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Risk of accidental needle stick injuries (NSI)

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Abstract: ***Many health care personnel have a higher risk of accidental needle stick injuries (NSI) due to the nature of their workplace. These employees run the danger of contracting blood-borne infections like HIV, hepatitis B and C, and other illnesses as a result of their employment. It is also crucial that healthcare personnel have proper training on how to handle sharp objects. Effective reporting mechanisms should be installed in all healthcare facilities to enable early case reporting and prompt action to address the situation by administering appropriate PEP and treatment, in addition to giving information and sufficient training to healthcare providers. Traditional schedule: 0,1,6 months, Recent guidelines: 0,1,4 months, Method: Intramuscular (deltoid), Side effects: pain at injection site, fever Anti-HBs > 10mIU/ml is protective level. As early as possible, ideally within 72 hrs Exposures that doesn't require PEP when the exposed individual is already HIV positive when the source is established to be HIV negative; exposure to bodily fluids that does not pose a significant risk: tears, non-blood-stained saliva, urine and sweat. It has been concluded that infection risk after needle stick for HIV is 0.3% and the preventive step is to act as soon as possible within hours. The infection risk after needle stick for HBV is approximately 0 % with pep and 6% to 30% without pep and the preventive step is to act within 24 hours and no later than seven days. The infection risk after needle stick for HCV is 1.8% and there are no preventive steps are recommended.***

Keywords: HIV, HB, HVC, Injection, NSI, PEP.

1. INTRODUCTION

Many health care personnel have a higher risk of accidental needle stick injuries (NSI) due to the nature of their workplace. These employees run the danger of contracting blood-borne infections like HIV, hepatitis B and C, and other illnesses as a result of their employment. After being exposed percutaneously to HIV-positive blood, a health care worker's average risk of contracting the virus has been calculated. A WHO study estimates that each year, 2.6% of health care workers (HCW) are exposed to blood-borne pathogens globally, 5.9% to HBV, and 0.5% to HIV. This translates to roughly 16,000 HCV infections and 66,000 HBV infections among HCW globally. The delivery of healthcare is significantly impacted by needle stick injuries, particularly in developing nations where there is already a shortage of skilled workers relative to the prevalence of disease in the population [1]–[6]. Not only do these injuries exacerbate health implications, but they also induce mental distress in healthcare professionals, which leads to lost work and has a direct impact on the resources and services provided by the healthcare system. Needles, such as hypodermic needles, blood collection needles, intravenous stylets, and needles used to connect intravenous delivery system components, can cause needle stick injuries, or NSIs. NSIs occur frequently and are frequently inevitable for healthcare professionals while they are providing patient care [3], [7]–[13]. Among healthcare providers, NSIs are one of the most avoidable occupational dangers in the industry. The Centers for Disease Control (CDC) in the United States of America approximated that six million non-steroidal surgical instruments (NSIs) occur annually, and that exposure to blood and bodily fluids by sharps exposes about three million health workers annually. In the underdeveloped world, occupational exposure to

neurotoxic stress injuries (NSIs) is thought to be significantly higher, and many instances go unreported. It is anticipated that in underdeveloped nations, around 75% of NSIs are unreported. There is a flagrant underreporting of non-sexual injuries (NSIs) worldwide, with reported incidences significantly lower than actual incidences. Healthcare facilities need to use caution when interpreting or interpreting a low reporting rate as a low injury rate. Research has demonstrated that, in many cases, the number of NSIs recorded by standard hospital reporting systems is underreported by up to ten times.

The Government of India's Ministry of Health and Family Welfare suggests that healthcare practitioners be informed about the safety measures that need to be taken in order to prevent non-sexual sexual injuries (NSIs). It is also crucial that healthcare personnel have proper training on how to handle sharp objects. Effective reporting mechanisms should be installed in all healthcare facilities to enable early case reporting and prompt action to address the situation by administering appropriate PEP and treatment, in addition to giving information and sufficient training to healthcare providers. Only when data is adequately and promptly reported can PEP be started. In India, certain institutions have a staff health service facility that keeps track of all NSI cases, records them, and has safety measures in place to manage them and effectively monitor any decline in cases. All hospitals and healthcare facilities should have safety measures in place to reduce the risk of NSIs, enforce the use of safety precautions, and provide for quick action in the event of an exposure. Information regarding the characteristics and frequency of NSIs in India's various healthcare settings is scarce. The purpose of this research was to determine the prevalence, additional correlates, and characteristics of non-severe infection (NSI) among medical staff in a South Indian tertiary care teaching hospital [8], [14]–[16].

