

Needle Stick Injury and Hepatitis B Virus Vaccination Status of Medical Staff in Tertiary Care Hospitals of Islamabad and Rawalpindi

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Abstract

Objective: To ascertain the vaccination coverage against Hepatitis B virus (HBV) and to identify the most vulnerable group for needle stick injury and HBV infection among healthcare workers of tertiary care hospitals of Islamabad and Rawalpindi.

Study type, settings & duration: This descriptive cross-sectional study was conducted at Tertiary care hospitals of Islamabad and Rawalpindi from December 2023 to March 2024.

Methodology: Study participants were healthcare workers such as doctors, paramedics and janitorial staff. Participants were selected through simple random sampling technique. A sample size of 300 healthcare workers was statistically calculated. After taking informed consent a predesigned questionnaire was used to collect the demography, HBV vaccination status and needle stick injury from healthcare workers. Data was entered and analyzed through SPSS-26.

Results: Current study shows that only 24% participants received vaccination, among them 69.3% were doctors and 30.7% were paramedics. Janitorial staff had no vaccination at all. Single or multiple times, needle stick injuries were seen in around 85% of study population which were mostly paramedics' staff.

Conclusion: Current study shows that vaccination coverage is low in healthcare workers, working in tertiary care hospitals of Islamabad and Rawalpindi. A high proportion of healthcare workers suffer from single or multiple times, needle stick injuries.

Key words: Medical staff, vaccination status, janitorial staff.

Introduction

Hepatitis B virus (HBV) infection is a major public health concern. Around 360 million individuals have a chronic liver infection or at risk of getting this infection and according to the most recent estimate 2 billion people worldwide have

serologic evidence of hepatitis B infection.¹ In certain regions of Asia and Africa, the prevalence of hepatitis B infection is approximately 20% of the overall population.¹ In various age categories, the prevalence of HBV is 8% in South Asia i.e India, Bangladesh, Nepal and Pakistan. Approximately 11 million people or 5% of the country's population is infected in Pakistan.² An estimated 37% of health care workers (HCWs) globally have occupational HBV infections. In low and middle income countries, professional exposure to infected patient's blood, body fluids, and contaminated medical supplies is responsible for 50% of HBV infections among healthcare workers.³ Patient can contact the virus from healthcare professionals as well, by the use of improperly sterilized medical equipment.⁴ Exposure to the HBV in infants and newborns via infected healthcare workers and perinatal transmission can have devastating consequences, around 95% of infected children develop chronic hepatitis later in life.⁵ There are no particular regulations in

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Authors Contribution

MA & FS conceptualized the project and did the data collection. FS & AS performed the statistical analysis. NS & LH did the literature search. AS & FN did the arrangements, conversion of references, data entry in SPSS-26 and formatting. Drafting, revision & writing of manuscript were done by MA, FS & NS.

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Pakistan's healthcare system regarding HCWs' vaccination against hepatitis B. These unfavorable effects on HCWs' will limit access to healthcare services and impair the integrity of the healthcare system. It has been observed that Private hospitals have taken the HBV vaccination into account and made it a prerequisite for employment. An estimate states that 40% of healthcare workers working in Pakistan's public hospitals had received all three doses of the vaccination.⁶ According to a multi-center survey, 73% of healthcare workers from both public and private hospitals have received their HBV vaccination.⁷ Inadequate information, awareness, misunderstandings, mistrust towards vaccines, vaccine availability and cost are factors which affect the vaccination coverage among HCWs'.⁸ Attention to the high-risk workers and high risk areas, increasing the adoption of safety protocols can significantly reduce the incidence of injuries and improve the overall safety of healthcare environments. The significance of this study is that it may be useful for decision makers in creating customized initiatives that will increase vaccination rates among HCWs' and reduce vaccine preventable disease outbreaks in hospital environments. The objectives of this study were therefore to ascertain the vaccination coverage against Hepatitis B virus (HBV) and to identify the most vulnerable group for needle stick injury and HBV infection among healthcare workers of tertiary care hospitals of Islamabad and Rawalpindi.

Methodology

This is a descriptive cross sectional study that was conducted in different tertiary care hospitals of Islamabad and Rawalpindi. The study duration was from December 2023 to March 2024 (Four months). A structured questionnaire was used to collect the data which was taken from previous literature.⁷ After modification, questions were asked from participants. Following were the components of the questionnaire: socio demographic, exposure of needle stick injury in different wards, vaccination status against HBV and associated factors then questionnaire was filled by me accordingly. Informed verbal consent was taken from each participant. Target population were medical professionals such as doctors, paramedics and janitorial staff (individuals responsible for maintaining the cleanliness and hospital waste handlers), were selected through simple random sampling technique working in different wards i.e: Nephrology, Urology, Emergency, Laboratory, Medicine, Surgery, Gynae Obs and Paeds. Sample size was 300, calculated by using the formula taken

from previous literature⁷. Those health care workers who joined hospital duty one year back were included in study.

