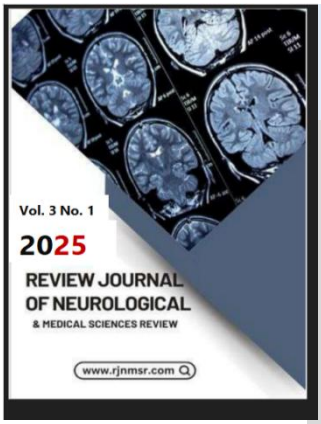

Vol. 3 No. 1 (2025): January - March
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Unveiling Hidden Threats: Prevalence and Risk Factors of Hepatitis B and C Infection among Hospital Waste Handlers in District Abbottabad, KP, Pakistan

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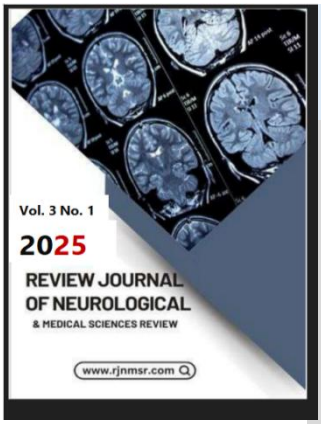

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Abstract

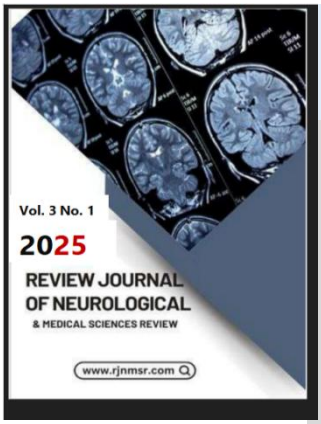
Viral hepatitis is a condition characterized by liver inflammation due to a viral infection. Several viruses can cause liver inflammation, but the leading cause of chronic liver disease with a high mortality rate is the hepatitis B and C viruses. Medical waste handlers who collect, move, and discard medical waste in healthcare facilities run the risk of contracting infections primarily from contaminated blood and bodily fluids. This includes splashing or cutting injuries to the eye or mucous membranes. Acute or chronic viral hepatitis can lead to severe liver scarring (cirrhosis), liver failure, liver cancer, and potentially death. Viral hepatitis is a serious global health concern. That's why the current study is aimed to conduct information regarding spread of Hepatitis B & C infection among medical waste handlers from different medical institution at district Abbottabad. Total 150 blood samples were collected in Gel tube (yellow top bottle) among different hospitals waste handlers. All samples were processed under aseptic conditions for HBsAg and HCV testing using the ICT kit method. Only 3.33% of the samples tested positive, with 2.66% showing a positive result for hepatitis B and 0.66% testing positive for HCV, while the remaining 96.6% of samples were negative. The current study concludes that medical waste handlers are occupationally exposed to both HBV and HCV, and that carriers of these infections can transmit them to others through contact with their blood, bodily fluids, or secretions. So, all medical waste handlers must follow the safety guidelines to prevent the spread of all communicable diseases.

Introduction

Hepatitis is a combination of the Greek words "hepar" (liver) and "itis" (inflammation). The viral disease hepatitis causes the liver to swell and become inflamed. There are five types of hepatitis viruses: A, B, C, D, and E. Hepatitis A and E are typically transmitted via contaminated food and water, while hepatitis B is mainly spread through contaminated bodily fluids, intimate contact, or childbirth. Hepatitis C and D are typically transmitted by blood. Hepatitis B spreads through blood and blood products, as well as by sexual contact. On rare occasions, interfamilial spread is recorded. Hepatitis B (HBV) is a virus that affects 350 million people globally (1).

A member of the hepadnaviridae family, the hepatitis B virus (HBV) causes a number of serious illnesses, such as hepatic liver cirrhosis (HLC), hepatocellular carcinoma (HCC) and chronic hepatitis. The genome of the virus is made of circular, partly double-stranded DNA (2). Globally, viral hepatitis is a major public health hazard. Pakistan has a carrier rate of 3-4%, placing it in the zone of moderate HBV prevalence (3). Hepatitis B virus (HBV) infection is a common and essential public health issue that causes major death and morbidity worldwide, particularly in nations that are developing. HBV has spread to around 2 billion people worldwide (4).