One of the most crucial facets of occupational health practice is workplace safety. The Centers for Disease Control and Prevention (CDC) estimated that 800 000 health care workers (HCWs) were injured by needles used by patients in the United States in 1998. Of those HCWs, 2000 tested positive for hepatitis C virus (HCV), 400 for hepatitis B virus (HBV), and 35 for HIV. According to estimates from the World Health Organization, percutaneous occupational exposure accounts for 40% to 65% of HBV and HCV infections among healthcare workers in underdeveloped nations. Like many underdeveloped nations, Egypt has not made many attempts to educate hospital administrators and healthcare workers about needle stick injuries (NSI). There is a dearth of concrete information regarding the spread of blood borne illnesses in healthcare settings, and risky behaviors are widespread. Furthermore, there are few rules and guidelines to shield HCWs from danger. Even though infection control and common precautions are low-cost ways to lower the risk of sharp injuries and are likely to be implemented, health care workers (HCWs) seldom receive training in these areas. "Introduction of blood and other potentially hazardous material into the body of healthcare providers during the routine performance of their duties by a hollow bore needle or sharp instruments, e.g., needles, lancets, and contaminated broken glass" is the definition of a needle-stick injury (NSI). After a hollow needle injury, there is a 0.2%–0.5% risk of HIV transmission, a 3%–10% risk of hepatitis C virus

(HCV) transmission, and a 40% risk of hepatitis B virus (HBV) transmission. Medical professionals (HCWs) who handle biomedical waste (BMW) are among those who are susceptible to non-surgical stress infections (NSIs). The goal of the current study was to determine the prevalence of NSIs and investigate their underlying causes. One of the main risk factors for needle stick and other sharps-related accidents among HCWs and the general public is unsafe injection. Research indicates that a significant number of healthcare workers (HCWs) in underdeveloped nations—where over 90% of NSI-related incidents take place—use dangerous injection techniques. For example, Kotwal et al. identified a frequency of 77.5% in India, while Li et al. observed a prevalence of 77.1% among HCWs, including physicians, in China regarding dangerous injection practices [17]–[21]. Moreover, four NSIs occurred annually/HCW on average in the African, Eastern Mediterranean, and Asian populations, according to World Health Organization injection safety assessments. According to reports, hazardous injection techniques are prevalent in poor nations. One of the main risk factors for needle stick and other sharps-related accidents among HCWs and the general public is unsafe injection. Research indicates that a significant number of healthcare workers (HCWs) in underdeveloped nations—where over 90% of NSI-related incidents take place—use dangerous injection techniques. For example, Kotwal et al. identified a frequency of 77.5% in India, while Li et al. observed a prevalence of 77.1% among HCWs, including physicians, in China regarding dangerous injection practices [22], [23]. Moreover, four NSIs occurred annually/HCW on average in the African, Eastern Mediterranean, and Asian populations, according to World Health Organization injection safety assessments. According to reports, hazardous injection techniques are prevalent in poor nations.

2. LITERATURE REVIEW

Shyamkumar Sriram et al. [6] said that the Needles, such as hypodermic needles, blood collection needles, intravenous stylets, and needles used to connect intravenous delivery system components, can cause needle stick injuries, or NSIs. NSIs occur frequently and are frequently inevitable for healthcare professionals while they are providing patient care. In poor nations, almost 75% of NSIs get unreported. In a tertiary care teaching hospital in South India, the purpose of this study was to determine the prevalence of NSIs as well as their other correlates and characteristics among medical professionals.

Humaira Bashir et al. [5] said that the Needle stick injury among health workers is regarded as an occupational hazard. Health care workers are at risk of having blood-borne diseases in case they are exposed to blood and other biological samples of the patients. Moreover, staff including doctors working in tertiary care hospitals has high work load which results in increased chances of getting these injuries. The aim and objectives of this study were to find out the prevalence of needle stick injury among different categories of health care workers. Authors also aimed to assess the knowledge, attitude and practices associated with it.

