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Safety Attitudes among Nurses and Its Relation with Occupational Accidents: A Questionnaire Based Survey

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ABSTRACT

Various aspects of work and occupational diversity and the complexity of the nursing profession have a significant impact on the incidence rate of unsafe acts and consequences of accidents. In this regard, safety attitude will have a significant impact on occupational accidents among nursing personnel. The aim of this study was to assess safety attitude among nurses and its relation with occupational accidents among teaching hospitals of Kerman University of Medical Sciences. This cross-sectional study was conducted on 244 nurses in Kerman, Iran in 2015. Tools for gathering data were Demographic and Organizational Questionnaires, Safety Attitudes Questionnaire (SAQ) and Occupational Accidents Questionnaire. Data was analyzed using SPSS 21 statistical software and descriptive statistics and statistical tests including Pearson correlation, independent t-test and ANOVA. The highest and lowest attitude scores were related to teamwork climate scale (58.9) and perception of management (38%). The stress recognition scale had significant correlations with each of the other scales. Reliability of the questionnaire was high, (α=0.872), and scale reliability ranged from α=0.82 to α=0.908 for the six scales. Chemical splash to eyes, in more than 3 times accident frequencies, had the lowest percentage (1.03%), and exposure to blood or other body fluids, had the highest percentage, (37.11%). There was a significant relationship between exposure to blood or other body fluids and traumatic backache while changing patient's positions with safety attitude ($P<0.05$). With regard to the relationship between safety attitude and occupational accidents, managers, by increasing their awareness of safety knowledge, improved incentive system, collaborative management, employee safety and dealing with occupational stress and finding the effective causes of patient safety can develop employees' attitude to safety.

KEYWORDS: *Accident, Occupational accident, Safety attitude, Nurses*

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INREODUCTION

Various aspects of work and occupational diversity

and complexity have a considerable impact on personal behavior in working environment, and this impact causes the unintended
occurrence of unsafe acts and consequently the incidence of accidents [1-2].

Accident (s) is defined as unplanned and unintentional event sequence (s) which occurs due to unsafe acts, unsafe conditions or both of them, and results in immediate or delayed undesirable effects [3].

Hospital is considered as the main and riskiest health care center in health systems. Also, nurses are exposed to occupational accidents such as sprains, strains and muscle tears resulting from heavy lifting, slips and falls, needle-stick, contact with blood and other body fluids and open wound contamination with patients' blood, cut from drug ampoules and scalpel cuts as well as other accidents [4-6]. According to the Bureau of Labor Statistics, in the most recent related study [7], accidents which result in nurse injuries in the hospitals have been counted for 5 percent of all work-related injuries. Also, work related accidents among nurses are regarded as an important cause of lost hours of work [8].

Nursing, is a job with several characteristics [9] such as job stress, high workload, work shift, work interruptions, overtime, distractions, role conflict and etc, that are defined as effective risk factors on nurse's safety and job-related accidents [10]. Nurses are regularly faced to stressful events which are effective on hospital's safety as well as patients' safety [11-12]. Having awareness of nursing characteristics can help to prevent medical errors and occupational accidents [13]. High level job characteristics in nursing personnel can force on their workload, job-related mistakes, indecisiveness and unsafe occupational behaviors. Nursing characteristics has a direct relationship with safety issues [9, 14]

One aspect of researches in many industrialized countries in reducing or preventing work-related accidents is to improve training, workplace conditions, quality of work tools and investigate effective causes of accidents in workplace [15-16]. In developed countries, having only an advanced management systems and technology is not enough for improving safe behaviors in workplace. Having a favorable safety and prevent accidents require personal perception and attitude along with organizational attitude towards safety [17-20] .This mutual perception and attitudes forms the organization's safety culture [21] .In recent years, the perception of different factors in health-care organizations, such as: emphasis on service, operational cost control, professional norms of organization and attention to attitudes of health care providers create patient safety culture [22]. This attitude is a major factor to prevent from occupational accidents in nurses [23]. Researches have shown the relationship between workers' safety attitudes and their safe behavior and also based on safety attitude, occupational accident and injuries can be traced [24-25]. This perception and sense of responsibility in individuals provide the implementation of safety culture in the organization [26].