However, the prevalence is relatively high in other parts of the country. Hepatitis B and C virus (HBV and HCV) infections can result in cirrhosis and hepatocellular cancer, two serious public health issues in Pakistan. In developing countries such as



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Pakistan, hepatitis C has emerged as a serious public health concern. Risk factors for the spread of HCV infection can differ significantly between nations and even within a single nation (5). Patients with HBV infection have a higher risk of developing hepatocellular carcinoma (HCC) than those with HCV infection. A study of 128,726 patients conducted between 1992 and 2006 found the following death rates: 63.7% for HCV mono-infection, 33% for HBV mono-infection, 2.6% for HBV/HCV co-infection, 0.2% for HIV/HBV co-infection, and 0.1% for HIV/HBV/HCV triple infections (6).

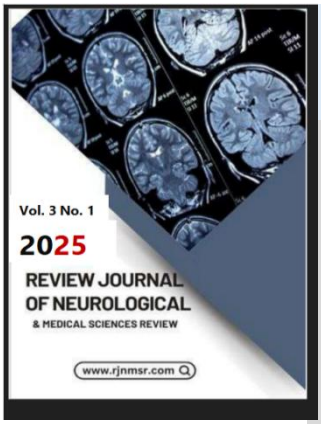
The Pakistan Medical Research Council examined the frequency of hepatitis in each province of Pakistan between 2007 and 2008. After roughly 47,000 participants were checked for hepatitis B and C, the prevalence of HBs Ag and anti-hepatitis C virus was found to be 2.5% and 4.8%, respectively, in this study and combined infection rate was 7.6% (7). A study estimates that 13 million people in Pakistan have hepatitis B and C.HBV can transmit horizontally to children through microscopic skin or mucous membrane breaks or through intimate physical contact with other kids. The prevalence of HBs Ag in pregnant women is 2.5%, with 17% having HBe Ag and 61% having anti HBs antibodies (8).

Hepatitis B and C is a major health concern in Pakistan and one of the world's top causes of mortality and sickness. Hepatitis B virus (HBV) infection is common and is thought to be the cause of one to two million fatalities annually on a global scale. Around two billion individuals are currently or have previously been infected, and 350 million (5- 15% of total cases) are viral carriers, with Asia accounting for 80%. HBV infects more than one-third of the population in the South East Asian Region (SEAR), with approximately 80 million bearers and 0.2 million death each year (9).

Globally, the death rate from hepatitis B climbed to 580,500–799,000 between 1990 and 2017, while deaths from hepatitis C increased to about 350,100–580,000 worldwide (10). Pakistan's state is larger than the developed countries of the world. HBV and HCV are the most prevalent hepatitis viruses in the region, which calls for more investigation. A nationwide survey was conducted by the Pakistan Medical Research Council (PMRC) to determine the prevalence of hepatitis B and C in Pakistani society at large. Preliminary findings show that the prevalence of anti-HCV and HBsAg infection is 4.9% and 2.5%, respectively. According to the National Survey on Prevalence, 12 million persons in Pakistan are infected with both viruses, with a combined positive incidence of 7.4%, indicating that 12 million people in Pakistan are infected (11).

HBV belongs to the family Hepadnaviridae. Its 3,200 kb circular genome is present. One complete strand and one partial strand make up the double-stranded structure of HBV DNA. Dane particles are 42 nm-sized HBV viral particles. It is made up of an HBs Ag outer envelope and a Nucleocapsid of HBSAg with a diameter of 27 nm, along with a genome and DNA polymerase (12).