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Syed Shuja Qadri et al. [4] proposed that the health workers' needle stick injuries are considered an occupational hazard. If healthcare personnel come into contact with a patient's blood or other biological sample, they run the risk of contracting blood-borne infections. Furthermore, tertiary care hospital employees—including physicians—have a heavy workload, which raises their risk of suffering from these injuries. The purpose of this study was to determine the needle stick injury prevalence among various health care worker categories. The authors also sought to evaluate related knowledge, attitudes, and practices.Techniques: A cross-sectional study conducted in a hospital to determine the frequency of needle stick injuries among different healthcare providers at the tertiary Karpagam Faculty of Medical Sciences and Research in Coimbatore, Tamil Nadu. For the study, a total of 250 healthcare professionals were chosen. A self-created, semi-structured, pre-tested survey was employed to evaluate the frequency of needlestick injuries and the variables linked to them. Results: 94 percent of healthcare professionals were aware of needle stick injuries, and 92 percent recognized that needle stick injuries can spread HIV. Additionally, 78.4% and 69.65% of healthcare professionals knew that needle stick injuries can spread Hepatitis B and C, respectively. Approximately 28.4% of the participants had previously suffered a needlestick injury. Additionally, it was shown that there was a strong correlation between the type and location of exposure and various categories of healthcare personnel ($p < 0.001$).Conclusions: The greatest approach to avoid many bloodborne infections is to protect healthcare personnel from needle stick injuries. A preventative program with an emphasis on health care worker training should be implemented. Health care professionals should be required to record needle stick injury accidents and implement additional prevention tactics.

Kye Mon Min Swe et al.[4] said that the globally, needle stick injuries (NSIs) are the primary means of bloodborne infection transmission among healthcare professionals. When doing their clinical work in hospitals, medical students run the danger of getting a blood-borne infection from microorganisms and suffering a needle stick injury. The purpose of the study was to ascertain the frequency of needle stick injuries among medical students in terms of cases and episodes of injuries, to pinpoint the contributing factors, and to evaluate the medical students' awareness of universal precaution and risk perception regarding needle stick injuries.

Dharmendra Gupta et al.[2] said that those who handle hypodermic needles and other needle equipment run the risk of suffering needle stick injuries (NSIs). Needles can sustain these injuries during use, disassembly, or disposal at any time. Sharps and Needle Stick injuries (NSSIs) represent a significant risk factor for blood-borne diseases. The study's goals were to evaluate nurses' knowledge, attitudes, practices, and prevalence of non-sexual sexual injuries (NSIs) in a private tertiary care hospital in the Bareilly district and to suggest preventive measures to reduce injuries.

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3. METHODOLOGY

A needle stick injury is a percutaneous piercing wound typically set by a needle point but, possibly also by other sharp instruments or objects. CDC estimates that each year 385,000 needle sticks and other sharps related injuries are sustained by healthcare personnel an average of 1,000 sharps injuries per day.

- **Infections Transmitted via Sharps Injuries**

- ❑ Hepatitis B
- ❑ Hepatitis C
- ❑ HIV
- ❑ Leptospirosis
- ❑ Malaria
- ❑ Diphtheria
- ❑ M. tuberculosis
- ❑ Rocky Mountain Spotted fever
- ❑ Gonorrhea
- ❑ Strep pyogenes
- ❑ Syphilis
- ❑ Toxoplasmosis
- ❑ Herpes
- ❑ Blastomycosis
- ❑ Cryptococosis
- ❑ Ebola