Measuring personal safety attitude and perceptions by the use of a suitable tool can be considered as a valuable benchmark for evaluating organization's performance to prevent accidents [21, 27].

Recently, different methods were used to scale the safety attitudes of health care workers. One of them was Safety Attitude Questionnaire which contains 6 dimensions of teamwork climate, safety climate, perceptions of management, job satisfaction, working conditions and stress recognition [28-30]. The mentioned method is able to distinguish the probable weak points in health care services, motivate staff to improve the quality of service and decrease errors and occupational accidents [31]. In this regard, Tylor et al, have found a significant correlation between SAQ dimensions and occupational injuries or accidents in nursing personnel. According to the mentioned study, safety of nurses and patients is in line with safety attitude [32]. On the basis of previous researches, there is a strong correlation between safety culture, quality of finance and safety-related functions [33-35].

Since, in organizations of health care, work-related accident and injury are high [36-37], safety attitude and safety culture in organizations, as well as their effects on work-related accidents and injury seems necessary [38]. The purpose of this study was to assessing safety attitudes among nurses and its relation with occupational accidents in training hospitals of Kerman University of Medical Sciences.

MATERIALS AND METHODS

This cross sectional study was done in 2015 at training hospitals affiliated to Kerman University of Medical Sciences: (Afzali pour, Shahid Bahonar, Shahid Beheshti and Shafa). The population study was including 1100 nurses of the studied hospitals. Based on reports of safety attitudes by nurses (78%) in previous studies [39-41], and according to population in this cross-sectional study, acceptable error of 5%, α=0.05 and with assumed 15% additional samples, the number of samples were obtained 244. The questionnaires for gathering data were included:

A) Demographic and organizational variables consisting gender, age (yr), shift work, marital status, work experience (yr), education level and job title. Questionnaires reliability was checked by test-retest and reported by alpha Cronbach (0.83).

B) Safety Attitudes Questionnaire (SAQ). Safety aspects were classified into six dimensions (30 items):

- Teamwork climate (6 items),
- Safety climate (7 items),
- Perceptions of management (4 items),
- job satisfaction (5 items),
- Working conditions (4 items), and
- Stress recognition (4 items).

Each question was scored based on five-point Likert rating from 1 to 5 (1: strongly disagree, 2: disagree, 3: no difference, 4: agree, 5: strongly agree). Also, for negative questions, reverse scoring was used. Scores of each scale was graded from 0 to 100 (1=0, 2=25, 3=50, 4=75, and 5=100). The validity and reliability of SAQ were investigated and confirmed in different studies and languages, including Persian [42-46]

C) Occupational accidents questionnaire, contains of 18 occupational accidents designated according to literature reviews and previous researches such as "Cutting with sharp objects", "Sticking needle to body", "Exposure to blood or other body fluids", "Breakage sample containers or slides", "Falling foreign objects in eyes", "Chemical splash in eyes" and etc. Each question rated as "not encountered" or "encountered less than 3 times" or "encountered more than 3 times". The reliability of occupational accidents questionnaire has been reviewed and approved [47]. In the study conducted by Raeissi et al., Cronbach's alpha was presented 0.81 [4].

Sampling and data collection were done after obtaining the necessary permissions and submitting it to the official departments. Sampling method was simply randomized.

In this study, inclusion criteria were having bachelor's degree or higher and having at least 12-months clinical work experience in hospitals. Incomplete questionnaires were excluded and to complete the number of samples, new samples were replaced.