As of right now, there is no vaccine against HCV, and the cost of therapy is very high. Blood transfusions, exchanging used needles, equipment damage from contaminated equipment, parent-child transmission, and sexual contact are the main ways that hepatitis is spread. The most common ways that HCV spreads in Pakistan include the



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https://rjnmsr.com/index.php/rjnmsr/about

Review Journal of Neurological & Medical Sciences Review

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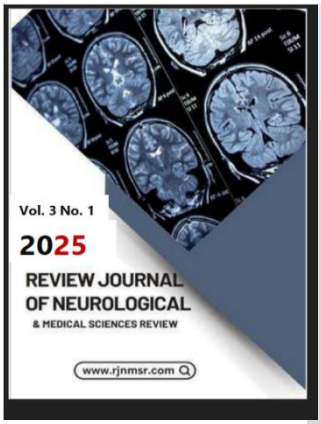
use of tainted needles and equipment in medical settings, unsafe blood transfusion practices, injectable drug use, shaving the face and underarms with contaminated barber equipment, and inadequate personal hygiene practices (13). According to the World Health Organization (WHO), all blood donors should be tested for HBV, HCV, HIV, and syphilis using very sensitive and accurate techniques. Every country should have a national blood screening programmed as well as a regulatory structure in place to regulate blood transfusion services, including blood screening (14).

Acute liver damage is caused by HCV after 40–120 days of virus incubation. Between 20 and 50 percent to 80 percent of individuals with acute hepatitis C also have a chronic HCV infection. Chronic HCV infection can cause liver damage and possibly death if antiviral medication is not taken to treat it (15). Consequently, HBV and HCV infection continue to be a major global health concern. Despite HBV and HCV being primarily transmitted through injection and sexual pathways, approximately 26% of patients with severe liver disease and 15% of patients with acute hepatitis C have no known risk exposure (16). Approximately 160 million people globally, or the population infected with HCV are 3% (17).

Infection with the hepatitis C virus, also known as is spreading rapidly and has become chronic in most regions of the world, with a global incidence of about 3% (18). Surgeons and paramedics in particular are susceptible to contracting HBV and HCV infections from patients who are affected. Each year in the United States, around 500,000 healthcare professionals who work in hospitals are affected by blood exposure. Personnel working in operating rooms and surgeons are more vulnerable to occupational exposure (19).Over the past few years, numerous research have been carried out in Pakistan, and guidelines for the control and prevention of hepatitis B and C have been published. Nevertheless, there are more and more cases of hepatitis B and C positive in our community. Pakistan has one of the highest rates of chronic hepatitis, liver failure, and hepatocellular carcinoma deaths worldwide, per a recent study (20).

Many Pakistanis are unaware of the epidemiology and risk factors of viral hepatitis. Despite the fact that diagnostic and screening processes encourage early detection of HBV and HCV (21). In Pakistan, however, almost every patient with a viral illness is taken to a hospital when their liver damage reaches a serious level. Antiviral drug efficacy is reduced and hepatocellular carcinoma risk is elevated in cases of delayed detection(22). According to earlier data (HCV: 4.9% and HBV: 2.5%), the prevalence of the Hepatitis B and C viruses (HCV and HCV) in Pakistan is significant (23).

According to the most recent report from the World Health Organization, over a million people died from viral hepatitis in 2015. This number is thought to be higher than the combined mortality from HIV and tuberculosis in the same year. Global rates of HIV and tuberculosis mortality have decreased, however deaths from viral hepatitis have increased. 2015 saw 720,000 deaths from chronic liver disease and 470,000 deaths from liver malignancies linked to viral hepatitis. In 2015, 328 million persons were infected with chronic HBV (257 million) and chronic HCV (71 million). Although it also affects nations in other regions, including as Asia, HBV mostly



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Review Journal of Neurological & Medical Sciences Review

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affects countries in Africa and the Western Pacific. Worldwide, HCV is prevalent both between and among nations (24).

Materials and Methods

Study Area

The current study was carried out among hospital waste handlers from different hospitals at district Abbottabad Khyber Pashtun Khwa, Pakistan.

Study Design

Selected government and private hospitals in District Abbottabad, including Ayub Medical Complex, Abbottabad International Hospital, DHQ Abbottabad, International Hospital, Shahina Jamil Hospital, Type D Hospital, Maryam Hospital, and City Hospital, participated in a cross-sectional study conducted between May and July of 2023. These medical facilities, among the largest in District Abbottabad, are advanced institutions providing top-notch medical care as well as medical education and training for medical and paramedical personnel. Depending on their capacity and areas of expertise, Abbottabad hospitals generate various kinds and types of medical waste. The hospitals under study produce all varieties of medical waste, including sharp, disposable, infectious, and general trash.

Quantity of Samples

Total of 150 samples were collected from different hospitals waste handler in district Abbottabad as shown in table 1.

