

## **Survey of needle-stick injuries in paediatric health personnel of 5 University Hospitals in Tehran**

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### **Abstract**

**Objective:** To study the prevalence and correlates of needle-stick injury in the health personnel of the Paediatric Department of five university-affiliated hospitals in Tehran, from April till June 2009.

**Methods:** Cross-sectional questionnaire survey. Physicians undergoing paediatric training and nurses working in the paediatric departments filled up a pre-designed questionnaire. Relevant variables were compared between doctors and nurses.

**Results:** Three-hundred fifty-five health personnel were enrolled. Of these 49.3% had incurred needle stick injury at least once, 36.7% doctors and 54.9% nurses ( $p=0.002$ ). Nurses fared better than the doctors as regards knowledge about hazards of improper needle disposal. Correct answers from doctors and nurses respectively were: 45.6% vs. 59.3% about needle separation and 41.9% vs. 81.2% about recapping, ( $p=0.02$  and  $<0.001$ ). Doctors 11.1% and Nurses 37.7% believed injections to be better than oral medication for children, ( $p<0.001$ ), however, 68.9% of doctors and 46.6% of nurses believed that parents preferred injections to oral medicines for their children, ( $p<0.001$ ). Only 26.6% knew about auto-disable syringes. Vaccinated against Hepatitis B was present in 92.7%. Doctors 58.7% and 55.3% nurses knew HBV to be the most common needle transmitted infection, ( $p=0.56$ ).

**Conclusion:** Needle-stick injuries are common among Paediatric health care personnel and their knowledge about prevention strategies is suboptimal. Most, health personnel are immunized against Hepatitis B.

**Keywords:** Needle-stick injury, Health care workers, recapping, auto-disable syringes (JPMA 61:127; 2011).

### **Introduction**

Health care workers face the hazard of needle-stick injuries, (NSI) which can result in serious infections with blood borne pathogens such as hepatitis B virus, (HBV), hepatitis C virus, (HCV) or Human immunodeficiency virus, (HIV).<sup>1-4</sup>

Health personnel working with patients harbouring these viruses are placed at increased risk. It is estimated that, 66000 HBV, 16000 HCV, and almost 1,000 HIV infections may have occurred in the year 2000 worldwide among health-care workers due to their occupational exposure to percutaneous injuries; almost 40% of HBV and HCV, and 4.4% of HIV infections are attributable to occupational exposure to sharps.<sup>5</sup> In Iran 3% of the population is estimated to be chronically infected with hepatitis B virus. A study performed on 6,583 subjects, aged between 18 and 65 years from three provinces in Iran namely Tehran, Golestan, and Hormozgan, revealed a prevalence of hepatitis B surface antigen and anti-hepatitis B core antibody as 2.6% and 16.4%, respectively. No significant difference was found between males and females.<sup>6</sup> In another study, about prevalence of hepatitis B surface antigen, on 14 599 783

blood donations in Iran collected during 10 years revealed that the overall HBsAg prevalence rates declined from a 1.79% (1789/100 000 donations) in 1998 to 0.41% (409/100 000 donations) in 2007.<sup>7</sup> Recent figures for HIV, released by the Ministry of Health, quote a figure of 20130 individuals infected with the HIV virus in Iran.<sup>8</sup>

The first step in preventing injection-associated infections is elimination of unnecessary injections.<sup>2,4</sup> However, when injections are medically indicated, prevention of needle-stick injuries is of utmost importance.

Our objective was to determine the prevalence of NSI in health personnel working in the Paediatric departments affiliated to Shahid Beheshti Medical University in Tehran. In addition, our purpose was to learn about their hepatitis B immunization status, their knowledge about injection transmitted illnesses and WHO-recommended safe injection practices.

We chose personnel working with children for our study as managing young children and handling sharps which simultaneously exposes the individual to additional risks. Our overall aim was to increase awareness of healthcare personnel about hazards in workplace settings that lead to NSI.

## Subjects and Methods

This was a cross-sectional questionnaire survey. Nurses, Paediatric residents, (first and second year residents), and 6th year students undergoing Paediatric rotation in the children's ward of 4 general hospitals and one children's hospital affiliated with the Shahid Beheshti Medical University were recruited during the study period of 3 months starting from April 2009.

Nurse-aids with less than 12 years of school education were excluded.

Personnel accessible to the study team were asked to fill up a pre-designed questionnaire, administered to them by trained members of the study team. Purpose of the survey was explained to the participants and their consent obtained before the survey. Personal information was confidential and personnel were not required to put their names on the forms. The study was approved by the research committee of the Paediatric Infections Research Center at Mofid Children Hospital affiliated with Shahid Beheshti Medical University.

Data including demographic characteristics, HBV-vaccination status of the personnel, their knowledge about auto-disable syringes, injection-transmissible infections and safe injection practices were considered relevant for this study.

Prevalence and nature of needle-stick injury, common procedures resulting in NSI, instruments causing NSI, and the frequency of NSI with blood-contaminated needles were recorded and compared between doctors and nurses who had incurred NSI. We also asked about immediate post exposure management after sustaining NSI.

