

Sharps and Needlestick Injuries: The Impact of Hepatitis B Vaccination as an Intervention Measure

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Abstract

Introduction: This paper studies the epidemiology of sharps and needlestick injuries amongst healthcare workers and the effectiveness of intervention measures implemented at a regional hospital, Singapore. **Materials and Methods:** A retrospective review of sharps and needlestick injuries among healthcare workers of a regional hospital at Singapore between 1992 and 1997. Various interventions namely education, policy changes and a hospital-wide hepatitis B immunisation programme were reviewed for effectiveness of programmes implementation. **Results:** Of the 347 reported sharps and needlestick injuries, 45.7% occurred in the nursing staff, 25.1% medical staff, 7.5% health attendants, 5.2% hospital cleaners and 3.7% laboratory technicians. A steady rise in reporting was noted amongst the doctors from 1994 and this correlated with the implementation of educational talks given to new medical staff in May 1993. The number of healthcare workers with no previous history of hepatitis B immunisation decreased significantly from 17 in 1996 to 9 in 1997 ($P < 0.001$, odds ratio = 1.806 with 95% CI 1.443 to 2.261) after the implementation of the hospital-wide hepatitis B immunisation programme. **Conclusions:** Levels of awareness may contribute towards changes seen in the number of reporting of injuries. In our experience, we contend that education and appropriate policy changes towards easier reporting help to decrease sharps and needlestick injuries in healthcare workers. The hospital-wide hepatitis B immunisation programme helped to raise the immune status of the staff so as to reduce the costly prophylactic usage of hepatitis B immunoglobulin.

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Key words: Hepatitis B immunisation, Needlestick injuries, Sharps

Introduction

Sharps/needlestick injuries are a common occupational hazard among healthcare workers (HCWs).¹ It is an issue of major infection control concern as it carries with it the possible risk of transmission of blood-borne pathogens e.g. hepatitis B virus, hepatitis C virus and human immunodeficiency virus. As more and newer blood-borne pathogens are being discovered e.g. hepatitis G virus, it has become increasingly important that HCWs be aware of the risks of sharps/needlestick injuries and possible ways of preventing it.

We studied the 5-year epidemiology of sharps/needlestick injuries in HCWs of a regional hospital with the aim of assessing the effectiveness of intervention measures implemented.

Materials and Methods

This study was conducted at Tan Tock Seng Hospital, a 1000-bedded regional hospital offering rheumatology,

neurosurgery and respiratory medicine as its main services. There were approximately 2620 employees and of these, about 1038 (39.6%) were nursing personnel and 158 (6%) were doctors.

Reports of sharps/needlestick injuries were collected by the infection control nurses, entered into a database and analysed with the aid of the software EPINET. Analysis was carried out for reports collected from 1992 to 1997 at the end of the 5-year period.

Infection Control Measures

In-service education programmes were conducted for new nursing staff bimonthly from 1992 and for new medical staff quarterly from May 1993, and continual education to nursing staff monthly from 1992. Education of the doctors were conducted by the clinical microbiologist whilst that of the nurses by the infection control nurses (ICNs) with compulsory attendance required of the new staff. These programmes emphasised the safe and proper handling of

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sharps and needles and their proper disposal into sharps disposal containers.

A sharps/needlestick injury protocol was first implemented in January 1992 and then revised in January and December 1994. The initial protocol recorded the number of injuries reported. The injured staff were referred to a designated national centre located next to the hospital, the Communicable Disease Centre, for the reporting of sharps/needlestick injuries where post-exposure prophylaxis (PEP) against hepatitis B was administered as indicated. However, this centre did not actively investigate the source patient's serological status for hepatitis B. The reason for this was not known but it could possibly be related to the geographic difference of reporting and accident site. This is not ideal as the evaluation of source patient's hepatitis B status is important to assist in decision making for hepatitis B PEP. Hence, in January 1994, the protocol was revised to include the immediate reporting of any HCW who sustained a sharps/needlestick injury to the hospital's own Accident and Emergency Department for the necessary investigations and hepatitis B PEP. A sharps/needlestick Injury Report Form completed by the staff concerned was then sent to the Infection Control Unit who will actively trace the hepatitis B surface antigen results for all source patients. The report form includes information on location of incident, nature of injury, and type of prophylaxis given. The revision was made to facilitate better reporting and prompt administration of hepatitis B PEP. The protocol was again revised in December 1994 to include the reporting of injured staff to the hospital's Staff Clinic during office hours or the Accident and Emergency Department after office hours for PEP. The payment of serological testing and prophylaxis of HCWs were borne by the hospital.