Sample Collection

About 3ml of blood sample collected from patient in gel tube by venipuncture with aseptic protocol. Gel tube is used for collecting blood. Serum was separated from clotted blood after centrifugation at 3000 rpm for 5 minutes. Screening test was done on commercially available anti HCV ICT device for hepatitis C and HBs Ag ICT device for Hepatitis B virus.

Personal Information

A questioner has been designed for the information related to our research which has been individually filled with each sample. Questioner include Name, Age, sex, marital status, Education, address, vaccination, services, CNIC, Contact number, cut from needle and puncture history with any Sharpe waste etc.

Labeling of the Sample

After collection the sample were labeled with patient name, serial number and date and time of collection and sent to the laboratory with a request form immediately for further processing.

Centrifugation

Samples were subjected to centrifugation so that serum has been obtained from sample, for this purpose sample is centrifuged for 5 minutes at 3000 rpm.

Procedure

Using a dropper, take two drops (the amount depending on the test's requirements and the manufacturer's recommendations) and dispense them into the strip's sample hole. Give the sample some buffer. Hold off for ten to fifteen minutes. Examine outcomes and make appropriate interpretations (Figure 1).

Vol. 3 No. 1 (2025): January - March
https://rjnmsr.com/index.php/rjnmsr/about

Review Journal of Neurological & Medical Sciences Review

E(ISSN) : 3007-3073
P(ISSN) : 3007-3065

Interpretation of Result

After adding serum and buffer wait for 15 minutes. Then result was observed by the lines appearance in the kit as shown in figure 4. The ICT (Immunochromatographic Test) for HCV and HBsAg provides quick screening results for Hepatitis C and B infections. A positive HCV result indicates the presence of antibodies, suggesting a current or past infection, while a negative result represents no any infection. For HBsAg, a positive test results indicate the occurrence of Hepatitis B surface antigen, suggesting a current or possibly chronic infection, whereas a negative result suggests no current infection. Positive results from these tests usually require further confirmatory testing for a definitive diagnosis (Figure 1).

Positive and Negative Test Result

The ICT kit shows negative result as only control line appears while positive test result as one more line other then control line appear as shown in figure 1 (A describes the positive test result while B describes negative test result) .

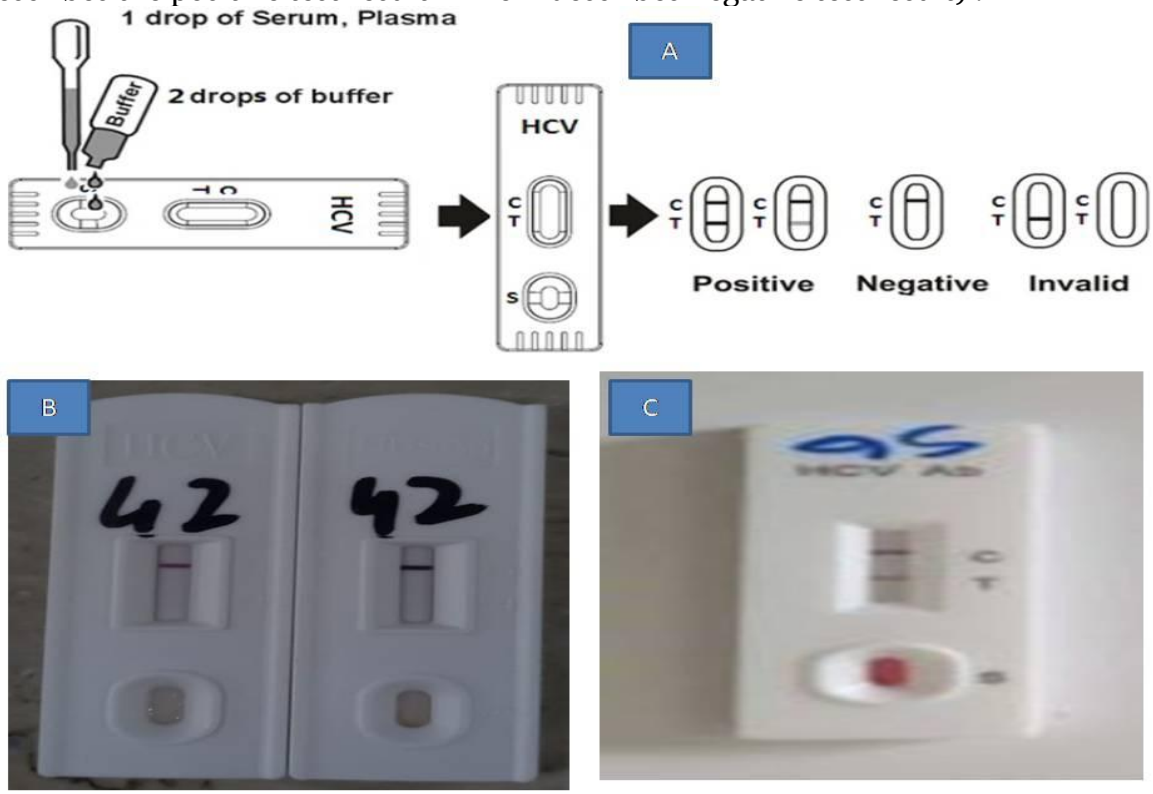
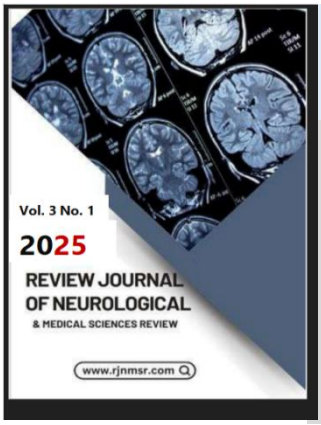


