Short Communication

Needlestick Injury and Psychomotor Performance as Measured by Pursuit-Aiming Test in Health-Care Professionals

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Abstract

Background: Several factors play a role in Needlestick Injury (NSI). We aimed to determine the association of NSI with psychomotor performance in health-care workers. **Materials and Methods:** In this cross-sectional study, demographic, occupational characteristics, and needlestick history were completed for 357 health personnel of a university hospital of Tehran in 2019 through a checklist. Psychomotor performance was measured using a pursuit-aiming test. **Results:** Most of the NSI occurred in nurses. The mean age of the workers with a positive history of NSI was significantly lower compared to their peers with a negative history, and similarly, they had lower work experience. After adjustment for the confounding variables, the correct pursuit-aiming test had a borderline association with the occurrence of the NSI. **Conclusions:** Psychomotor performance had a borderline association with the history of NSI.

Keywords: *Needlestick injuries, nurses, psychomotor performance*

Introduction

Needlestick Injuries (NSIs) are among the most serious occupational injuries in the health-care setting.[1] Based on the World Health Organization (WHO) report, approximately 2 million health-care workers (HCWs) experience skin exposure to infectious diseases annually and a noticeable number of cases of blood-borne viruses in HCWs are due to NSI.[2] The prevalence of NSI in Iran was as high as 42.5%.[1] It should be noted that a fraction of the HCWs does not report the injury which is about 59% of cases in Iran.[2]

Previous evidence showed that behavioral factors, such as recapping the needle, play an important role in the occurrence of the NSI.[3] On the other hand, not using universal precautions during procedure, lack of the required skill and unsafe handling and disposal of sharp materials are other incident factors.

Unfortunately, knowledge about human and behavioral factors is limited and therefore requiring a new understanding of the leading causes could prevent NSIs. For example, psychomotor activities, such as taking an intravenous line, which are movement oriented, require clinical reasoning to decide for patient care. As there is no clear data regarding the psychomotor performance, we aimed to determine the association of needle-stick injury with psychomotor performance.

Materials and Methods

In this cross-sectional study during 2019, the data-gathering form consisting of demographic, occupational characteristics, history of hepatitis B vaccination, and NSI was completed for the subjects. The HCWs of a teaching hospital, affiliated to Tehran University of Medical Sciences, who referred to the occupational health clinic for their periodic medical examination, were randomly enrolled in our study. Inclusion criteria for this study included (1) working at clinical units; (2) at least 1-year experience at the hospital; and (3) having no history of neurological, muscular disease, or movement disorders. The HCWs who were not present during data collection period and those who did not desire to participate in the study were excluded from the study.

In order to measure the psychomotor performance, fine motor control, and motor steadiness, the participants were

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Table 1: Baseline characteristics of the study participants and comparison between the individuals with and without a history of NSI*

Characteristic	Total (*n*=357)	Negative NSI (*n*=194)	Positive NSI (*n*=163)	*p*#
Quantitative variables				
Age; years mean (SD)	32.20 (7.20)	34.20 (7.40)	30.10 (6.20)	<0.001
Work experience, years mean (SD)	8.0 (6.60)	9.90 (6.90)	5.70 (5.50)	<0.001
Working hour/week, mean (SD)	47.0 (10.90)	46.20 (12.10)	47.90 (9.20)	0.193
Qualitative variables				
Male sex, *n* (%)	44 (12.30)	24 (12.40)	20 (12.30)	0.977
Married, *n* (%)	189 (52.90)	110 (56.70)	79 (48.50)	0.12
Rotational shift work, *n* (%)	271 (75.90)	134 (69.40)	137 (85.10)	0.001
Formal employment, *n* (%)	180 (50.40)	115 (59.30)	65 (39.90)	<0.001
Education (>master), *n* (%)	45 (12.60)	30 (15.50)	15 (9.20)	0.076
Nursing jobs, *n* (%)	265 (74.20)	153 (78.90)	112 (68.70)	0.029
***ICU personnel, *n* (%)	153 (42.90)	81 (41.80)	72 (44.20)	0.645
Vaccination history, *n* (%)	319 (89.40)	175 (93.10)	144 (92.30)	0.782
Anti-HBS** level, *n* (%)				0.31
Sufficient	242 (67.80)	137 (70.60)	105 (64.40)	
Insufficient	6 (1.70)	4 (2.10)	2 (1.20)	
Unknown	109 (30.50)	53 (27.30)	56 (34.40)	