A survey was conducted in September 1995 to determine the hepatitis B immune status of 1551 HCWs. One hundred and ninety-nine HCWs reported that they sustained a needlestick injury at least once in 1994. Five hundred and sixty-four (36.4%) of the surveyed staff had no past history of hepatitis B immunisation whilst 489 (31.5%) gave a history of immunisation more than 5 years ago and anti-HBs screening was performed for these. Following the results obtained from the survey, 150 non-immune staff were immunised against hepatitis B in mid-1996.

Statistical Analysis

Pearson's chi-square was used for the comparison of incidence of sharps/needlestick injury by means of SPSS statistical package (version 8). The number of health care worker injured is the numerator whilst the total number of healthcare workers within the particular job category is the denominator for the calculation of the incidence which is expressed as per 1000 healthcare workers.

Results

There was a total of 347 reported sharps/needlestick injuries between 1992 and 1996 with an average incidence of 22.4 injuries per 1000 HCWs (Fig. 1). An increase from 43 to 62 (44.2%) was noted in the reporting of injuries in 1994 but this was not statistically significant ($P = 0.338$).

One hundred ninety-three (55.6%) of the reported injuries occurred in the nursing staff and 87 (25.1%) in medical staff, 26 (7.5%) amongst health attendants, 18 (5.2%) in hospital cleaners and 13 (3.7%) in laboratory technicians (Fig. 2). However, the incidence was higher amongst the doctors with an average of 91.7 per 1000 doctors compared to 31.1 per 1000 nurses (Table I); this was statistically significant ($P < 0.001$, odds ratio = 3.165 with 95% CI 2.088 to 4.808).

A steady rise in reporting was noted amongst the doctors from 1994 (Table I) and this was statistically significant ($P < 0.001$, odds ratio = 2.113 with 95% CI 1.525 to 2.928). The trend in reporting amongst nurses showed no statistically significant variation from year to year (range of $P = 0.088$ to $P = 0.891$).

One hundred and thirty-seven (39.5%) occurred in the patient's room, 65 (18.7%) in the operating theatre and 39 (11.2%) in the ward treatment room (Fig. 3).

One hundred and fifty-three (44.1%) occurred after use of a sharp or needle i.e. prior disposal, 67 (19.3%) during use i.e. during the procedure and 35 (10.1%) occurred because of recapping of needles. Fourteen (4%) occurred in between steps of use of the sharp/needle, 11 (3.2%) after disposing the sharp/needle, and 11 (3.2%) occurred because of inappropriate disposal into trash containers (Fig. 4).

Hepatitis B PEP was administered to 194 (55.9%) HCWs. Of these, 184 (53%) received a dose of HBV upon reporting, 9 (2.6%) received both HBV and HBIG (Table II).

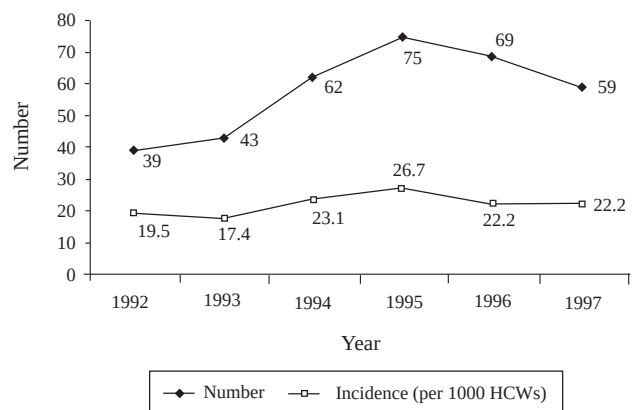
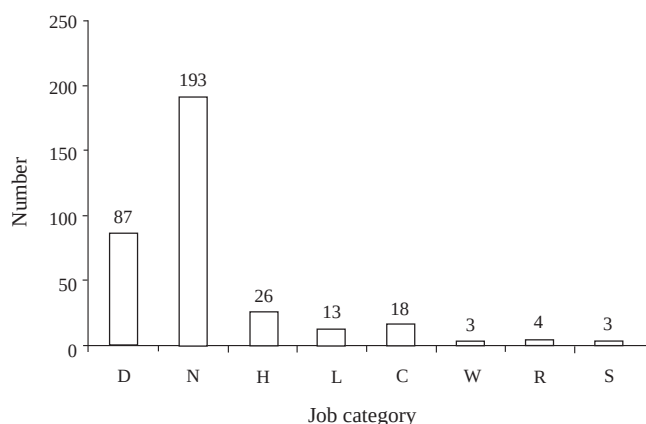