Figure 1: Represent the Procedure and Positive and Negative Result

Result

The current study was conducted among various hospital waste handlers in District Abbottabad. A total of 150 samples were collected from different hospital waste handler staff. The detailed breakdown of sample collection from each hospital is shown in Table 1.



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https://rjnmsr.com/index.php/rjnmsr/about

Review Journal of Neurological & Medical Sciences Review

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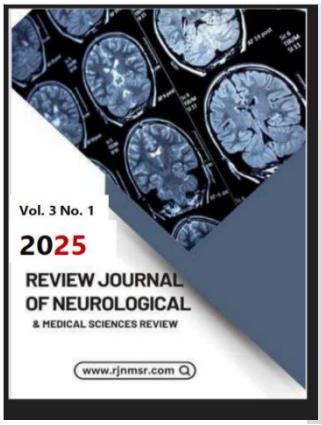
P(ISSN) : 3007-3065

Table 1.representing the total number with positive number of hepatitis B & C infection

	Number of sample		
Hospitals	**Total samples**	**Hepatitis B positive**	**Hepatitis C positive**
Ayub Medical Complex	40	1	1
DHQ Abbottabad	35	2	0
Abbottabad International Hospital	10	0	0
Jinnah International Hospital	15	1	0
Shahina Jamil Hospital	10	0	0
Type D hospital	10	0	0
Maryam Hospital	10	0	0
City hospital	20	0	0
Total	**150**	**4**	**1**

The total number of samples was 150 collected from different hospital but only 5 sample showed positive result i.e. (3.33%), among which 4 samples showed positive result for hepatitis B (2.66%) while only one sample showed HCV positive result with percentage of 0.66 and the rest of samples showed negative result (96.6%) as shown in Figure 2.