Queries regarding personnel's beliefs about the effectiveness of injections as compared to oral medicines for management of children treated as outpatients were included in the questionnaire. In addition, we asked their opinion about parental preferences regarding the use of injectable medications for treatment of common illnesses in children. All relevant variables were compared between physicians and

nursing personnel.

Categorical data are summarized as frequency number, percentage and quantitative data as mean and standard deviation. Comparison between categorical data was performed with Chi square test or Fisher's exact test where appropriate; p-values less than 0.05 were considered to be statistically significant.

## Results

Three-hundred fifty-five health personnel answered the questionnaire, 290 were females; 246 nurses, and 109 doctors. Sixty-nine, (19.8%) of the respondents had worked for <1 year, 128 (36.4%) for 1-5 years and 151 (43.4%) for >5 years.

In this survey 175 (49.3%) of healthcare personnel had incurred needle stick injury at least once during their working hours. From a total of 109 doctors 40 had experienced NSI (36.7%) while out of 246 participants from the nursing personnel 135 (54.9%) had been injured ( $p=0.001$ ). Majority i.e. 329 individuals, had been vaccinated against Hepatitis B (92.7%).

Number of episodes: Forty-three subjects out of 175 (24.57%) did not mention the number of episodes, 76 had been injured once, and 56 individuals (32%) had experienced NSI more than once.

Out of 175 personnel with NSI, 166 responded to the question about the type of sharp instrument causing the injury. Of these, 139 respondents had sustained injuries from hollow-bore needles, 7 through scalpels, 5 a broken vial, 2 with biopsy needle and 22 persons had been injured by multiple sharps i.e., needles, vials and scalpels. Eighty nine episodes had been caused during venepuncture for collecting blood samples, 49 while giving IM or IV injections, 26 in the course of stitching up wounds, 4 while performing a spinal tap, and once during ascites tap; 24 people did not name the procedure.

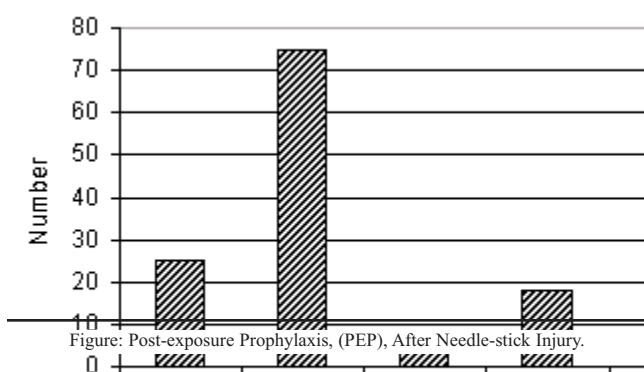
Out of the 163 health care personnel who answered

Table-1: Comparison of relevant variables in medical and nursing personnel.

Variable	Doctors n=109 %	Nurses n=246 %	p-value
Needle-stick injuries experienced	36.7	54.9	0.002
Negate needle separation (correct response)	30.2	44.2	0.014
Negate needle recap, (correct response)	34	73.7	<0.001
Believe needle separation increases risk of NTI	45.6	59.3	0.019
Believe needle recap increases risk of NTI	41.9	81.2	<0.001
Believe Injection better than oral medication for children	11.1	37.7	<0.001
Believe Injection more effective than oral medication	32	55.1	<0.001
Believe injected drug acts more rapidly	74.8	56.7	<0.001
Believe parents prefer injection to oral treatment	68.9	46.6	<0.001
Knows about auto disable syringes	22	28.8	0.187
Knows HBV as most common Needle transmitted infection	58.7	55.3	0.563
Fully immunized against HBV	93.6	92.3	0.664

Table-2: Comparison of correlates of needle-stick injury between doctors & nurses.

No	Variable	Doctors n=40 %	Nurses n=135 %	p-value
1	NSI causing instrument: needle	83.4	93.1	0.14
2	NSI causing instrument: scalpel	15	6	0.001
3	NSI after instrument used on patient	78.9	82.4	0.631
4	NSI during procedure: venepuncture	39.5	54.1	0.272
5	NSI during procedure: injection	10	34	0.011
6	Visible blood on Instrument	46.8	36.2	0.581
7	No Post-exposure management	37	20	0.072



the query about the timing of the NSI, in 133, (81.6%), the NSI occurred after the instrument had been used on the patient.

Of the 175 people who had incurred an NSI, 73 gave no answer regarding post exposure management, 59 said they washed the injured part with soap and water and or antiseptic solution, and 16 made the part bleed after washing; only 6 reported the incident to the infection control authorities (which are present in all teaching hospitals). Eighteen people checked their antibody status against Hepatitis B. Four people received HBIG after exposure, and 2 persons received a booster dose of HBV vaccination in addition to HBIG (Figure).

Regarding participants' knowledge about Needle-stick injury prevention 190 (55.2%) knew that separating the needles from the syringe increases the risk of NSI; 238 (69.2%) understood that recapping the needles did so. Only 93 recruits (26.6%) were aware of the existence of auto-disable syringes.