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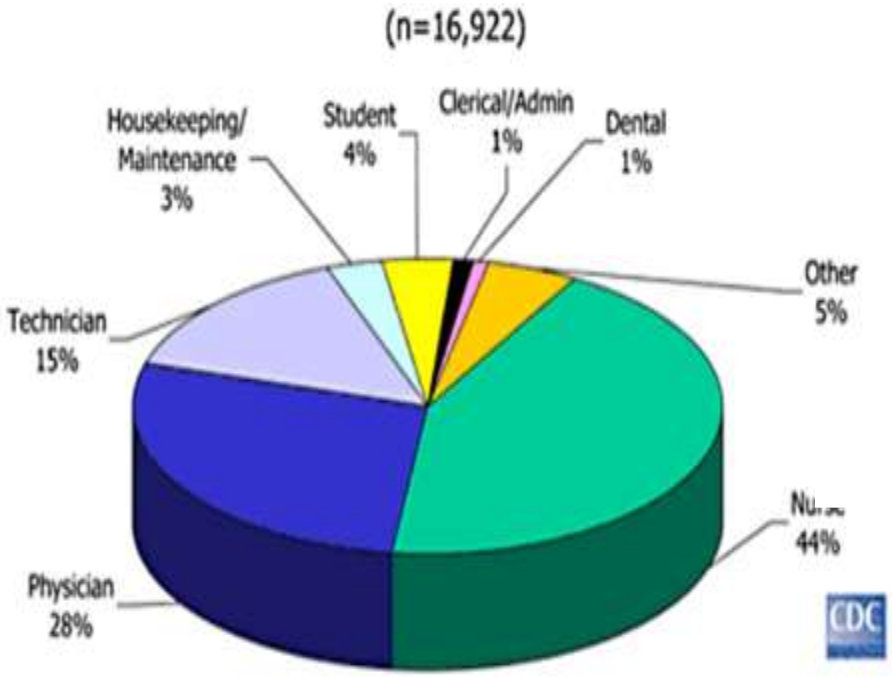

Fig 1 shows occupational groups of heat exposed to blood/body fluids NaSH 6/95 to 12/01