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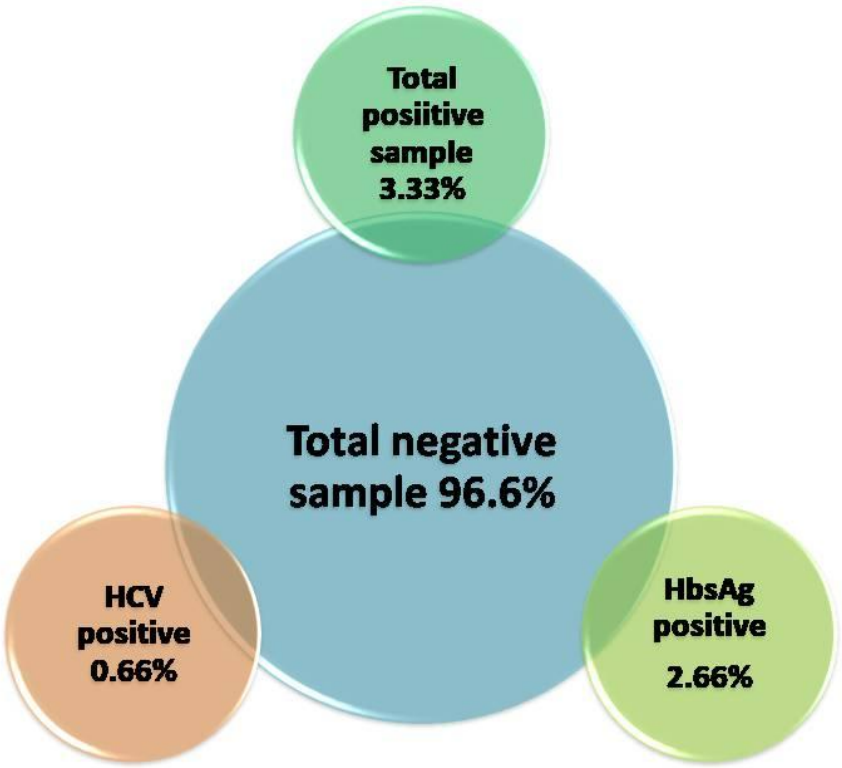
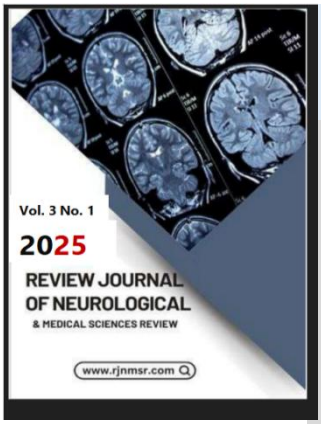


Figure 2. Representing the Positive and Negative Hepatitis B & C Percentage

Gender and Age Wise Samples Distribution

In this study the male sampling ratio were 93.33% in which 28 sample were taken from age group 18-20 years, 40 samples from age group 20-30 years, 45 samples from 30-45 years and 27 samples were taken from age group 50-80 years. While female ratio were 6.66% in which 5 sample collected from each age group 18-20 and 20-30 years respectively as shown in Table 2.



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https://rjnmsr.com/index.php/rjnmsr/about

Review Journal of Neurological & Medical Sciences Review

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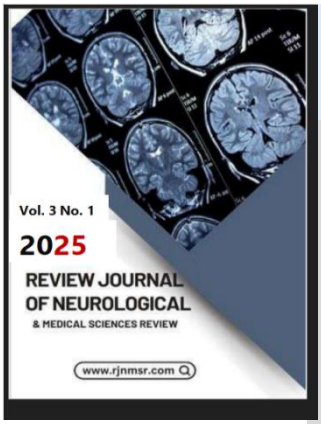
Table 2. Age and Gender Wise Distribution of Samples

Age Group	18-20 years	20-30 years	30-50 years	50-80 years
Male	28	40	45	27
Female	5	5	0	0
Total	**33**	**45**	**45**	**27**
Male ratio	**93.33%**			
Female ratio	**6.66 %**			

Personnel Protective Equipment (PPEs)

It is necessary to use PPEs while handling any type of biomedical waste to prevent the spread of communicable diseases, therefore the current study also focused on the waste handler while using PPEs or not. During our findings it is observed that most of the waste handlers were not using any type of PPEs. Only 36.7% handler were noted to used PPEs and 66.3% were those waste handlers who were not using PPEs as shown in Figure 7.

Figure 3. Comparison between waste handler using PPEs or were not Using



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Review Journal of Neurological & Medical Sciences Review

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Previous History Of Injury During Waste Handling

The 20% of total waste handlers had the previous history of injury from sharp waste (needle, surgical blades, glass slides and broken glass etc) in those who were not following the safety guidelines while 80% were not injured be any sharp waste