Throughout the study, they were also assured that the data was only used for research purposes, and their information was confidentially reserved. Emphasis was also laid on the fact that at every stage of research, participants could withdraw from the survey.

Following the collection of the questionnaires, data was analyzed using SPSS 23 statistical software and descriptive statistics (frequency, mean, standard deviation). Inter-scale correlations of SAQ was analyzed by Pearson correlation, frequency distribution of occupational accidents and relation with SAQ dimension was analyzed by one-way ANOVA and The relationship of demographic and organizational variables with SAQ dimensions was analyzed by independent t-test and Chi square test. In order to respect the rights, principles and ethical considerations, the purpose of the study was described for participants and subjects were asked to sign the informed consent form.

RESULTS

Participators characteristics are shown in Table 1. Nurses were predominantly woman (72.2%), and more than three-fourth (71.3%) of the participants were in contractual employment status. According to the results, nurses were mainly in rotational shift (83.6%). Almost 74.2% of the participants were married and the remaining was single and other states.

SAQ item descriptions are shown in Table 2. The average rate of incomplete (missing and not applicable) data at the item level was 1.65%, with a range of 0% to 3.1%. Item 10 "I know the proper channels to direct questions regarding patient safety in this office", item 14, "This office is a good place to work", item 15, "I am proud to work at this office", item 16, "Working in this office is like being part of a large family" and item 23, "Senior management of this office is doing a good job" provided the highest proportion (3.1%) of missing answers, and item 1, "In this office, "It is difficult to speak up if I perceive a problem with patient care" and item 2, "The physicians and nurses here work together as a well-coordinated team" provided the lowest proportion (0%). According to the response pattern, the proportions of %-missing, %-agree, %-disagree, and %-neutral were calculated. The highest proportion of %-agree (84.6%) was related to item 2, "The physicians and nurses here work together as a well-coordinated team". The lowest level of %-agree (43.3%) and the highest level of %-disagree (44.3%) across all items were provided by Item 28, "The staffing levels in this clinical area are sufficient to handle the number of patients", and item 26 "This office deals constructively with personnel's problem".

Among all dimensions of SAQ, the highest and lowest mean and standard deviations were related to Teamwork climate (3.92±.15) and Perception of management (3.38±.38), respectively. The average score of each dimension and questions of safety attitude were moderate to high, so that among the 30-questioned survey the highest and lowest mean and standard deviation were related to "In this office, it is easy to speak up if I perceive a problem with patient care" (4.15±1.62 and "The levels of staffing in this office are sufficient to handle the number of patients (2.8±0.98).

Subscale results for SAQ (N=244) are shown in Table 2 for the entire sample, reporting %-positive and mean scale statistics. Across the entire sample, %-positive ranged from 38% for perception of unit management to 58.9% for teamwork climate.

Variations in %-positive across the clinical areas are shown as minimum–maximum in Table 2,

and the distributions of %-positive are shown in Fig. 1.

Less than 60% of responder's reporting positive attitudes would indicate a need for improvement, according to the previous studies [48].

Mean scale scores and standard deviation are displayed in Table 2 and ranged from 61.82 (23.09) for perception of unit management to 74.06 (19.26) for teamwork climate.

The Cronbach's alpha for the total SAQ was high (0.872) and it changed minimally when items were removed (0.826–0.904). Cronbach's alpha exceeded the set cut off point of 0.82 for all scales (0.82–0.908), which indicates good scale reliability. Scale reliability is shown in Table 3. In this study, SAQ scale correlations were done by Pearson's correlation. All scales were correlated poorly and between 0.284 and 0.297 ($P<0.01$). Pearson's correlations indicated significant strong positive relationships for all other scales; correlation coefficients ranged from 0.367 to 0.774. in this regard, the most correlation coefficients were related to Safety Climate and Teamwork Climate (Table 3).