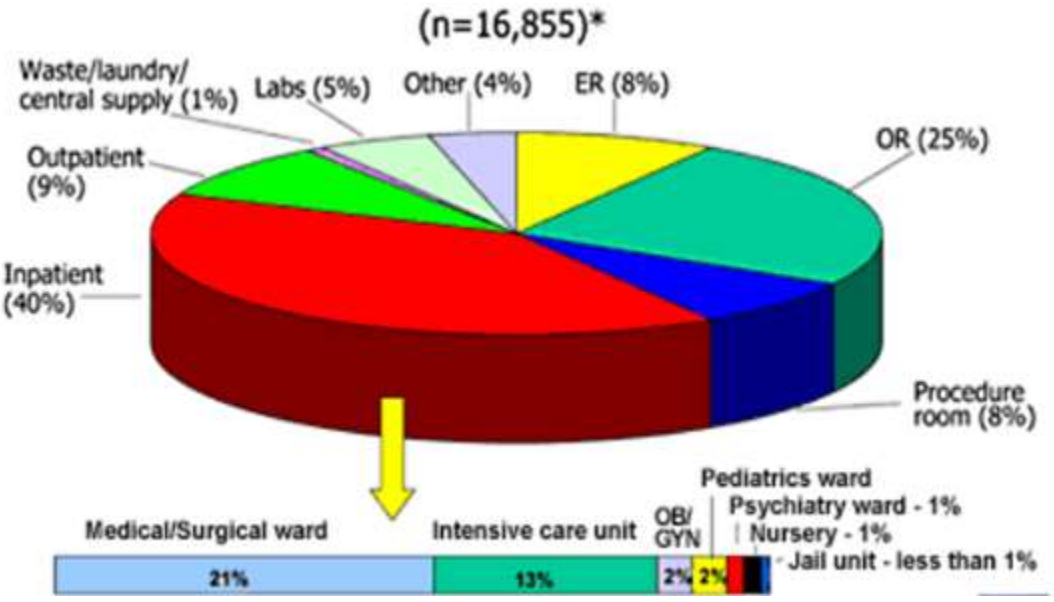

Fig 2 shows work locations where blc fluid exposures occurred NaSH 6/95 to 12/01

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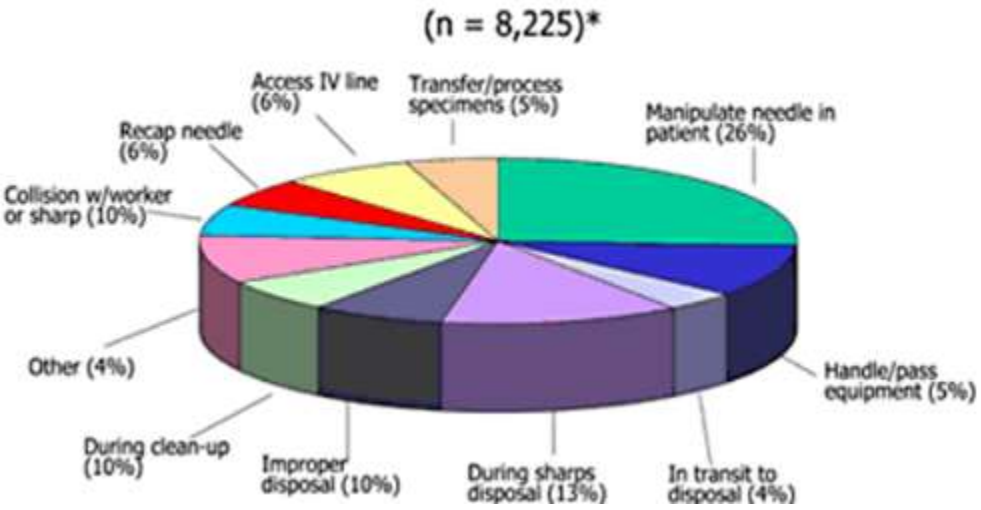

Fig 3 shows circumstances associated hollow-bore needle injuries NaSH 6/95 to 12/01

Needle Stick Injuries (NSI)- IPD:

Formula

$$\frac{\text{Number of NSI in a month}}{\text{Number of In-Patient days in that month}} \times 1000$$

Category	Jul-18	Aug-18	Sep-18	Oct-18	Nov-18	Dec-18	Jan-19
No. of Parenteral exposure	0	2	2	3	2	5	3
No. of in patient days	25935	28786	26892	27566	15600	23650	20345
Incidence of NSI	1.17	0.62	1.03	1.8	1.1	1.8	0.14

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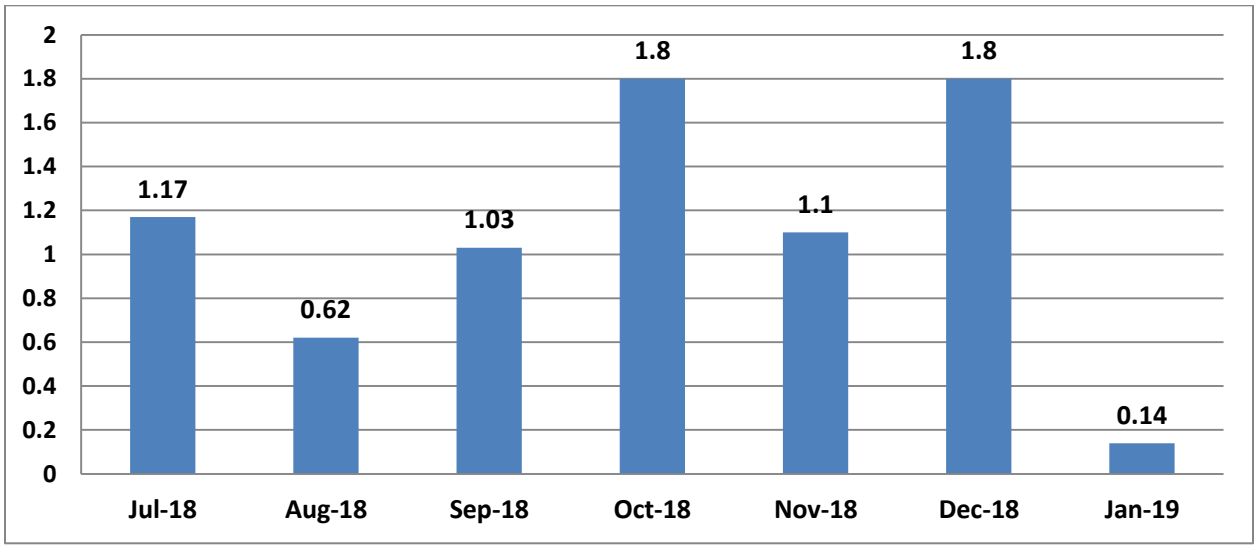

4. RESULTS AND DISCUSSSION

Leave these in place while irrigating the eye, as they form a barrier over the eye and will help protect it. Once the eye has been cleaned, remove the contact lenses and clean them in the normal manner as shown in fig 4 below.