The permission was taken from all those tertiary care hospitals from where data was collected. The study participants were not given access to the data set directly or indirectly and they were assured that information will remain confidential. Data was used solely for purpose of study. It was a non- invasive and non-interventional study without any physical risk to the participants. There was no direct benefit to participants but in the long run there will be benefit to the community and country. After collection of data it was reviewed for any error. We analyzed data into frequencies of various demographic variables with corresponding crude odds ratios (COR), adjusted odds ratios (AOR), and p-values to assess statistical significance by using SPSS-26 and expressed it in tabulated form.

The ethical approval was obtained from the Institution Review Board of Akhtar Saeed Medical College, Rawalpindi vide letter no. RAC & IRB-18/10/2023.

Results

Table-1 showed that most participants were in age group of 30-40 years mostly males. Most study participants having 10-20 years of experience and highest proportion of 33.6% were working in medical wards. Male gender was predominant (57.3%) as compared to female with a female to male ratio of 1:1.34.

Table-2 showed that 24% participants received HBV vaccination among them mostly were doctors (69.9%) while none of janitorial had HBV vaccination. Multiple times needle stick injury of (51%) was more common and frequently seen in paramedics (53.9%).

Table-3 showed exposure of needle stick injury in various sections of hospitals. Single time needle stick injury was frequently seen in worker of medical ward (18.7%) and multiple time needle stick injury was seen in emergency & pediatric wards (11.6%).

Table-4 presents the relationship between vaccination status and various demographic variables with corresponding crude odds ratios (COR), adjusted odds ratios (AOR), and p-values to assess statistical significance. Significant associations are noted for age, gender, and profession, while working experience does not show a significant correlation with vaccination status.

Table 1: Socio-demographic information of participants.

Variables	Frequency n (%)
Age (in years)	
<30	102 (34)
30-40	155 (51)
>40	43 (14.3)
Gender	
Male	172 (57.3)
Female	128 (42.6)
Working Experience (in years)	
<10	199 (66.3)
10-20	101 (33.6)
>20	100 (33.3)
Profession	
Doctors	117 (39)
Paramedics	156 (52)
Janitorial staff	27 (9)
Nephrology & Urology	13 (4.33)
Emergency room	48 (16)
Place of work (wards)	
Laboratory	21 (7)
Medical ward	101 (33.6)
Surgery Ward	30 (10)
Obs/Gynae	32 (10.66)
Pediatric ward	55 (18.33)

Table 2: Sample characteristics of participants.

Variables	Frequency n (%)
HBV Vaccination	
Yes	72 (24)
No	228 (76)
HBV Vaccination Status in participants	
Doctors	50 (69.3)
Paramedics	22 (30.7)
Janitorial Staff	0 (0.0)
Exposure to Needle Sticks Injury	
No exposure	44(14.6)
One time exposure	103 (34.3)
Multiple time exposure	153 (51.0)
Frequency of One Time Needle Stick injury	
Doctors	41 (39.7)
Paramedics	43 (40.2)
Janitorial Staff	19 (20.1)
Frequency of Multiple Times Needle Stick Injury	
Doctors	30 (19.9)
Paramedics	82 (53.9)
Janitorial Staff	41 (26.2)

Discussion

In present study it was found that 24% of Medical staff had obtained the hepatitis B vaccination. Same was documented in a study

conducted by Yuan Q et al in China which shows that in developing countries HBV vaccination coverage amongst HCWs is low (11.3%).⁹ Another study conducted by Chang Hun Lee et al., which also shows decrease vaccination rate, suggesting an urgent need for tailored interventions to increase awareness and accessibility of vaccinations.¹⁰ High HBV Vaccination rate was observed in Europe and North America, including the USA and Canada.¹¹ Improved outcomes were also discovered in a study carried out by Salman et al in Karachi, Pakistan.¹² Among the different professional groups, doctors show the highest vaccination rate (69.3%), while janitorial staff are notably non-vaccinated (0%). Paramedics also have a significant percentage of non-vaccinated individuals. This disparity highlights potential discrepancies in access and awareness to vaccination. Same was seen in a study that reported paramedics and janitorial staff often have lower vaccination rates due to misunderstandings about the risks and the importance of vaccination.¹³

Current study reveals that 51% of participants experienced multiple needle stick injuries, while 34.3% reported a single time exposure, and 14.6% had no exposure. These numbers suggest that a significant proportion of healthcare workers are at risk of potential HBV exposure due to unsafe practices. The findings correlate with a Study by Najma et al., which reported that needle stick injuries remain a prevalent occupational hazard.¹⁴ Study shows that paramedics reported the highest percentage of both single time (40.2%) and multiple times needle stick injuries (53.9%). This emphasizes that paramedics are frequently engaged in procedures associated with higher risk, possibly due to the nature of their emergency medical services. This study further supports the need for improved protective measures and training, specifically for emergency responders, highlighting how effective interventions could substantially reduce the incidence of needle stick injuries among this group.¹⁵

Table 3: Exposure of needle stick injury in different wards.

