Association of the dominant hand and needle stick injuries for Healthcare Workers in Taiwan

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Abstract

Background

Healthcare workers face the risk of acquiring blood-borne infections from patients through needle stick injuries. Understanding the factors that are associated with increased risk, for example, the role of the dominant hand, is important so that preventive measures can be focused.

Methods

The EPINet (Exposure Prevention, Information Network- a trade mark of Virginia University) questionnaire was used to collect the data. The EPInet system started 2003 in Taiwan under C-MESH. When healthcare workers sustain sharp injury, they complete the injury report form, and report to infection control personnel, who then transmitted the data to EPINet website monthly.

Results

93.5% of the healthcare workers reported being right handed and only 6.5% reported being left handed. About two-thirds (65%) of the reported injuries were by self, 30% injuries were by others and 5% were reported as injured by unknown. There was an association between the dominant hand injury and the needle stick original HCW user, $p<0.0001$. There is a significant difference between the dominant hand and the needlestick original HCW user.

HCW whose dominant hand was the right hand were most likely at risk to be injured by "others" than "self" or "unknown HCW"; OR$\leq$ 18.39; CI (0.42 $\pm$ 2.33).

Conclusion

Needlestick injuries among health care workers in Taiwan continue to pose a serious occupational problem. Historically, prevention has focused on the use of protective wear than assessment of which hand may be at greater risk than the other. There is a greater need to prevent hand injuries as the dominant hand remains the most used and injured in process of patient care.

Background

Healthcare workers (HCW) face the risk of acquiring blood-borne and other infections from patients in their care. Needle stick and other sharp instrument injuries are important preventable mechanisms of injuries among healthcare workers. Wilburn[1] noted that over 30 million health care workers globally were reported to be handling sharp objects in different work settings. The US Exposure Prevention Information Net Work -EPINet[2] reports that handling of sharp objects remain the primary focus of universal precautions in hospitals. Proper handling of sharps is determined by several professional factors: the experience of the healthcare worker, level of education, age, pressure of work and the frequently used hand in discharging duties[3] . Further, hand injury is also associated with the type of the device used, type of department the healthcare workers is located[4,5], the type of the tasks the healthcare workers is doing[6,7,8,9] and the nature of protective wear used[10,11,12].

About 400,000 needle stick injuries involving the hand occur annually among the 4 million health care workers in the United States[13,14,15,16,17]. There are few studies globally that has focused on the association of dominant hand on needlestick injuries. We were not aware of any study in Taiwan that tried to look onto this subject.

Schiao[18] reported that 66.7% injuries in Taiwan involved a contaminated hollow-bore needle. From these injuries, 308 to 924 healthcare workers were estimated to be at risk for contracting hepatitis B virus; 334 to 836 were at risk for contracting hepatitis C Virus.

Nature of the instruments

Most studies have indicated that hollow bore needles are the major risk sharp objects. This is because the needle is made in such a way to be strong and sharp edged for easy piercing into the skin during its intervention. So, when nurses or any HCW do not handle it properly it may injure the hand. However, which hand is mostly injured by what instrument was not yet known[19].

Therefore, the objective of this study was to determine the association of dominant hand and needlestick injuries in Taiwan.

Due to the high prevalence of the HBV in Taiwan (21%),this study significantly, was a break through for the establishment of the better national needle monitoring strategy for hand protection. Previous studies have revealed that hand injury is the commonest among healthcare workers. Some manufacturers could take advantage to design a better hand protective wear determined by the individuals' dominant hand of use and at risk in hospitals. Policy makers could also be enlightened to revisit the regulations and enhance the shortfalls[20].

Methods

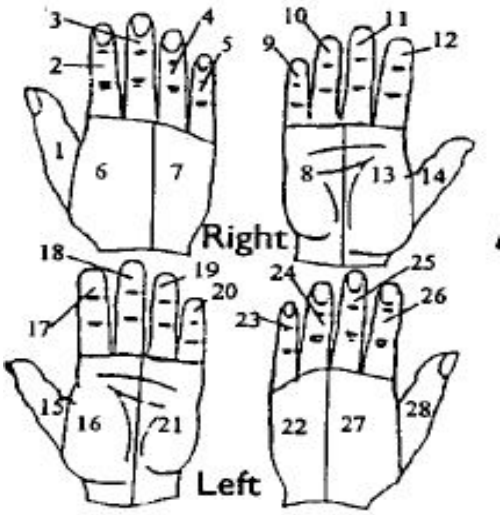
This was a retrospective study conducted among all healthcare workers who reported exposure to needle stick injuries in Taiwan. Twenty three[21,22,23] hospitals which had monthly been reporting on line to C-MESH (Centre for Medical Employee Safety and Health in Taiwan),on needle stick injuries in their hospitals were included. C-MESH is an EPINet non-governmental organization that keeps track of the needlestick injuries in Taiwan through website reporting system[24].

