health care workers in a federal medical centre in southern nigeria. *West afr j med*. 2012;31:47–51.
26. Bolarinwa oa, asowande a, akintimi ci. Needle stick injury pattern among health workers in primary health care facilities in ilorin, nigeria. *Acad res int*. 2011;1:419–27.
27. Efetie er, salami ha. Prevalence of, and attitude towards, needle-stick injuries by nigerian gynaecological surgeons. *Niger j clin pract*. 2009;12:34–6.
28. Adegboye aa, moss gb, soyinka f, kreiss jk. The epidemiology of needlestick and sharp instrument accidents in a nigerian hospital. *Infect control hosp epidemiol*. 1994;15:27–31.
29. Norsayani my, noor hassim i. Study on incidence of needle stick injury and factors associated with this problem among medical students. *J occup health*. 2003;45:172–8.
30. Spruce l. Back to basics: sharps safety. *Aorn j*. 2016;104:30–6.
31. Lee jm, botteman mf, xanthakos n, nicklasson l. Needlestick injuries in the united states. Epidemiologic, economic, and quality of life issues. *Aaohn j*. 2005;53:117–33.
32. Goel v, kumar d, lingaiah r, singh s. Occurrence of needlestick and injuries among health-care workers of a tertiary care teaching hospital in north india. *J lab physicians*. 2017;9:20–5.
33. Au e, gossage ja, bailey sr. The reporting of needle stick injuries sustained in theatre by surgeons: are we under-reporting? *J hosp infect*. 2008;70:66–70.

34. Elder a, paterson c. Sharps injuries in uk health care: a review of injury rates, viral transmission and potential efficacy of safety devices. *Occup med (lond)* 2006;56:566–74.
35. Wilburn sq. Needlestick and sharps injury prevention. *Online j issues nurs.* 2004;9:5.
36. Cheng hc, su cy, yen am, huang cf. Factors affecting occupational exposure to needle stick and sharps injuries among dentists in taiwan: a nationwide survey. *Plos one.* 2012;7:e34911.
37. Centers for disease control and prevention: niosh publications and products. Preventing needle stick injuries in health care settings (2000-108) [last accessed on 2018 jun 18]. Available from: <http://www.cdc.gov/niosh/docs/2000-108/>
38. Kermode m, muani v. Injection practices in the formal and informal healthcare sectors in rural north india. *In j med res.* 2006;124:513–20.
39. Sharma r, rasanias sk, verma a, singh s. Study of prevalence and response to needle stick injuries among health care workers in a tertiary care hospital in delhi, india. *Indian j community med.* 2010;35:74–7.
40. Malhotra s, sharma s, bhatia nj, hans c. Needlestick injury among health care workers and its response in a tertiary care hospital. *In j med microbiol.* 2016;34:258–9.
41. "the national surveillance system for healthcare workers (nash) summary report for blood and body fluid exposure (1995–2007)" (pdf). Cdc. 2011.
42. Tarigan, lukman h.; cifuentes, manuel; quinn, margaret; kriebel, david (1 july 2015). "prevention of needle-stick injuries in healthcare facilities: a meta-analysis". *Infection control and hospital epidemiology.* 36 (7): 823–29. Doi:10.
43. Leigh, jp; markis, ca; iosif, a; romano, ps (2015). "california's nurse-to-patient ratio law and occupational injury". *International arcHIVES of occupational and environmental health.* 88 (4): 477–84. Doi:10.
44. Alamgir, h; yu, s (2008). "epidemiology of occupational injury among cleaners in the healthcare sector". *Occupational medicine.* 58 (6): 393–99. Doi:10.
45. Wicker, s; ludwig, a; gottschalk, r; rabenau, hf (2008). "needlestick injuries among health care workers: occupational hazard or avoidable hazard?". *Wiener klinische wochenschrift.* 120 (15–16): 486–92.
46. Phillips, ek; conaway, m; parker, g; perry, j; jagger, j (2013). "issues in understanding the impact of the needlestick safety and prevention act on hospital sharps injuries". *Infection control and hospital epidemiology.* 34 (9): 935–39.
47. Bassett iv, freedberg ka, walensky rp. Two drugs or three? Balancing efficacy, toxicity, and resistance in postexposure prophylaxis for occupational exposure to HIV. *Clin infect dis.* 2004 aug 1. 39(3):395-401.
48. Cdc. Recommendations for follow-up of health-care workers after occupational exposure to hepatitis c virus. *Mmwr morb mortal wkly rep.* 1997 jul 4. 46(26):603-6.
