

Evaluation of Occupational Accident and Its Related Factors in Two Hospitals in Tehran

Mehdi Raadabadi^a, Mohammad Salimi^b, Masood Safari^c, Majid Heydari^{d*}

^a Students Scientific Research Center, Tehran University of Medical Sciences, Tehran, Iran

^b MSc Student of Health Economics, Students Scientific Research Center, Tehran University of Medical Sciences, Tehran, Iran

^c Trauma Research Center, Shahid Sadoughi University of Medical Sciences, Yazd, Iran

^d PhD Student of Health Services Management, Health management and economics research center, Iran University of medical sciences, Tehran, Iran

*Correspondence should be addressed to Mr Majid Heydari, Email: majidheydari67@gmail.com

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Background & Aims of the Study: Hospital safety is a critical issue since hospitals are more vulnerable than other places to traumatic incidents. Investigation of occupational accidents in hospitals could prevent these events and preserve human and financial resources. With this background in mind, the present study aimed to investigate the occupational accident and its related factors in two university hospitals in Tehran.

Materials and Methods: This descriptive study was conducted at two hospitals (including one public and one specialized hospital) in Tehran. The study population consisted of 186 nursing group personnel working in different departments of hospitals who were selected by simple random selection. Data collection tool was a questionnaire which consisted of two parts: demographic variable and 18 questions about occupational incidents. Data were analyzed in SPSS software (version 21) using descriptive statistics and Chi-Square, Mann-Whitney, and Kruskal Wallis tests.

Results: Among 18 accidents, exposure to blood or body fluids showed to have the highest frequency, while falling had the lowest frequency. The obtained results demonstrated no relationship between gender and the number and type of accidents. Nonetheless, in some of the accidents, the number and type of accidents were significantly correlated with the department, work experiences, educational level, work shift, and type of hospital ($P < 0.05$).

Conclusion: Due to the prevalence of accidents, such as exposure to blood or other body fluids, cutting with sharp objects, and needle sticks, it is suggested that accidents and their causes be recorded and preventive measures be implemented to reduce the causes of accidents. Moreover, some interventions, such as training in personal and occupational protection techniques and risk assessment of different procedures are recommended.

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Background

One of the major safety concerns is the occupational accident which is an unexpected and unplanned occurrence in the course of work. Millions of occupational accidents take

place around the world every year. Some of these accidents cause death and some others lead to temporary or permanent disability (1). Today, safety in the industry and labor, especially in industrialized countries, has found its true place as a critical issue (2).

Most of occupational accidents are

preventable. Apart from disability, loss of income, and changes in workers' quality of life and their family life, occupational accidents also exert considerable adverse effects on the production and economy of the country (3). The incident is an unpredictable and detrimental event which stops and disrupts the normal development or continuation of an activity or function. It always occurs as the result of an unsafe or insecure act or conditions of labor or a combination of them (4). In general, occupational safety consists of rules and regulations which are used for the provision of a safe, secured, and harmless workplace for employees and improve workers' efficiency and industry development (5). Hospital safety is a critical issue since hospitals are more vulnerable than other places to traumatic incidents. The existence of flammable materials, medical gases, ionizing radiation, and chemicals calls for serious and continuous care services for the safety of patients, staff, and other people (6, 7). Research on occupational accidents which may exert traumatic effects on healthcare staff is an important epidemiological issue (8).

The hospital is the main center of health care delivery in health systems (9). According to research on occupational accidents, the nursing staff is the first working group with the highest occupational stress and risk (10).

Hospital safety and maintenance is nowadays one of the most important components of the management of treatment units (11). Safety is economically, morally, and ethically critical; therefore, the observance of its principles in hospitals which are prone to accidents (12, 13) leads to increased effectiveness, efficiency, and productivity. It brings positive effects on patients, staff, and stakeholders (14). In addition, in the event of accidents and disasters, hospitals and health centers are among the first units to provide proper and timely health services. Therefore, they greatly contribute to the reduction of mortality and the rescue of injured people. Their safety is also important in this

area (15).