Fig 4 shows preventive steps of using eye lenses

After a splash contacts the mouth Spit the fluid out immediately, Rinse the mouth thoroughly, using water or saline, and spit again Repeat this process several times. Do not use soap or disinfectant in the mouth.

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Blood
Semen
Vaginal secretions
Cerebrospinal fluid
Synovial, pleural, peritoneal, pericardial fluid
Amniotic fluid
Other body fluids contaminated with visible blood

Exposure to body fluids considered *'not at risk'*	
Tears	
sweat	
Urine and faeces	*unless these secretions contain visible blood*
saliva	

Fig 5 shows exposure to body fluids at risk or not risk

HCW Status	Recommended Treatment		
	Source HBsAg Positive	Source HBsAg Negative	Source Unknown or Unavailable
Unvaccinated	HBIG x1 and HBV vaccine*	HBV vaccine*	HBV vaccine*
Previously Vaccinated			
Responder Anti-HBs >10 mIU/ml	No treatment	No treatment	No treatment
Non-Responder Anti-HBs <10 mIU/ml	1. HBIG x1 and HBV vaccine* *or* 2. HBIG now and in one month†	No treatment	If Source High Risk 1. HBIG x1 and HBV vaccine* *or* 2. HBIG now and in one month†
Response Unknown	Test HCW ant-HBs 1. If titer >10 mIU/ml, No Treatment 2. If titer <10 mIU/ml, HBIG and booster	No treatment	Test HCW ant-HBs 1. If titer >10 mIU/ml, No Treatment 2. If titer <10 mIU/ml, Vaccine booster and recheck titer in 1-2 months

*Initiate and complete HBV vaccine series (3 doses).
†Two doses of HBIG preferred for individuals who failed to respond to two completed HBV vaccine series.
HBIG= hepatitis B immune globulin (0.06 ml/kg IM)

Fig 6 shows Post exposure prophylaxis (PEP)

Traditional schedule: 0,1,6 months, Recent guidelines: 0,1,4 months, Method: Intramuscular (deltoid), Side effects: pain at injection site, fever Anti-HBs > 10mIU/ml is protective level. As early as possible, ideally within 72 hrs Exposures that doesn't require PEP when the exposed individual is already HIV positive when the source is established to be HIV negative; exposure to bodily fluids that does not pose a significant risk: tears, non-blood-stained saliva, urine and sweat.