In, personnel awareness about NSI transmitted diseases 332 answers were documented. Eighty-two respondents (24.7%), deemed HIV to be the most common infection transmitted through NSI, 57 (17.2%), thought HCV to be more common and 187 (56.3%), knew HBV to be the most common problem, 6 named localized infection or sepsis as a common complication.

Personnel attitude about the use of injections for children showed that 182 of 340 staff thought that parents

preferred injections to oral medications to treat their children in outpatients, and 208 were under the impression that injections were better, more effective, (134 respondents ), or acted faster than oral medications, (211 persons).

Comparison of different factors between nursing and medical personnel is given in Table 1 & 2.

## Discussion

An unacceptably high proportion of the personnel in our study, (almost 50%), had experienced sharp object injuries, most often from hollow-bore needles. Although our figures are lower than those from Egypt, (66.2%) and Mongolia, (67.8%), they are comparable to some other studies viz. one from Malaysia that reports a rate of 31-52% in health care workers, with medical assistants in the emergency department facing the highest risks.<sup>9,10</sup> Another report from the graduating medical school class in the University of Toronto, states that 1/3 of the students had experienced at least one episode of needle-stick injury.<sup>11</sup> Studies from Iran quote figures of 71.1% in medical, dental, nursing and midwifery students at the university hospitals of Shiraz.<sup>12</sup>

In contrast to the studies from India about self-reported NSI, where exposure to blood was highest among residents in training, (76%) and only 11% in nurses, our figures for NSI were highest among nurses.<sup>13</sup> Self-reporting of the incidents could account for such a vast difference between their figures and ours. Report from a teaching hospital in Germany quotes figures of 55.1% for physicians, (highest risk group) and only 18.7% among Health Care Workers (HCWs) in the Paediatric department.<sup>14</sup>

Similar to other reports, venepunctures were the single leading procedures associated with NSI followed closely by injections in our study.<sup>15</sup>

Separating needles from syringes before disposal and/ or recapping the needles after use have repeatedly been proven as dangerous practices resulting in sharps injury.<sup>2,4,9,16</sup> Contrary to standard recommendations, a substantial number of our healthcare personnel believed that separating needles from the syringe and recapping would decrease the risk of NSI; nursing personnel fared better than physicians in their

knowledge about these preventive measures.

All Health care workers are required to attain up-to-date knowledge about the infectious consequences of NSI and the preventive actions to be taken after incurring NSI.<sup>1,16</sup> Hepatitis B is the most common infection transmitted through sharps injury followed by Hepatitis C.<sup>17</sup> Figures for the risk of acquiring HIV infection vary from 0.3% in some studies to 0.42%.<sup>8,13</sup> Although most of our subjects were aware that potentially life-threatening illness can be transmitted through NSI, a substantial number graded HIV infection as the single most common threat after an NSI.

In the advent of sustaining an NSI, health care workers should have proper access to post-exposure prophylaxis (PEP) for hepatitis B. Immediate actions include washing the injured site with soap and water and flushing the mucous membranes with water.<sup>16</sup> The CDC recommends that vaccinated healthcare workers whose antibody status is unknown, should be checked for anti-HBS and, if antibody level is inadequate, they should receive a vaccine booster after incurring an NSI even from a low risk or untested source.<sup>18</sup> In our study a point of concern was nil or inappropriate post-exposure management; participants incurring NSI resorted to different measures after the injury suggesting a lack of a uniform policy for post-exposure prophylaxis.

In order to decrease the incidence of needle-stick transmitted infections, WHO recommends universal implementation of reuse preventing, (RUP), or auto-disable syringes for injections, especially for immunizations; in our study less than one-third of the participants knew about the existence of these devices.<sup>19</sup>

Primary prevention of NSI emphasizes on elimination of needless injections.<sup>2,16</sup> In order to cut down the use of unnecessary injections, it is important for healthcare providers to understand that the majority of children, especially those treated as outpatients, do not need injectable medications, that contrary to the prevailing beliefs most oral drugs are as effective as the injectable form and are absorbed as quickly as the injectable counterpart. Moreover, it has been shown in various surveys that parents usually do not prefer injection prescriptions to oral medication for their children.<sup>20</sup> However, a considerable number of our respondents still believe injections to be the optimal form of medication, either because of its effectiveness or because of parental preference.

In our country universal immunization with the HBV vaccine has been put in effect for all infants born since the early 1990s, in addition Hepatitis B vaccine has been recommended for all high risk groups. In the United

States 75% of healthcare workers in hospitals are vaccinated against Hepatitis B.<sup>21</sup> Similar to the studies from Shiraz and Tehran, where 86.2% and 87.5% of the responding students had received the HBV vaccine, and opposed to studies from Egypt where only 11.3% had been fully immunized, almost all of our participants had been immunized against hepatitis B.<sup>3,9,12</sup>

Our findings highlight the shortcomings in the knowledge and attitudes of health care professionals about needle-stick injuries and emphasize the need for appropriate training in order to increase awareness of health personnel with regard to this preventable occupational health hazard.

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