A survey which was conducted in 175 countries pointed to the inaccurate occupational accident documentation in developing countries which results in unsuccessful planning for the prevention of these accidents. Nonetheless, in 1998, from the total number of 264 million occupational accidents, 350,000 cases were irreversible, and the injury incidence rate of fatal accidents (5, 16) was indicated as 89.2 per 1,000 staff per year (16). In a global study performed in 2005, the number of occupational accidents that ended in mortality was estimated at approximately 312,000 cases. In addition, in the mentioned study, the incidence of occupational accidents was reported as 9 per 1000 people (17). According to the last official report of Social Security in Iran in 2009, 21,740 people have injured in the course of work leading to 110 deaths and 234 cases of disability (18). In a study carried out on hospital settings, Secco *et al.* demonstrated that over a five-year period, the total registered accidents were 717 (6 per 100 employees) 86% of which (616) were typical (8). There is a paucity of studies on the factors influencing the occurrence of occupational accidents (19).

Hajivandi *et al.* (2015) showed that the incidence of accidents among nurses of Bushehr was more frequently observed after 4 pm, as compared to other hours (20). Nazari and Masoudi (2015), in their study which was conducted in Hashemi Nejad Hospital, Tehran, pointed to a significant difference between events reported by nurses and those reported in the hospital information system (21).

Research on occupational accidents sheds some light on the factors and escalation mechanisms of incidents, determines procedures, and raises the awareness of mass media, policymakers, and society towards the adverse effects of this phenomenon (22). Healthcare staffs in hospitals are exposed to such dangerous risks as infection with pathogens, blood, and body contacts (23), and among the health staffs, nurses are the most vulnerable group (24).

The present article aimed to determine and investigate the incidence of accidents in each of the two hospitals in Tehran to provide required fields for disaster management and focus on the black spots to make a procedure to prevent the occurrence of similar incidents and accidents.

Materials & Methods

This is a descriptive study conducted in two university hospitals (a public and a specialized) in Tehran in 2018. The hospitals which were affiliated to Tehran University of Medical Sciences were assigned to two subgroups of general and specialized hospitals. Thereafter, using simple random selection, a general and a specialized hospital were selected. These two hospitals with more than 150 active beds were selected due to the verbal consent of managers in order to compare variables between general and specialized hospitals. These two hospitals are known as university hospitals (a general hospital with different types of services and a specialized hospital with only one kind of care). The study population of the current study included all nursing personnel. According to Cochran's sample size formula, the sample consisted of 186 nursing staff from all departments and units (i.e. ICU, CCU) who were selected by simple random selection in each hospital. Before the commencement of the study, the verbal informed constant was obtained from all participants and they were assured of the confidentiality of their responses. The names of hospitals were not disclosed in compliance with ethical concerns. Data collection tool was a questionnaire consisting of the following sections: the first part included demographic variables, namely gender, shifts, type of hospital, age, education, work experience, and place of employment. Second part encompassed 18 occupational incidents. The items of the questionnaire were gathered using a comprehensive literature review based on prevalence and repetition: Cutting with

sharp instrument, needle stick, exposure to blood or other body fluids, container or sample slide breakage, dropped foreign objects into the eye, chemicals and fluid splash in the eyes, eye contact with disinfectants vapors, radiation exposure, breathing disinfectant fumes, breathing fumes of the emergence and stability drugs, drug poisoning, poisoning with chemical solvent, falling, slip and trip, injuries from falling objects, traumatic backache while changing the patients' positions, patient contacts. We asked nurses to determine their exposure to each of these incidents within the past year in three categories: no exposure, exposure less than three times, and more than three times. Validity and reliability were confirmed by Jouyani *et al.* (25).

Data were analyzed in SPSS software (version 21) using descriptive statistics and statistical tests of Chi-Square, Mann-Whitney, and Kruskal Wallis.

Results

Among all the studied samples, 29.5% of employees were male and 70.5% were female. Regarding the educational level, 21% of them had a diploma, 10% of cases had an associate's degree, 67% had a bachelor's degree, and 2% had a Master's degree. In terms of work experience, 31% of them had less than 5 years of work experience, 22% had 5-10 years of work experience, 27% of cases had 10-15 years of work experience, 15% of participants had 15-20 years of work experience, and 5% of cases had been engaged at work over 20 years. 87% of employees worked in multiple shifts, while 14% of cases worked just in single shifts (Table 1).