Between January 2004 and April 2007, a total of 1966 healthcare workers out of 15474 in the 23 hospitals in Taiwan reported exposure to needle stick injury. Needle stick injuries were defined according to the United States EPINet guidelines, i.e. as an injury with a device contaminated with blood or body fluids which penetrate the skin[25].

We used the EPINet (Exposure Prevention, Information Network- a trade mark of Virginia University) questionnaire

to collect the data. The EPInet system started on 2003 in Taiwan under C-MESH. When healthcare workers sustain sharp injury,[25] they completed the injury report form, and report to infection control personnel, who then transmitted the data to EPINet website monthly using the following figure and scale.

Distribution of injury sites in the hand



1. Right hand fingers, back 1-5
2 . right hand, back 6-7
3. Right hand fingers, Front 9-12,14
4 -Right hand palm. Front 8,13
5. Left hand fingers, Front 15, 17-20
6. left hand palm, Front, 16,21
7. Left hand fingers,Back, 23-26,28
8. left hand Back, 22, 27

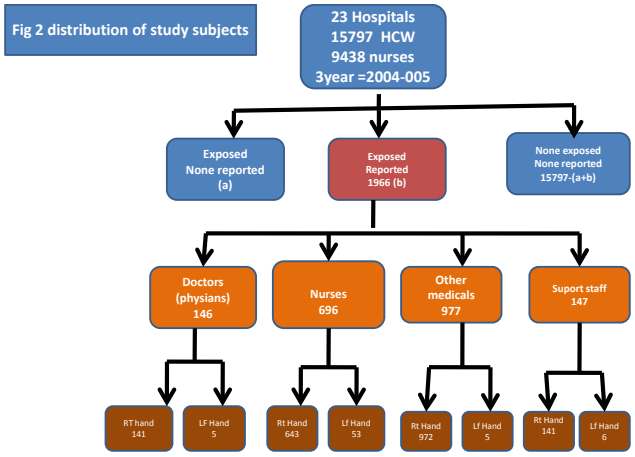
The following data were collected: type of job for healthcare workers; department of working; source of patient for the used device; nature of the device and department of the healthcare workers. The more active hand when handling sharps was defined as the dominant hand.

Pearson's χ^2 tests were used to assess the association between injury to the dominant hand and categorical explanatory variables.

Results

After exclusion of the above mentioned medical staff in 23 hospitals the following is the distribution of the HCW in this study.

The distribution of the study clients:



Distribution of Injured site n=1041

INJURED SITES	Dominant Hand	
	N(%) Right	N(%) Left
1. Right hand fingers , back	94(9.72)	1(1.49)
2 . right hand , back (excluding fingers)	18 (1.86)	1 (1.49)
3. Right hand fingers, front	215 (22.23)	8 (11.59)
4 -Right hand palm. Front	32 (3.31)	3 (4.48)
5. Left hand fingers. Front	**450 (46.54)**	**28(41.78)**
6. left hand palm . front	30 (3.09)	7 (10.14)
7. Left hand fingers , back,	63 (6.48)	13 (18.84)
8. left hand back	15 (1.54)	4 (4.35)
	967 (100)	**67 (100)**
Total numbers of injuries	**967(93.5)**	**67 (6.48)**
	N= 1034 (100)	

The majority (93.5%) of the healthcare workers reported being right handed and only 6.5% reported being left handed. About two-thirds (65%) of the reported injuries were by self, 30% injuries were by others and 5% were reported as injured by unknown. The most injured site by the right handed healthcare workers were the left hand fingers front which was 46.4%. Even for the left handed healthcare workers, the most at risk hand site was the left hand finger.

