Injection Practices Among Health Care Workers and Risk Factor for Hepatitis B Virus in A Governmental Hospital

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Abstract

World Health Organization estimates that 1 in 10 health care workers worldwide sustain a needle stick injury each year.

The total number of randomly selected group was 50 nurses and 30 laboratory technicians aged between 17 to 49 years, working at Mubarak Hospital. WHO had sustained at least 1 needle stick injury in the previous 12 months.

A structured questionnaire was used to collect individual socio-demographic characteristics, circumstances of most recent needle stick injury among the studied group. The serologic markers tested done were: Hepatitis B surface antigen, Hepatitis B surface antibody and total hepatitis B core antibody.

Result: The syringe needle is the major cause of needle stick injuries (45.7%), followed by blood collection (16.3%), followed by winged butterfly (15%), then hypodermic needle and suture needle (12.5%) for each of them.

15% of all participants did not have any of the markers and thus classified as susceptible to infection. About 22.5% were positive for anti-HBs and anti-HBc, an indication that they were immune to HBV infection following a natural infection while only 15% were immune following vaccination. Current HBV infection (HBsAg positive and anti-HBc positive) was present in 17.5% of respondents. Overall, 30% of respondents were classified as indeterminate because they had a positive anti-HBc result and were negative for HBsAg and anti-HBs.

Conclusion: High rate of needle-stick injuries were among health care workers working in Mubarak Hospital. Young age and recapping of needle were identified as risk factors for needle stick injuries. Also we found that the prevalence of exposure to hepatitis B virus infection was high. Yet only a small percentage of HCW were vaccinated.

Key Words: Needlestick injury – Health care workers – Hepatitis B virus infection.

Introduction

WORKPLACE safety is a very important aspect of occupational health practice. World Health Organization (WHO) estimates suggest that 1 in 10 health care workers (HCWs) worldwide sustain a needle stick injury each year [1].

In Egypt, like many developing countries [2], few efforts have been undertaken to raise awareness about needle stick injury (NSI) among health care workers (HCWs) and hospital managers. Concrete knowledge on the transmission of blood borne diseases in health care facilities is very limited and unsafe practices are common. Additionally, there is a lack of regulations and policies to protect HCWs from exposure [3].

The Centers for Disease Control and Prevention (CDC) estimates 385, 000 needle sticks and other sharps injuries per year among hospital workers in the United States. Nurses experience the majority of needle stick injuries in the world including half of the exposures that occur in the US [4]. Other individuals at risk include frontline patient care providers such as physicians, phlebotomists, and support personnel (housekeepers and laboratory staff).

Preventable needle stick injuries, while still common in the United States, occurs most commonly in Africa and Southeast Asia. These are the settings where health care workers are at greatest risk for infection because of the prevalence of infections among the patients and where hepatitis B immunization is not the standard. More attention and resources are needed to extend protection to health care workers worldwide. The burden of hepatitis B virus infection is highest in the developing world particularly Asia and sub-Saharan Africa [5].
World Health Organization estimates that the prevalence of hepatitis B virus infection in Africa is on average more than 10% [6].

A safe, effective and highly acceptable HBV vaccine has been around since 1981 [7], but its use among HCW in the developing world is low [8]. Limited access to vaccination by HCW is a consequence of lack of initiative from governments to formulate policy and guidelines to ensure that all HCW get vaccinated.

Aim of work:

This study was designed to elicit pertinent information related to the epidemiology of NSSI at Mubarak Hospital the magnitude of such events, the incidence within nurses and laboratory technicians, and the locations where the incidents occur, and the device involved were also examined to highlight the frequency of unsafe practices, the prevalence and risk factors for hepatitis B virus infection among health care workers.

Material and Methods

This cross-sectional study aimed to investigate health care workers at Mubarak Hospital from September to December 2010. The study group was nurses and laboratory technicians.

The total number of a randomly selected group was 50 nurses and 30 laboratory technicians aged between 17 to 49 years working on the basis of 12 hours/day with 3 days off per week (36 hours/week) who had sustained at least 1 NSI (needle stick injury) in the previous 12 months.