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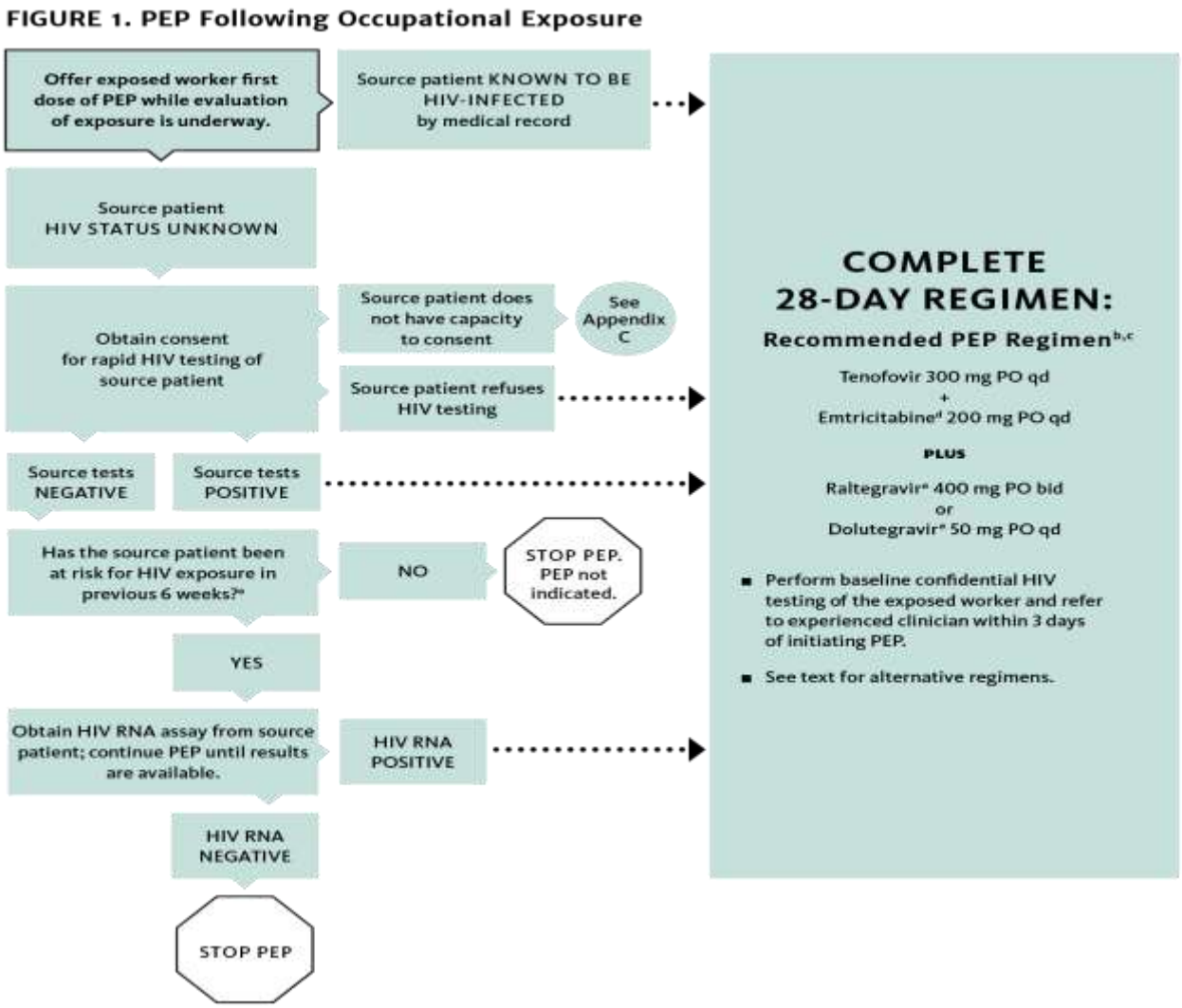

Fig 7 shows PEP following occupational exposure

5. CONCLUSION

It has been concluded that infection risk after needle stick for HIV is 0.3% and the preventive step is to act as soon as possible within hours. The infection risk after needle stick for HBV is approximately 0 % with pep and 6% to 30% without pep and the preventive step is to act within 24 hours and no later than seven days. The infection risk after needle stick for HCV is 1.8% and there are no preventive steps are recommended as shown in fig 8.

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PATHOGEN	INFECTION RISK AFTER NEEDLESTICK*	POST-EXPOSURE PROPHYLAXIS (PEP) WHAT TO DO?	WHEN TO ACT
HIV	0.3%	A four-week course of a combination of either two or three antiretroviral drugs determined on a case-by-case basis	As quickly as possible, preferably within hours.
HBV	Approximately 0% with PEP; 6% to 30% without PEP	HBIG alone or in combination with vaccine (if not previously vaccinated)	Preferably within 24 hours, no later than seven days
HCV	1.8%	No recommendation	N/A

*After needlestick injury from a known positive patient source.
+HBIG-Hepatitis B immune globulin.
Source: Adapted from Exposure to blood: What healthcare personnel need to know. Centers for Disease Control and Prevention website.

Fig 8 shows preventive measures after needle stick

DISPOSE WITH CARE

- Never recap needles
- Dispose used needles in sharps disposal containers
- Avoid overfilling of these containers

CARE FOR YOURSELF

- Hepatitis B vaccination
- Report all needle stick injuries

The most important way to prevent blood borne injections in the workplace is to STOP UNNECESSARY INJECTIONS.

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