Table 1) Demographic criteria of participators in study (total number= 186)

variables	Groups	Frequency (%)
Gender	Male	55 (29.5)
Age	Less than 30 years old	62 (33.3)
	Between 30-50 years old	119 (64)
	More than 50 years old	5 (2.7)
Education	Diploma	39 (21)
	Associate's degree	18 (10)
	Bachelor's degree	125 (67)
	Master's degree	4 (2)
Work experiences	Less than 5 years	57 (31)
	Between 5-10 years	41 (22)
	Between 11-15 years	51 (27)
	Between 16-20 years	28 (15)
	More than 20 years	9 (5)
Employment contract	Formal	71 (38)
	Contractual	69 (37)
	contractual-projective	41 (22)
	Other	3 (3)
Work shift	Single shift	25 (14)
	multiple shift	161 (86)

The frequency of occupational accidents within the past year in three categories indicated that exposure to blood or other body fluids had the lowest percentage of non-exposure, whereas falling from height had the highest percentage of non-exposure with each of 18 accidents; in other words, 168 samples had never experienced it before (90.45%). Moreover, falling from height had the lowest frequency with less than three times occurring just for 17 cases (9.1%), while needle sticks had the highest frequency experiencing by 92 cases (50.7%). Falling from height with more than three times had the lowest percentage (5%), whereas exposure to blood or other body fluids had the highest percentage, (47.5%) (Table 2).

As illustrated by the obtained results, there was no significant relationship between gender (Man Whitney test; Table 3) and age (Kruskal Wallice test; Table 4) of personnel for any type of accidents ($P>0.05$). Kruskal Wallice test demonstrated that exposure to blood and other body fluids, as well as traumatic backache

Table 2) Frequency distribution of occupational accidents in the studied employee

Type of event	Frequency of event					
	Lack of exposure		Less than 3 times		More than 3 times	
	Number	Percent	Number	Percent	Number	Percent
Cutting with sharp objects(e1)	47	25.05	89	49.3	50	26.65
Needle sticks(e2)	43	23.05	92	50.7	51	26.2
Exposure to blood or other body fluids(e3)	30	15.8	65	36.7	91	47.5
Breakage of sample containers or slides(e4)	101	54.15	72	39.1	13	6.75
Dropped foreign object in the eyes(e5)	118	62.85	59	32.45	9	4.75
Chemical splash in the eyes(e6)	109	58	68	37.45	9	4.6
Fluid splash in the eyes(e7)	106	55.95	67	37.2	13	6.9
Eye contact with vapor-phase disinfectants(e8)	91	48.7	61	33.8	33	17.55
Exposure to radiation(e9)	58	31.3	73	39.75	55	29
Breathing vapor-phase disinfectants (e10)	79	43.15	47	26.15	58	30.85
Breathing fumes of the emergence and stability drugs(e11)	133	71.3	35	19.5	18	9.25
Drug or chemical poisoning(e12)	141	75.4	37	20.45	8	4.2
Poisoning with chemical solvent(e13)	151	81.1	27	14.85	8	4.1
Falling from height(e14)	168	90.45	17	9.1	1	.5
Slide and trip(e15)	118	63.9	54	28.9	14	7.25
Injuries from falling objects(e16)	149	80.5	30	16	7	3.5
Traumatic backache while changing patients' positions(e17)	101	55.8	38	19.85	47	19.8
Assaulted or injured by the patient or other visitors(e18)	150	80.6	28	15.15	8	4.25

Table 3) Relationship of occupational accidents with gender, work shift, and type of hospital(Mann-Whitney test)