A structured questionnaire was used to collect individual socio-demographic characteristics, circumstances of most recent needle stick injury among the studied group, total number of years in practice, the ward/unit where it took place, vaccination status. The serologic markers tested done were, hepatitis B surface antigen (HBsAg), Hepatitis B surface antibody (anti-HBs) and total hepatitis B core antibody (total anti-HBc). Presence of HBsAg in blood signifies acute or chronic persistent HBV infection. Anti-HBs are produced in response to HBsAg and confer immunity to re-infection and their presence indicates immunity to HBV infection following an infection or successful immunization with hepatitis B vaccine. Anti-HBc is directed against the core antigen following a natural infection and normally persists for life. Its presence may indicate a current or past resolved infection. Written informed consent was obtained from each participant before any procedures were carried out.

Blood samples were taken from all subjects in accordance with standard procedure; a 5-ml venous blood sample was collected in from all subjects. The blood was allowed to clot for 45min at room temperature and the serum was separated after centrifugation at a low speed. The serum sample was then subjected to requested tests.

All WHCs were subjected to the following investigations:

- Hepatitis surface antigen (HBsAg) was measured by ELISA technique using kits from Dia-Sorin Biomedica Co., according to the methods of Boniolo et al., 1982 [9].
- Antibodies to hepatitis B virus surface antigen (anti-HBs) in human serum was detected by anti-HBs ELISA kit which is an enzyme linked-immunosorbent assay for in vitro qualitative detection of antibodies to hepatitis B virus surface antigen (anti-HBs) in human serum or plasma which based on the "sandwich principle". From xpress Bio, life science product; Catalog no.: W1280 (Lewis et al., 1973) [10].
- Antibodies to hepatitis B virus core antigen (anti-HBc) in human serum was detected by anti-HBc kit which is an enzyme-linked immunosorbent assay for qualitative. From Wantai Hep. BV, Catalog No. WB-2696 (IFUBC-01); China [11].

Results

Table (1) shows that out of the 80 participants, 82.5% were female and the mean age for all participants was 29.3 years (SD=8.4). Female health care workers (HCW) on average had spent about 3.4 years in service compared to about 5.2 years for the males. About 15% of HCW were working in operating room, 37.5% in inpatient ward, 12.5% in outpatient department, 12.5% in intensive care unit and 22.5% were working in laboratories. The largest number of injured HCWs (47.5%) was in the 17-27 year old age group. Health care workers aged 39 and more and those with more than 5 years of work experience were significantly less likely to be injured (15%).

Nurses had higher risk of suffering needle stick injuries (62.5%) compared with laboratory technicians (37.5%), looking at circumstances associated with NSSIs for the entire survey period (Table 2) illustrated that the highest proportion NSSIs was in the inpatient ward with 30 cases of NSSIs (37.5%), followed by the laboratories with 30 cases (22.5%), followed by the operating room 12 cases of NSSIs (15%), then outpatient and intensive care unit with 10 cases (12.5%) for each of them.
In our study syringe needle is the major cause of needle stick injuries (45.7%), followed by blood collection (16.3%), followed by winged butterfly (15%), then hypodermic needle and suture needle (12.5%) for each of them. The majority of needle stick injuries were due to recapping or disassembly of needle and during use of the device represent 31.25% followed by after use and before disposal (27.5%) then before use of the device (10%) as shown in (Table 2).

From (Table 3), it can be seen that 15% of all participants did not have any of the markers and thus classified as susceptible to infection. About 22.5% were positive for anti-HBs and anti-HBc, an indication that they were immune to HBV infection following a natural infection while only 15% were immune following vaccination. Current HBV infection (HBsAg positive and anti-HBc positive) was present in 17.5% of respondents. Overall, 30% of respondents were classified as indeterminate because they had a positive anti-HBc result and were negative for HBsAg and anti-HBs. Four possible interpretations are possible: resolving infection (window phase), remote resolved infection with low anti-HBs, chronic infection with low levels of HBsAg or false positive anti-HBc.

Table (1): Personal characteristics of the studied group experiencing needlestick injury (NSI) in the last 12 months (%).