The majority (90.9%) of the right handed study participants reported that they believed the injuring needle was contaminated. About two-thirds (68.7%) of the right handed healthcare workers who were injured reported that they were injured by disposable syringe needles. Injuries were reported as severe in 3% of the right handed injured healthcare workers. Most (98%) of the injured right handed healthcare workers reported the injury to unit secretariat

A third (33.8%) of right hand injuries were reported to have occurred in patient room;38.6% had occurred while giving injection to the patients.

Distribution of dominant hand and needle stick injuries n=1041

Characteristic					DOMINANT HAND INJURY
	Right Hand		Left Hand		
	N	%	N	%	P- Value
Cadre of healthcare worker					
Doctors	141	14.51	5	7.25	0.12
Nurses	643	66.15	53	76.81	
Support staff	141	14.51	6	8.70	
Others	972	4.84	5	7.25	
Person responsible for injury					
Self	648	66.80	54	78.26	0.0001
Others	276	28.45	6	8.70	
Unknown	41	4.23	7	10.14	
Not applicable	5	0.52	2	2.90	
Perceived needle contamination					
Yes	883	90.94	58	84.06	0.08
No	14	1.44	3	4.35	
Unknown	74	4.35	8	11.59	
Type of health facility Department					
Critical department	122	12.55	8	11.59	0.66
Medical department	194	19.96	14	20.29	
Surgical department	164	50.62	8	11.59	
Others	492	16.87	39	56.52	
Type of the injuring needle					
Disposable syringe	471	68.76	44	81.48	0.06
IV Line needle	80	11.68	4	7.41	
Catheter needles	67	9.78	0	0.00	
Other needles	67	9.78	6	11.11	
The hand site of injury					
Right hand fingers , back 1-5	95	(9.77)	1	(1.45)	0.0001
Right hand , back 6-7	18	(1.85)	1	(1.45)	
Right hand fingers, front 9-12,14	216	(22.22)	8	(11.59)	
Right hand palm. Front 8,13	32	(3.29)	3	(4.35)	
Left hand fingers. Front 15, 17-20	451	(46.40)	29	(42.03)	
Left hand palm . front, 16,21	30	(3.09)	7	(10.14)	
Left hand fingers , back, 23-26,28	63	(6.48)	13	(18.84)	
left hand back, 22, 27	15	(1.54)	4	(4.35)	

The cross tabulation table shows that nurses were at high risk of needlestick injury from syringes and intravenous equipment relative to the other health care workers. Self injury was the common needle stick healthcare workers whose dominant hand was the right injured their left hand fingers on needle stick injuries in 46.4% of the cases.

There was an association between the dominant hand injury and the needle stick original HCW user, $p<0.0001$. There is a significant difference between the dominant hand and the needlestick original HCW user. Individuals who were left handed are more likely to be injured by self than being injured by others.

There was a boardline relationship between the dominant hand injury and the type of needle used $p\leq 0.06$. This means that right hand is more at risk to be injured by the syringe needle that other types of needles. There was also a significant association between dominant hand and injured site $p<0.0001$.

Using nominal logistic regression at an α level between 0 and 1 and with 95% confidence interval, the co-variate "HCW original needle user- "self" (y Variable) was strongly associated with independent variable "dominant hand injury; setting the "unknown HCW" as a constant parameter. It was noted that HCW whose dominant hand was the right hand were most likely at risk to be injured by "others" than "self" or "unknown HCW"; OR$\leq$ 18.39; CI (0.42 $\pm$ 2.33).

Logistic regression for the dominant hand and the determinants n=1041

Variable	N	OR	95% Confidence Interval	
			Lower	Upper
Original HCW User of the Needle				
Self	729	4.79	-0.19	1.56
Others	334	**18.39**	0.42	2.33
Unknown	**55**	**1.00**	-	-
The hand site of injury				
Right hand fingers , back 1-5	96	**19.00**	0.41	2.99
right hand , back 6-7	19	**3.59**	0.44	2.17
Right hand fingers, front 9-12,14	224	**5.39**	0.04	1.52
Right hand palm. Front 8,13	35	2.13	-0.50	1.27
Left hand fingers. Front 15, 17-20	479	**3.11**	0.18	1.16
left hand palm . front, 16,21	36	0.86	0.80	0.62
Left hand fingers , back, 23-26,28	74	0.97	0.37	1.28
left hand back, 22, 27	**17**	**1.00**	-	-
Type of the injured needle				
disposable syringe		0.47	-0.86	0.03
IV Line needle		0.89	-0.69	0.63
Other needles		1.00	-	-

In the same nominal regression model, co-variate "hand site was associated to the independent variable "Dominant hand with co-variate "left hand back" set as the constant parameter, right hand fingers were found to be the most at risk to needlestick injuries; OR= 19.00 ; CI (0.41 - 2.99).