*NSI: Needlestick injury **HBS: Hepatitis B surface antigen; ***ICU: intensive care unit #Independent sample *t*-test for quantitative variables and Chi-square for qualitative variable

Table 2: The correlation between pursuit-aiming test and needlestick injury

Pursuit-aiming test	Negative NSI	Positive NSI	*p**
	Mean (SD)	Mean (SD)	
Aiming total	283.00 (54.48)	309.92 (141.83)	0.015
Aiming correct	253.86 (46.60)	259.63 (52.13)	0.274
Aiming incorrect	29.66 (24.14)	37.4938 (34.52)	0.013

*Independent sample *t*-test

asked to do the pursuit-aiming test from the WHO Neurobehavioral Core Test Battery (NCTB) comprising the Simple Reaction Time, Digit Span, Santa Ana Dexterity, Digit Symbol, Benton Visual Retention, Trail Making Test and Pursuit Aiming Tests, which is the first test battery designed to detect deficits suggestive of neurobehavioral assessment.[4] The pursuit-aiming test, which is one of the components of NCTB, evaluates motor steadiness and eye–hand coordination measures the ability to make quick and accurate movements with the hand. The test was performed in the morning by a trained occupational hygienist. The subject's task is to place one dot inside each cycle following the pattern given on the test sheet. The test performed in two trials, each of them has been given for 60 s. Finally, the number of correct, incorrect dots and total attempts were counted for every individual. Based on the history of NSI, the participants were divided into two groups (positive history of needlestick and no history of needlestick). Chi-square test and independent sample *t*-test were used to identify the determinants of needle-stick injury. p value < 0.05 was considered as statistically significant.

Ethical considerations

All participants signed a written informed consent form. The study protocol was approved by the ethics committee of Tehran University and Medical Sciences (Ethic's code: IR.TUMS.MEDICINE.REC.1396.3497).

Results

In the present study, 357 HCWs were enrolled. Comparison of the study characteristics between the workers with NSI is summarized in Table 1. Other groups of medical staff (laboratory and operating room technician), shift workers, and contract employees have reported higher rates of NSI. In addition, there was no difference regarding working unit (ICU vs. general units). According to independent sample *t*-test, total and the uncorrected response of pursuit-aiming test were correlated with NSI [Table 2].

Discussion

In the present study, we tested the association of NSI and psychomotor performance in the health workers of a general hospital. Other determinants of NSI included years of experience and having a rotational shift. In our study, shift works were contributing to the occurrence of injuries. A study of nurses in the United States showed that they are at a greater risk of NSIs by having more shift and working hours.[5] In our study, technician and laboratory staff who were defined as the other group had the highest incidence of NSI in contrast with the nurses; supervised training of infection control department could be an effective way in the monitoring of nurses which cause the reduction of NSI. One study in Thailand

showed that training without practice, lack of awareness, insufficient staff, not using protective equipment, and haste could result in NSI.[6] In a study in Pakistan, being a nurse, more years of experience, receiving a booster dose of hepatitis B vaccine, and female sex were the predictors for NSI.[7] These findings are completely in line with our findings. On the contrary, another study in Kenya showed that age <40 years and the absence of training in infection prevention were the risk factors of NSI and splash exposures among HCWs.[8] Note that we did not measure the level of job stress in our study; however, the place of work (e.g., working in the emergency department or intensive care unit) was not associated with the NSI.

Our study is actually one of the rare studies until now that investigated the association of NSI and psychomotor performance in HCWs. According to our results, total response of aiming test and incorrect response were significantly higher in the subjects with a positive history of needlesticks. It seems that nurses who had higher speed (due to higher number of total score) and lower accuracy and attention (due to the higher number of incorrect score) experience higher rate of NSIs.

The most important shortcoming of this study is its retrospective design that predisposes our findings to recall bias. Second, this was a single-center study performed in a university hospital. Therefore, our findings need to be tested in other settings in a multicenter study.

Conclusion

By proposing a large multicenter study to find out the importance of neurobehavioral performance, we could develop an organizational culture and attitude by emphasizing on the need for adequate medical staff on every shift and extra vigilance during periods of high workload. Also, by performing other studies to achieve the result's consistency, we could use psychomotor performance as a screening tool for fitness for work of nurses who are required to work in highly demanding units.

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Conflicts of interest

Nothing to declare.

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