Exposure	Gender						Shifts						Type of hospital								
	Male			Female			Sig	multiple shift			Single shift			Sig	general			specialized			Sig
	0	≤3	>3	0	≤3	>3		0	≤3	>3	0	≤3	>3		0	≤3	>3	0	≤3	>3	
e1	15	28	12	32	61	38	0.600	39	80	42	8	9	8	0.439	28	30	42	19	59	8	0.000
e2	15	27	13	28	65	38	0.609	34	86	41	9	6	10	0.023	24	34	42	19	58	9	0.000
e3	11	21	23	19	44	68	0.414	21	62	78	9	3	13	0.283	20	13	67	10	52	24	0.000
e4	32	17	6	69	55	7	0.206	86	64	11	15	8	2	0.759	56	34	10	45	38	3	0.125
e5	34	17	4	84	42	5	0.605	103	51	7	15	8	2	0.722	71	23	6	47	36	3	0.021
e6	27	23	5	82	45	4	0.095	95	59	7	14	9	2	0.729	66	26	8	43	42	1	0.001
e7	28	23	4	78	44	9	0.537	92	59	10	14	8	3	0.557	70	22	8	36	45	5	0.000
e8	28	16	11	63	45	22	0.737	78	54	28	13	7	5	0.844	55	24	21	36	37	12	0.018
e9	17	22	16	41	51	39	0.990	49	66	46	9	7	9	0.461	30	33	37	28	40	18	0.043
e10	26	11	18	53	36	40	0.516	70	42	47	9	5	11	0.350	40	19	40	39	28	18	0.011
e11	40	11	4	93	24	14	0.763	116	31	14	17	4	4	0.505	74	11	15	59	24	3	0.001
e12	42	11	2	99	26	6	0.959	122	32	7	19	5	1	0.997	81	13	6	60	24	2	0.025
e13	44	8	3	107	19	5	0.880	132	25	4	19	2	4	0.006	82	11	7	69	16	1	0.063
e14	48	7	0	120	10	1	0.449	145	15	1	23	2	0	0.902	89	10	1	79	7	0	0.584
e15	36	15	4	82	39	10	0.932	103	48	10	15	6	4	0.216	58	31	11	60	23	3	0.092
e16	47	7	1	102	23	6	0.444	128	28	5	21	2	2	0.270	75	18	7	74	12	0	0.027
e17	34	10	11	67	28	36	0.394	93	34	34	8	4	13	0.004	36	28	36	65	10	11	0.000
e18	41	10	4	109	18	4	0.180	129	27	5	21	1	3	0.041	81	14	5	69	14	3	0.815

Table 4) The relationship of occupational accidents with age, education, work experience, and workplace (Kruskal Wallis test)

Row	Type of event	The significance level(P-Value)			
		Age	Education	Work experience	Place of employment
e1	Cutting with sharp objects(e1)	0.028	0.333	0.002	0.114
e2	Needle sticks(e2)	0.004	0.362	0.005	0.041
e3	Exposure to blood or other body fluids(e3)	0.595	0.00	0.091	0.026
e4	Breakage of sample containers or slides(e4)	0.128	0.196	0.395	0.043
e5	Dropped foreign object in the eyes(e5)	0.000	0.097	0.010	0.263
e6	Chemical splash in the eyes(e6)	0.058	0.601	0.178	0.104
e7	Fluid splash in the eyes(e7)	0.092	0.770	0.108	0.105
e8	Eye contact with vapor-phase disinfectants(e8)	0.076	0.099	0.139	0.167
e9	Exposure to radiation(e9)	0.008	0.272	0.001	0.065
e10	Breathing vapor-phase disinfectants(e10)	0.379	0.087	0.0	0.553
e11	Breathing fumes of The emergence and stability drugs(e11)	0.064	0.251	0.017	0.221
e12	Drug or chemical poisoning(e12)	0.237	0.397	0.406	0.778
e13	Poisoning with chemical solvent(e13)	0.596	0.546	0.403	0.791
e14	Falling from height(e14)	0.750	0.379	0.763	0.830
e15	Slide and trip(e15)	0.548	0.201	0.086	0.75
e16	Injuries from falling objects(e16)	0.275	0.353	0.950	0.355
e17	Traumatic backache while changing patients` positions(e17)	0.575	0.005	0.002	0.170
e18	Assaulted or injured by the patient or other visitors(e18)	0.565	0.843	0.630	0.198

during changing the patients' position were correlated with the educational level of staff ($P<0.05$) (Table 4). Cutting with sharp objects, needle sticks, dropped foreign objects in the eyes, exposure to radiation, breathing disinfectants vapors, breathing fumes of the emergence and stability drugs, and traumatic backache during changing patients positions had

a correlation with work experience ($P<0.05$) (Kruskal Wallice test; Table 4). In addition, a significant relationship was observed between the place of employment and needle stick, exposure to blood or other body fluids, and the breakage of sample containers or slides ($P<0.05$) (Kruskal Wallice test; Table 4). In terms of work shift, just traumatic backache and

single or multiple shifts showed a significant relationship ($P<0.05$) (Man Whitney test; Table 3). Moreover, cutting with sharp objects, needle sticks, exposure to blood or other body fluids, fluid splash in the eyes, slip and trip, injuries from falling objects, and traumatic backache demonstrated a relationship with the type of hospital ($P<0.05$) (Man Whitney test; Table 3).