49. Merchant rc, keshavarz r. HIV postexposure prophylaxis practices by us ed practitioners. *Am j emerg med.* Jul 2003. 21(4):309-12.
50. Henderson dk. Management of needlestick injuries: a house officer who has a needlestick. *Jama.* 2012 jan 4. 307(1):75-84.
51. Cardo dm, culver dh, ciesielski ca, et al. A case-control study of HIV seroconversion in health care workers after percutaneous exposure. Centers for disease control and prevention needlestick surveillance group. *N engl j med.* 1997 nov 20. 337(21):1485-90.
52. Cdc. Public health service guidelines for the management of health-care worker exposures to HIV and recommendations for postexposure prophylaxis. Centers for disease control and prevention. *Mmwr recomm rep.* 1998 may 15. 47(rr-7):1-33.
53. Kuhar dt, henderson dk, struble ka, heneine w, thomas v, cheever lw, et al. Updated us public health service guidelines for the management of occupational exposures to human immunodeficiency virus and recommendations for postexposure prophylaxis. *Infect control hosp epidemiol.* 2013 sep. 34 (9):875-92.
54. Sidwell ru, green js, novelli v. Management of occupational exposure to HIV--what actually happens. *Commun dis public health.* 1999 dec. 2(4):287-90.
55. United states department of labor. Bloodborne pathogens and needlestick prevention. Occupational safety and health administration. Available at <https://www.osha.gov/sltc/bloodbornepathogens/recognition.html>. Accessed: september 5, 2015.
56. Cdc. Recommendations for postexposure interventions to prevent infections with hepatitis b virus, hepatitis c virus, or human immunodeficiency virus, and tetanus in persons wounded during bombings or similar mass-casualty events - united states, 2008. *Mmwr.* August 2008. 57(rr-6):1-19.
57. Marrazzo jm, del rio c, holtgrave dr, cohen ms, kalichman sc, mayer kh, et al. HIV prevention in clinical care settings: 2014 recommendations of the international antiviral society-usa panel. *Jama.* 2014 jul 23-30. 312 (4):390-409.

58. New york state department of health aids institute. HIV prophylaxis following occupational exposure - what's new october 2014. New york state department of health aids institute. Available at http://www.HIVguidelines.org/wp-content/uploads/2016/03/HIV-prophylaxis-following-occupational-exposure_3-28-16.pdf. October 2014.
59. Wald, j (2009). "the psychological consequences of occupational blood and body fluid exposure injuries". *Disability & rehabilitation*. 31 (23): 1963–69.
60. Laramie, ak; davis, lk; miner, c; pun, vc; laing, j; demaria, a (march 2012). "sharps injuries among hospital workers in massachusetts, 2010: findings from the massachusetts sharps injury surveillance system" (pdf). Massachusetts department of public health.
61. Parantainen, annika; verbeek, jos h.; lavoie, marie-claude; pahwa, manisha (1 january 2011). "blunt versus sharp suture needles for preventing percutaneous exposure incidents in surgical staff". *The cochrane database of systematic reviews* (11): cd009170.
62. "recommendations for prevention and control of hepatitis c virus (hcv) infection and hcv-related chronic disease". *Mmwr. Cdc*. 47 (rr-19): 1–39. 1998. Pmid 9790221.
63. Kuhar, dt; henderson, dk; struble, ka; heneine, w; thomas, v; cheever, lw; gomaa, a; panlilio, al; us public health service working group (september 2013). "updated us public health service guidelines for the management of occupational exposures to human immunodeficiency virus and recommendations for postexposure prophylaxis". *Infection control and hospital epidemiology*. 34 (9): 875–92.
64. Lavoie, m; verbeek, jh; pahwa, m (2014). "devices for preventing percutaneous exposure injuries caused by needles in healthcare personnel". *The cochrane database of systematic reviews*. 3 (3. Art. No.: cd009740): cd009740.
65. Mast ee, weinbaum cm, fiore ae, alter mj, bell bp, finelli l, rodewald le, douglas jm, janssen rs, ward jw (2006). "a comprehensive immunization strategy to eliminate transmission of hepatitis b virus infection in the united states: recommendations of the advisory committee on immunization practices (acip). Part ii: immunization of adults". *Mmwr. Cdc*. 55 (rr-16): 1–33, quiz ce1–4.
66. "Needlestick and sharp-object injury reports". *Epinet multihospital sharps injury surveillance network*. International healthcare worker safety center.\
67. Clinical guidelines: antiretroviral drugs for HIV prevention. World health organization. Available at <http://www.who.int/HIV/pub/arv/chapter3.pdf?ua=1>. Accessed: august 16, 2018.