Place of Work (Wards)	No Exposure n (%)	Total Exposure Single Time Needle Stick Injury n (%)	Multiple Times Needle Stick Injury n (%)
Nephrology & Urology wards	8 (7.7)	0 (0.0)	5 (2.5)
Emergency room	11 (10.6)	14 (7.1)	23 (11.6)
Laboratory	7 (6.7)	3 (1.5)	11 (5.5)
Medical ward	56 (54.3)	37 (18.7)	8 (4.0)
Surgery ward	2 (1.9)	24 (12.1)	4 (2.0)
Obs/Gynae	5 (4.8)	8 (4.0)	19 (9.6)
Pediatric ward	14 (13.5)	18 (9.1)	23 (11.6)
Total	103		197

Table 4: Factors associated with HBV vaccination status among healthcare workers of tertiary care hospitals in Islamabad and Rawalpindi.

Variables	Vaccinated n (%)	Non Vaccinated n (%)	COR (95% CI)	AOR (95% CI)	p-Value
Age					
<30 yrs	37 (52)	47 (20.61)	1	1	< 0.05
30-40 yrs	21 (30)	93 (40.78)	0.509 (0.337-0.769)	0.236 (0.110-0.506)	
>40 yrs	14 (18)	88 (38.59)	0.224 (0.131-0.386)	0.133 (0.033-0.543)	
Gender					
Male	48 (66.66)	116 (50.8)	2.81 (1.45-5.44)	2.8 (1.29-6.23)	< 0.05
Female	24 (33.33)	112 (49.12)	1.94 (1.02-3.66)	1.5 (0.69-3.28)	
Working	42 (58.3)	68 (29.8)	0.40 (0.23-0.69)	2.98 (0.43-20.82)	>0.05
Experience	21 (29.16)	71 (31.14)	0.67(0.35-1.26)	5.59 (1.05-29.81)	
	9 (12.5)	89 (39.03)	1	1	
Profession					
Doctors	50 (69.3)	78 (30.7)	3.8 (2.18-6.96)	2.2 (1.77-4.15)	<0.05
Paramedics	22 (30.7)	123 (69.3)	1.56 (0.88-2.76)		
Janitorial Staff	0	27 (9)			

Medical wards recorded the highest exposure, with a substantial number of single time injuries. This correlates with findings from recent studies indicating that the medical ward may often deal with high volumes of patients requiring invasive procedures.¹⁶ Emergency room also shows a high rate of exposure, due to the unpredictable nature of emergencies and the urgent care required, healthcare workers may have less time to adhere to safety protocols. This supports the findings of a systematic review which reported that environments with high patient turnover and emergency situations are strongly associated with needle stick injuries.¹⁷ Pediatric ward reflects a significant level of needle stick injuries. This may be attributed to the nature of care provided to children, which often requires venipuncture, administration of IV medications, and vaccinations, leading to a greater potential for exposure.¹⁸ In contrast, wards such as Nephrology & Urology and Surgery display lower incidence of exposure. This may correlated with specialized procedures being more controlled and perhaps fewer instances of needle manipulations compared to emergency or medical wards. Surgical teams may also employ stricter protocols and safety measures that reduce exposure rates.¹⁹

A study indicates that emergency departments and surgical wards consistently report higher rates of needle stick injuries due to their inherent risks associated with emergency care practices and invasive procedures.²⁰ Another research revealed that frontline healthcare workers in emergency and surgical departments experienced the highest frequency of NSIs.²¹

It has been found that age was critical factor influencing vaccination status. Workers aged <30 years had significantly higher vaccination rates

(52%) compared to those aged >40 years, where only 18% were vaccinated. The odds ratio indicates that workers over 40 are less likely to be vaccinated (AOR = 0.133; 95% CI: 0.033-0.543), suggesting that younger healthcare workers may be more receptive or have better access to vaccination programs. Gender differences also emerged, with a higher percentage of vaccinated males (66.66%) compared to females (33.33%). The crude odds ratio (2.81; 95% CI: 1.45-5.44) and adjusted odds ratio (2.8; 95% CI: 1.29-6.23) indicate that males are significantly more likely to be vaccinated than females. Working experience did not show a significant association with vaccination status overall. The odds ratios indicate that doctors are much more likely to be vaccinated (AOR = 2.2; 95% CI: 1.77-4.15). This discrepancy may reflect the differing levels of awareness, access, and perceived importance of vaccination among various professional groups.

In current study 76% of healthcare workers are not vaccinated. Most neglected group was janitorial staff and most vulnerable group for exposure of HBV was paramedics. Study reflects considerable variation in needle stick injuries across different hospital wards that reflect significant percentage in medical wards, emergency and pediatric wards.

Analysis of this study illustrate significant disparities in vaccination rates based on demographics, that influence vaccination can help policymakers to develop more effective strategies to promote vaccination and improve public health outcomes.

Weakness of this study was that the participant's vaccination status was self-reported and they had no vaccination cards.

Conflict of interest: None declared.

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