Fig. 1. Sharps/needlestick injuries from 1992-1997.



D: doctor; N: nurse; H: health attendant; L: laboratory technician; C: cleaner; W: ward clerk; R: radiographer; S: ward assistant

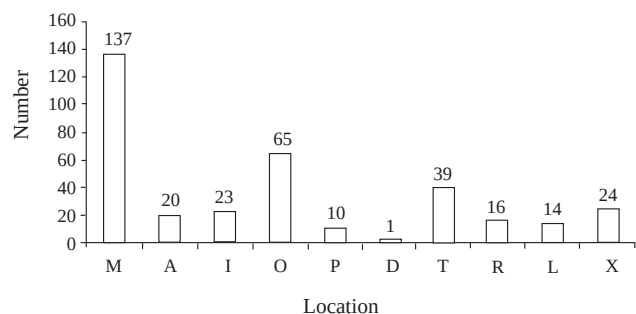
Fig. 2. Sharps/needlestick injuries by job categories (1992-1997)

The number of HCWs who did not have hepatitis B immunisation at the time of reporting of injuries varies from 17 to 33 from 1992 to 1996 (Fig. 5). This decreased from 17 in 1996 to 9 in 1997 (47.1%) ($P < 0.001$, odds ratio = 1.806 with 95% CI 1.443 to 2.261).

Discussion

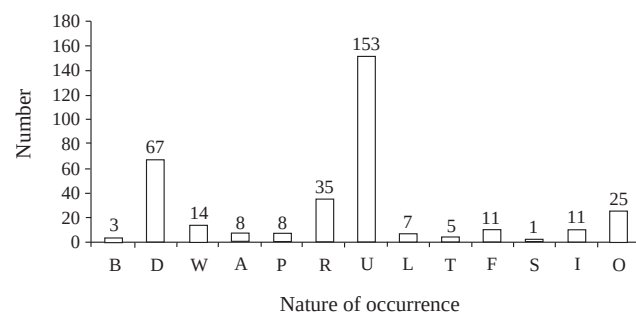
The epidemiological data of sharps/needlestick injuries amongst HCWs from this particular hospital in Singapore showed similar trends when compared with other investigators from different countries in the distribution of injured HCWs by job category and location site of injury.^{2,3} When we compared our data with the local national data of Lam et al,⁴ there was no difference in the distribution of injuries sustained by the various HCWs in the job categories and location of occurrence of injuries.

The hepatitis B survey in 1995 showed that 199 HCWs sustained at least one needlestick injury in 1994 in contrast to the figure of 62 reported injuries for that year. This



M: patient room; A: A & E; I: ICU; O: OT; P: OPD; D: dialysis unit; T: treatment room; R: procedure room; L: laboratory; X: others

Fig. 3. Location of sharps/needlestick injuries.



B: before use; D: during use; W: between steps; A: assembling; P: preparing for reuse; R: recapping; U: after use; L: left on sharps container; T: putting into sharps container; F: after disposal; S: pierced side of sharp container; I: inappropriate disposal; O: others

Fig. 4. Nature of occurrence of sharps/needlestick injuries.

discrepancy confirmed the under-reporting of injuries.