Discussion

As evidenced by the obtained results, a minimum of one exposure had occurred in about every 18 occupational incidents studied in these two hospitals. The occupational accident did not show a significant relationship with age and gender, while other factors, such as shift, and experience had a significant association with some exposures. These results demonstrated a high rate of occupational accidents and injuries due to more than three times exposures to blood or other body fluids in the nursing group in these two hospitals (47.5%). Among the incidents, the one which was experienced most frequently was exposure to blood or other body fluids, whereas falling from height was the least reported one. Lee stated that in developing countries, exposure to blood is a common problem due to less safety precaution which was compatible with our results concerning health workers (26). In a study conducted by Joyani *et al.*, among the studied incidents, the most exposure was cutting with sharp objects, while the least exposure was poisoning with chemical solvents (27). Patwary *et al.* also suggested that 75% of medical health workers in Bangladesh encountered needles and other sharp objects (28). On the other hand, Nenonen indicated that encountering with needles and other sharp objects was not the most important risk factor of diseases related to occupational accidents (29). This inconsistency between this finding and the result of the present study may be ascribed to smaller sample size (9%) in the study by Nenonen.

The frequency of some accidents differed in the mentioned study due to a different study setting. For instance, in elderly care centers, pressure ulcers, falls, and fractures are expected, while the prevalence is different in hospital settings.

In line with the results of the present study on the prevalence of accidents, such as exposure to fluids and injuries from cuts and needle dislocations, the results of a study performed by Masror *et al.* showed that the most common frequent safety events included medication errors, skin, neurological, and muscular injuries, and post-surgery complications (30). The results of other studies have demonstrated that falls and pressure ulcers are the most commonly reported accidents (31). Wolf *et al.* reported that the greatest medical error was determining the dose of drugs (32).

The results of the present study showed that gender had no effect on the rate of incidents. In the study conducted by Joyani, no significant relationship was detected between employees' gender and occupational accidents except for slipping and tripping. Nonetheless, Smith and Leggat (2005) did not find a relationship between gender and occupational accidents (33). Similar Studies and the results of this study showed that gender did not have a significant effect on accidents. In a systematic review conducted by Pidd *et al.*, they did not report gender control in occupational accidents in the health setting workers (34). The results indicated that employees do not need separate training based on gender.

The present study suggested that in many cases, such as cutting by sharp objects, needle sticks, dropped objects in the eye, exposure to radiation, breathing disinfectant vapors, breathing fumes of the emergence and stability drugs, and traumatic backache are correlated with work experience. It can be attributed to the fact that people with more work experience are more prone to accidents. Harrison *et al.* also indicated a direct correlation between occupational accidents and work experiences

(35). The results showed that only traumatic backache during changing the position of patients was significantly correlated with work shift ($P < 0.05$), and other incidents did not have a relationship with work shift. The findings of the study conducted by Joyani revealed that just the breathing fumes of emergence and stability drugs have a significant relationship with work shift; in other words, due to fatigue and lack of concentration, shift personnel encountered accidents three times more frequently (27). Therefore, work shift scheduling and distribution of workload among employees need special attention. In terms of the relationship between education and incidents, there was a significant relationship between the exposure to blood and body fluids and traumatic backache during change patients' position. This finding points to the necessity of training courses and leaflets for staff. In addition, a significant relationship was observed between the workplace and the needle stick, exposure to blood or other body fluids, and the breakage of sample containers or slides. In a similar vein, Aghajanloo found a significant relationship between organizational position and occupational incidents, such as cutting with sharp objects, chemicals and fluid splash in the eye, and eye contact with disinfectants (36).

Conclusion

As evidenced by the obtained results, hospital staff need special training on occupational safety skills at workplace. In addition, special consideration of hospital managers to buy special equipment for the protection of personnel in high-risk places can substantially prevent accidents. Due to the prevalence of accidents, such as exposure to blood or other body fluids, cutting with sharp objects, and needle sticks, it is suggested that accidents and their causes be recorded and preventive measures be implemented to reduce the causes of accidents. Moreover, some interventions, such as training in personal and

occupational protection techniques and risk assessment of different procedures are recommended.

Footnotes

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Conflict of Interest

The authors declare that they have no conflict of interest regarding the publication of this article.

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