Using all other predictor variables as stated in table one for the nominal logistic model, there was no association to the independent variable, after using the effect measure of dominant hand.

Discussion

This study has shown that health workers in Taiwan between 2004 and 2008, after assessing the risk of needle stick injuries, the right hand was the dominant hand and left hand fingers were found to be the most at risk for needle stick injuries. There were 1041 needlestick injuries per 15797 healthcare workers who were frequently monitored for there clinical work. This translated into 6590 needlestick injuries per 100,000 health workers for five years that was monitored. The risk of needle stick injuries in Taiwan was found to be more than in Cambodia although the reporting system was very low in this country.

The finding above reveal that right hand is the dominant hand and left hand fingers are the most at risk part of the body for needlestick injuries in HCW. Exposure of the health care professional or assistant to inadvertent sticking by a syringe needle is common. Most probably in the process of transferring body fluids from the patient to other containers for laboratory evaluation and is a real and constant safety problem in many countries too.

The majority of accidental hand injury in healthcare workers was reported to have occurred in the right hand which was determined as the dominant hand.

The right hand fingers were found to have a higher odds ratio which suggested that the right hand frequent injuries were closely associated with the dominant hand of the individual. This means that even when the dominant hand was found to be the left hand still it would be highly at risk to needle stick injuries[26].

Logistic regression analysis revealed that dominant hand is 14.8 times more likely to have experienced a needle stick injury than non dominant (odds ratio 14.8, 95% confidence interval 5.2–50.3,$P < 0.001$). The injury rate were much higher in nurses than other health care cadre. This is in line with Australian nursing students than in other international studies.

The injuries described predominantly (67%) involved the oppositional area consisting of the distal thumb, index, and middle fingers of the non dominant hand. During dissection, when opposed to hold or retract tissue, these digits form a surface that is directly exposed to the cutting edge, and injury to this area are termed dissector's digital injury[26]. Therefore, Injuries to other areas of the non-dominant hand were much less numerous and the dominant hand was highly injured. This is different from what was found in German where exposure to blood plashes to the face and eyes and glove punctures were frequent than the fingers or hand. These injury and exposure rates are probably broadly representative of practice in areas of low acquired. immunodeficiency syndrome prevalence and becomes very frequently improved on with increasing concern of patient congestion and about human immunodeficiency virus infection[19]. It is likely, however, that development of comfortable protective devices, based on knowledge of the pattern and circumstances of injury, will be necessary to eliminate these occupational hazards[26].

Data from this study indicate that most needlestick injuries

could be prevented with training on proper disposal of needles and medical waste, as 63% of injuries were related to faulty practices such as 2- handed recapping or bending needles. In addition, disposal of needles in puncture-proof containers couldfurther reduce injuries related to handling of medical waste, particularly among housekeeping staff or patient attendants who reported the highest frequency of injuries among all job categories in this study.

Limitations

The present study has several limitations. Data were self-reported. To the extent that study participants mis-reported either intentionally or inadvertently, our findings may be biased. Correlation analysis was limited to those data that were available. Some potentially important data that would have aided correlational analysis and control of confounders e.g. sex, age, were not collected.

Conclusion

This current study reveals the comprehensive injury prevention and control strategies in conjunction with the use of safer needle devices that has been mentioned elsewhere. Health care workers should assess their worksites to identify hand hazards and select products and strategies to correct the problem.

Needlestick injuries among health care workers in Taiwan continue to pose a serious occupational problem. Historically, prevention has focused on the use of protective wear than assessment of which hand may be at greater risk than the other. There is a greater need to prevent hand injuries as the dominant hand remains the most used and injured in process of patient care.

Competing interests

The authors report that they have no competing interests to declare.

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