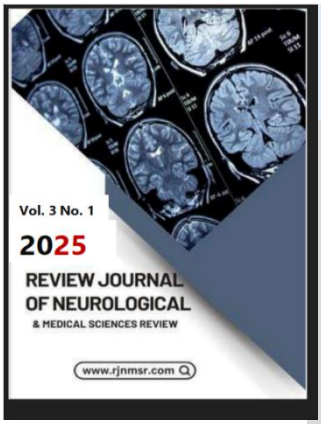
Discussion

Healthcare personnel may encounter difficulties when handling medical waste, especially waste handlers. In our current study, which was conducted in District Abbottabad, The total number of samples was 150 collected from different hospital but only 5 sample showed positive result i.e. (3.33%), among which 4 samples showed positive result for hepatitis B (2.66%) while only one sample showed HCV positive result with percentage of 0.66 and the rest of samples showed negative result (96.6%). Another study concluded that HBV and HCV viruses were tested in a sample of 100 medical waste handlers and 100 non-clinical waste handlers. Medical waste handlers at Gondar Town Health Institutions tested positive for HBV in 6 (6.0%), 1 (1.0%), and HCV in 1 (1.0%) and 0 (0.0%) of them. In contrast, another study found that the prevalence of HBsAg and anti-HCV among medical waste handlers was 1.3% and 0.7%, respectively (25).

The prevalence of HCV antibodies (Anti-HCV) was 3.3% in exposed workers and 0.9% in unexposed workers. For the hepatitis B core antigen antibody (Anti-HBc), the prevalence was 9.8% in exposed workers and 5.6% in unexposed workers. Only 207 (44.9%) of those exposed to domestic waste and 45 (73.8%) of those handling healthcare waste were effectively immunized against the hepatitis B virus (HBV) (26). The ratio of injuries caused by needle sticks and other sharp objects was 20% in the current study; in contrast, the Gondar Town Health Institutions study found that the Northwest ratio of injuries caused by waste handlers using needle sticks and other sharp objects was 43% and in the study on medical waste handlers (MWH) exposed to hepatitis B virus infection in southern Ethiopia, the ratio of injuries caused by waste handlers using needle sticks and other sharp objects was 47.4% and the ratio of non-injury is 52.6%. The exposure rate to hepatitis B and C viruses among medical waste workers in three government hospitals, southern Ethiopia) (27).

According to this current study, 36.7% of waste handlers workers used personal protective equipment (PPEs), where as 63.3% did not. In three government hospitals in Southern Ethiopia, 4.4% of medical waste handlers were exposed to hepatitis B and C viruses. All medical waste handlers were aware that personal protective equipment (PPE) could prevent infection. However, in contrast to previous studies conducted among medical waste handlers at Gondar Town Health institutions, 55% did not use PPEs regularly and had 9.1% hepatitis viruses' positivity (25) .

In Bangladesh, there is a lack of representative population studies on the prevalence of HCV. Aside from a Japanese group's study, which reported a 5% prevalence of HCV in Bangladesh, other studies have indicated an extremely low prevalence. A study conducted in Bangladesh found the prevalence of HBV and HCV among medical waste handlers (MWHs) to be 6.3% and 1%, respectively, aligning with findings from other studies (28).



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https://rjnmsr.com/index.php/rjnmsr/about

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Conclusion

Acute or chronic viral hepatitis can lead to severe liver scarring (cirrhosis), liver failure, liver cancer, and even death, making it a significant global health concern. This study aims to collect data on the prevalence of Hepatitis B and C infections among medical waste handlers in various medical institutions in Abbottabad.

Syringes and needles should be collected and contained properly at the point of use, with the container sealed before it reaches full capacity. After seal, the sharp containers must not be reopened, emptied, reused, or sold. Additionally, free-flowing liquid waste should be stored in leak-proof, rigid, and durable containers

Infectious waste is typically stored in red or orange bags, which should be labeled with the universal biohazard symbol. This waste must be contained from the point of origin until it is no longer considered infectious.

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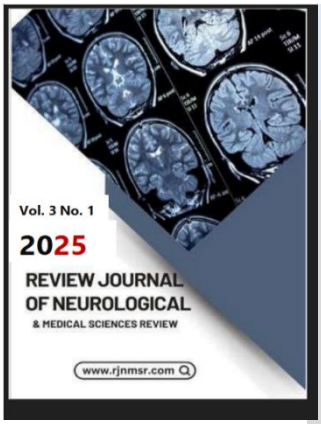

Vol. 3 No. 1 (2025): January - March
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