68. Information for healthcare personnel potentially exposed to hepatitis c virus (hvc). Center for disease control. Available at <https://www.cdc.gov/hepatitis/pdfs/testing-followup-exposed-hc-personnel.pdf>. Accessed: august 22, 2018.
69. Isara ar, oguzie ke, okpogoro oe. Prevalence of needlestick injuries among healthcare workers in the accident and emergency department of a teaching hospital in nigeria. *Annals of medical and health sciences research*. 2015;5(6):392-6.
70. Ng yw, hassim in. Needlestick injury among medical personnel in accident and emergency department of two teaching hospital. *Medical journal of malaysia*. 2007 mar.
71. Muralidhar s, kumar singh p, jain rk, malhotra m, bala m. Needle stick injuries among health care workers in a tertiary care hospital of india. *Indian journal of medical research*. 2010 mar 1;131(3):405.
72. Goel v, kumar d, lingaiah r, singh s. Occurrence of needlestick and injuries among health-care workers of a tertiary care teaching hospital in north india. *Journal of laboratory physicians*. 2017 jan;9(1):20.
73. Amini m, behzadnia mj, saboori f, bahadori m, ravangard r. Needle-stick injuries among healthcare workers in a teaching hospital. *Trauma monthly*. 2015 nov;20(4).
74. Sriram s. Study of needle stick injuries among healthcare providers: evidence from a teaching hospital in india. *Journal of family medicine and primary care*. 2019 feb;8(2):599.
75. Garus-pakowska a, górajski m. Epidemiology of needlestick and sharp injuries among health care workers based on records from 252 hospitals for the period 2010–2014, poland. *Bmc public health*. 2019 dec;19(1):634.
76. Bekele t, gebremariam a, kaso m, ahmed k. Factors associated with occupational needle stick and sharps injuries among hospital healthcare workers in bale zone, southeast ethiopia. *Plos one*. 2015 oct 15.
77. Salelkar s, motghare dd, kulkarni ms, vaz fs. Study of needle stick injuries among health care workers at a tertiary care hospital. *Indian journal of public health*. 2010 jan 1;54(1):18.
78. Rais n, jamil hm. Prevalence of needle stick injuries among health care providers. *Int j endorsing health sci res*. 2013 dec;1(2):73-9.
79. Masoumi-asl h, rahbar m, soltani a, pezeski z, khanaliha k, kolifarhood g. Epidemiology of needlestick injuries among healthcare workers in tehran, iran: a cross-sectional study. *ArchIVES of clinical infectious diseases*. 2017;12(2).

80. Ahmed as. Needle stick and sharp injuries among nurses at zagazig university hospitals, sharkia governorate, egypt. Middle east journal of applied sciences, 4 (4). 2014;1205:1207.
81. Gheshlagh rg, aslani m, shabani f, dalvand s, parizad n. Prevalence of needlestick and sharps injuries in the healthcare workers of iranian hospitals: an updated meta-analysis. Environmental health and preventive medicine. 2018 dec;23.
82. Hashmi a, al reesh sa, indah l. Prevalence of needle-stick and sharps injuries among healthcare workers, najran, saudi arabia. Epidemiology. 2012.
83. Sujatha c, vadasseril j, jayaprakash g, joy jk. Needlestick injury among healthcare workers in a tertiary care hospital, kerala.
84. Bhardwaj a, sivapathasundaram n, yusof mf, minghat ah, swe km, sinha nk. The prevalence of accidental needle stick injury and their reporting among healthcare workers in orthopaedic wards in general hospital melaka, malaysia. Malaysian orthopaedic journal. 2014 jul;8(2):6.
85. Jahan s. Epidemiology of needlestick injuries among health care workers in a secondary care hospital in saudi arabia. Annals of saudi medicine. 2005 may;25(3):233-8.
86. Al jarallah am, ahmed as. Risk management approach of needle stick and sharp injuries among nurses, saudi arabia: an interventional study. Journal of the arab society for medical research. 2016 jul 1;11(2):50.
87. Kruger wh, joubert g, jimoh so. Needlestick injuries among nurses in a regional hospital in south africa. Occupational health southern africa. 2012 may 1;18(3):4-10.
88. Lyra pr, hittinahalli v, sangeetha kt. Study of needle stick injuries among health care workers at a tertiary care hospital. Int. J. Curr. Microbiol. App. Sci. 2019;8(7):1134-40.
89. Matsubara c, sakisaka k, sychareun v, phensavanh a, ali m. Prevalence and risk factors of needle stick and sharp injury among tertiary hospital workers, vientiane, lao pdr. Journal of occupational health. 2017;17-0084.