The effects made by the improvement in reporting and education are reflected in the data collected. The sharp increase of 44.2% in the 1994 reporting of injuries can be explained by the ease in reporting by HCW at their own hospital ground as compared to the previous use of a distant national reporting centre. However, greater awareness of

TABLE I: NUMBER AND INCIDENCE (PER 1000 HCWs) OF INJURIES IN MEDICAL AND NURSING PERSONNEL

HCW	No. (incidence per 1000 HCWs)						Total injuries
	1992	1993	1994	1995	1996	1997	
Doctors	1 (9.1)	8 (59.3)	18 (116.9)	20 (111.1)	21 (109.9)	19 (106.1)	87 (91.7)
Nurses	30 (42.1)	26 (28.1)	30 (27.2)	43 (36.1)	35 (28.2)	30 (26.6)	194 (31.1)

HCWs: health care workers

TABLE II: HEPATITIS B POST-EXPOSURE PROPHYLAXIS

Prophylaxis	1992	1993	1994	1995	1996	1997	Total (%)
Hepatitis B vaccine (HBV)	19	31	38	38	32	26	184 (53)
HBV + HBIG	0	0	4	3	2	0	9 (2.6)
Nil	20	12	20	4	35	33	124 (35.8)
Total number of injuries	39	43	62	75	69	59	347 (100)

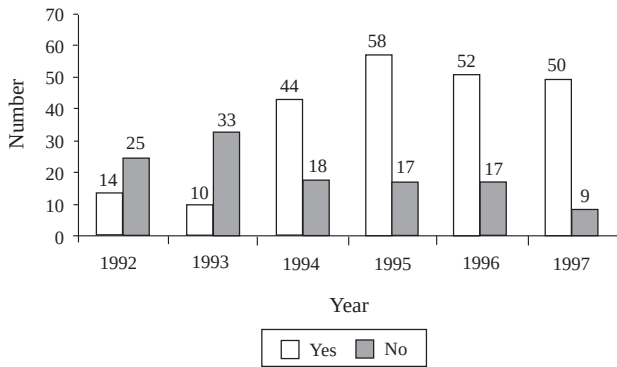


Fig. 5. Hepatitis B immunisation status amongst HCWs who reported sharps/needlestick injuries.

the staff in the importance of reporting arisen from improved education is also another possible contributory factor.

The steady rise in reporting noted amongst the doctors from 1993 correlated with the implementation of quarterly educational talks given to all new doctors upon entry to the hospital from May 1993. The practice of continual, consistent education by Infection Control personnel to HCWs have shown similar effective results by other investigators.⁵⁻⁷

The revision of the needlestick injury protocol in 1994 included clear guidelines on hepatitis B PEP as recommended by the Infection Control personnel. The ICNs were actively involved in the surveillance of injuries as all cases were reported to them within 24 hours. This resulted in the prompt institution of hepatitis B PEP as the ICNs were involved in tracing the results of the hepatitis serological tests conducted on both source patient and HCW.

The complete decline in the use of HBIG in 1997 and the significant 47.1% decrease in the number of HCWs who were not immunised against HBV in 1997 can be attributed to the successful hepatitis B immunisation programme in mid-1996.

This study showed the importance of a carefully planned and comprehensive sharps/needlestick injuries protocol in any hospital. The important factors for the successful implementation of such a protocol involved close good working relationship of all departments, a continual educational programme, surveillance of incidence of injuries as well as a hepatitis B immunisation programme for all HCWs.

Conclusion

We have demonstrated the benefits of an on-going analysis of sharps/needlestick injuries amongst HCWs. The initial small numbers in reporting in 1992 and 1993 prompted the Infection Control team to review and improve on the logistics of reporting of injuries. Secondly, the value of

continual medical and nursing education is evident by the rise in reporting arising from awareness created amongst new staff, namely the doctors when the Clinical Microbiologist started delivering educational talks from May 1993. Thirdly, the implementation of a hospital-wide mandatory hepatitis B immunisation programme has its impact in reducing the preventable cost incurred from the administration of HBIG in non-immune HCWs upon exposure to a patient who is HBsAg positive.

Hospitals should develop management structures and programmatic approaches that ensure appropriate immunisation of healthcare workers. Since hepatitis B is a preventable disease and healthcare workers are at significant risk of acquiring it, hepatitis B immunisation has been strongly recommended for all healthcare workers.⁸ At the point of employment, the healthcare worker with a previous history of immunisation would benefit from an anti-HBs screening and a booster of the hepatitis B vaccine given if his antibody is <10 mIU/ml. Another worker with no history of immunisation should be started on the immunisation schedule instead. The implementation of an Employee Health Policy incorporating the above will help towards ensuring a healthy workforce in the hospital.

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