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Females</td>
<td>66</td>
<td>82.5</td>
</tr>
<tr>
<td>Males</td>
<td>14</td>
<td>17.5</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17-27 years old</td>
<td>38</td>
<td>47.5</td>
</tr>
<tr>
<td>28-38 years old</td>
<td>30</td>
<td>37.5</td>
</tr>
<tr>
<td>39-49 years old</td>
<td>12</td>
<td>15</td>
</tr>
<tr>
<td>Years in service</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 year</td>
<td>28</td>
<td>35</td>
</tr>
<tr>
<td>2-5 years</td>
<td>40</td>
<td>50</td>
</tr>
<tr>
<td>&gt;5 years</td>
<td>12</td>
<td>15</td>
</tr>
<tr>
<td>Cadre</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nurse</td>
<td>50</td>
<td>62.5</td>
</tr>
<tr>
<td>Laboratory technicians</td>
<td>30</td>
<td>37.5</td>
</tr>
</tbody>
</table>

Table (2): Circumstances of most recent needle-stick injury among the studied group.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location of occurrence (medical specialty area):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating room</td>
<td>12</td>
<td>15</td>
</tr>
<tr>
<td>Inpatient ward</td>
<td>30</td>
<td>37.5</td>
</tr>
<tr>
<td>Intensive care unit</td>
<td>10</td>
<td>12.5</td>
</tr>
<tr>
<td>Outpatient department</td>
<td>10</td>
<td>12.5</td>
</tr>
<tr>
<td>Laboratories</td>
<td>18</td>
<td>22.5</td>
</tr>
<tr>
<td>Device involved</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Syringe needle</td>
<td>35</td>
<td>43.75</td>
</tr>
<tr>
<td>Suture needle</td>
<td>10</td>
<td>12.5</td>
</tr>
<tr>
<td>Winged, butterfly needle</td>
<td>12</td>
<td>15</td>
</tr>
<tr>
<td>Blood collection</td>
<td>13</td>
<td>16.25</td>
</tr>
<tr>
<td>(needle holder or vacuum tube)</td>
<td>10</td>
<td>12.5</td>
</tr>
<tr>
<td>Hypodermic needle attached to disposable syringe</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activity and timing of accident:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recapping or disassembly of needle</td>
<td>25</td>
<td>31.25</td>
</tr>
<tr>
<td>After use and before disposal</td>
<td>22</td>
<td>27.5</td>
</tr>
<tr>
<td>Before use of the device</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>During use of the device</td>
<td>25</td>
<td>31.25</td>
</tr>
</tbody>
</table>

Table (3): Interpretation of serologic markers: HBV infection status and corresponding percentages.

<table>
<thead>
<tr>
<th>Serologic markers</th>
<th>Interpreation</th>
<th>Number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>HBsAg</td>
<td>AntiHBs</td>
<td>AntiHBc</td>
<td></td>
</tr>
<tr>
<td>Negative</td>
<td>Negative</td>
<td>Negative</td>
<td>Susceptible</td>
</tr>
<tr>
<td>Negative</td>
<td>Positive</td>
<td>Positive</td>
<td>Immune after infection</td>
</tr>
<tr>
<td>Negative</td>
<td>Positive</td>
<td>Negative</td>
<td>Immune after vaccination</td>
</tr>
<tr>
<td>Positive</td>
<td>Negative</td>
<td>Positive</td>
<td>Current infection</td>
</tr>
<tr>
<td>Positive</td>
<td>Positive</td>
<td>Positive</td>
<td>Intermediate:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>*Resolving infection</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>**Remote resolving infection</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>***Chronic infection with low levels of HBsAg</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>****False positive anti HBc, hence susceptible</td>
</tr>
</tbody>
</table>
Discussion

All health care providers are at risk of needle stick injuries at their work environment but nurses are at high risk because of their job nature [12]. In this study we reported 80 of HCWs (nurses and laboratory technicians) who have been exposed to NSSIs from September to December 2010.

Our result has shown female predominated among HCWs with NSSIs (82.5%) and that is explained by the fact that the vast majority of nursing staff in our Hospital are female in gender this is in accordance with a study which showed that female predominated among HCWs with NSSIs (60%) [13].

Nurses have been reported to be the major occupational group in our study (62.5%) which was in accordance with Malek and colleagues’ study which showed that nurses have been reported to be the major occupational group (45%) this is explained by the fact that nurses are responsible for most of blood sampling and other I.V. Access procedure in the hospital [13].

The largest number of injured HCWs (47.5%) was in the 17-27-year-old age group Similar observation was also reported by Moges and his colleagues’ study which stated that a higher prevalence of needle stick injuries was observed in subjects aged less than 30 years, stated that the reasons for higher needle-stick injuries among young people could be lack of experience and skill on the job. Many workers began work at an early age and often without safety training [15].

In this study the inpatient ward reported the largest proportion of total NSSIs (37.5%) where there was less intense activity than in more intense areas such as the intensive care unit which reported in our study (12%) this may be because better qualified staff work in the emergency rooms [16]. Also the ward and bedside are the most common location for needle stick injury to occur [17].

Regarding the device involved this study showed that syringe needle represents the main cause of needle stick injuries (43.75%), this is in accordance with Hanafi study that stated that syringe needle is the major cause of needle stick injuries in nurses (72%) [14]. Our study showed that Blood collection (needle holder) represents 16.25%, winged, butterfly needle represents 15%, while hypodermic and suture needle each of them represents 12.5%, this is agree with the United States National Surveillance System for Health Care workers (NaSH) which identified six devices responsible for the majority of needle stick and other sharps related injuries: Hypodermic needles (32%), suture needles (19%), winged steel needles (butterfly) (12%), scalpel blades (7%), IV catheter styles (6%), and phlebotomy needles (3%) [4].

This study found that the highest percentage of injuries occur equally during recapping or disassembly of needle and during the use of the device (31.25%) in contrast to our study the United States National Surveillance System for Health Care workers (NaSH) showed that recapping needles represents 6% of the needle injury situations [4].

This study showed that hepatitis B virus sero-markers are prevalent among health care workers (nurses and laboratory technicians). The prevalence of infection was 22.5%, and that of current infection 17.5%. Findings from a similar study conducted among health care workers in Uganda found a comparable prevalence of 9.0% for current infection; however that for life time exposure to hepatitis B virus infection was much higher at 60.1% [18].

Only 15% of participants were immune as a result of vaccination. Although 22.5% of all participants had ever been exposed to hepatitis B virus infection and some of them got immune after the infection, a sizeable 15% remained susceptible to infection and could potentially benefit from vaccination. The 15% vaccination coverage reported in this study is very low compared to other developing countries like Pakistan with vaccination coverage of over 80% [19].

This study showed that the risk of NSIs decreases with long duration of service as HCW for 2 to 5 years in service represents 50% while those with more than 5 years of service represents 15% of incidence for NSIs this is in agree with Francesco et al study which stated that The needle stick injury rate declined from 32% in those with less than 5 years of employment to 28% in those with more than 20 years (p<0.01) [20]. In contrast Ismail study which stated that there was no statistical difference related job duration less than or equal to 20 years and more than 20 years (>0.5) [21].

Conclusion:

While the science base on NSIs continuous to grow, research indicates that such injuries are an important and continuing cause of exposure to serious and sometimes fatal infections among HCWs.
This study demonstrated a high rate of needle-stick injuries among health care workers working in Mubarak hospital. Young age and recapping of needle were identified as risk factors for needle stick injuries. Also we found that the prevalence of exposure to hepatitis B virus infection was high. Yet only a small percentage of HCW were vaccinated. There is need to vaccinate all health care workers as a matter of policy and ensure a safer work environment.

Recommendations:

It is highly recommended that the nurses & laboratory technicians should be aware of their occupational health hazards through career counseling. Regular courses and seminars should be conducted for sharp management training. Use needles that retract, sheathe, or blunt immediately after use. (These devices, after a decade of technology advances, are widely available in North America and Europe and required by law in the United States) [22].

Reporting of needle stick injuries is mandatory to higher officials of infection control committee, regular screening of nurses and laboratory technicians for infections transmitted through contaminated needles should be done on regular intervals. It should be mandatory for all nurses and laboratory technicians to get immune prophylaxis against Hepatitis B before entering into clinical setting.

References