In all scales, Higher proportions of positive responders were found more in female staff than male staff, but based on independent T-test results and one way ANOVA, no significant relationship was found between demographic criteria (such as gender, age, marital status, work experience, education level) and organizational variables (such as shift work and Profession) with SAQ demotions (teamwork climate, safety climate, perceptions of management, job satisfaction, working conditions and stress recognition) (P-value> 0.05).

Data in Fig. 1 provides insight in the variability in different factors pertaining to the safety attitude, among nurses. Percentages of positive SAQ scale scores (≥ 75 out of 100) were charted to demonstrate the variability across nurses which reflected to both the presence and magnitude of each SAQ factor. There was substantial variability ranging from 0% to 100% in the percent of positive scores for each of the factors across the nurses (n=244). Item responses were visibly skewed toward the positive, but showed considerable variation across all items.

The frequency of occupational accidents among nurses was assumed in three categories:

a) Not encountered,
b) Encountered less-equal than 3 times and
c) Encountered more than 3 times.

based on the results, "Cutting with sharp objects", have the lowest percentage of not encountered (26.80%), and Poison with chemical solvent, had the most percentage of not encountered (89.69%).

Also "Poison with chemical solvent" had the lowest frequency in less than 3 times occurrences, that was occurred just for 20 cases (8.25%) and "Cutting with sharp objects" had the most frequency that was happened for 123 cases (50.52%). "Chemical splash in eyes", in more than 3 times accident frequencies, had the lowest percentage (1.03%), and Exposure to blood or other body fluids, had the highest percentage, (37.11%).

Also, there was a significant relationship between Exposure to blood or other body fluids and Traumatic backache while changing patient's position with SAQ dimensions. ($P<0.05$) (Table 4).

Table 1. Demographic characteristics of participators in study (n=244)

Variables	Type	Frequency (Percent)
Gender	Male	68 (27.8)
	Female	176(72.2)
Age (years)	<30	88 (36.1)
	31-40	108 (44.3)
	>41	48 (19.6)
Shift work	Fixed shift	40 (16.4)
	Rotational shift	204 (83.6)
Profession	Nurses	179 (73.4%)
	Head nurses	27 (11.1%)
	Nurse service manager	38 (15.5%)
Marital status	Single	50 (20.5%)
	Married	181 (74.2%)
	Other	13 (5.3%)
Years of work experience	<5	85 (34.8%)
	6-10	88 (36.1%)
	>11	71 (29.1%)

Table 2. SAQ-A item descriptions and subscale results for SAQ-A among nurses studied, 2014 (n=244)

Questionnaire dimensions	SAQ-A item descriptions						Subscale results for SAQ-A			
	Percent of disagree	Percent of neutral	Percent of agree	Missing	M±SD	Total M±SD	Percent of Missing	Percent of Positive	Min-Max	M±SD
Teamwork climate										
In this office, it is difficult to speak up if I perceive a problem with patient care.	8.3	8.2	83.5	0	4.15±1.62	3.92±0.15	3.1	58.9	4.17-100	74.06±19.26
The physicians and nurses here work together as a well-coordinated team.	9.3	6.1	84.6	0	4.09±1.59					
Disagreements in this office are resolved appropriately (i.e., not who is right but what is best for the patient).	16.5	13.5	69	1	3.78±1.39					
Nurse input is well received in this office.	16.5	9.3	73.2	1	3.74±1.42					
I have the support I need from other personnel to care for patients	9.3	10.3	78.3	2.1	3.87±1.49					
It is easy for personnel in this office to ask questions when there is something that they do not understand.	7.3	16.4	74.2	2.1	3.86±1.46					
Safety climate										
I am encouraged by my colleagues to report any patient safety concerns I may have.	17.5	20.7	60.8	1	3.6±1.3	3.62±0.05	6.2	48.4	14.29-100	67.97±20.97
The culture in this office makes it easy to learn from the errors of others.	16.5	16.4	65	2.1	3.6±1.33					
Medical errors are handled appropriately in this office.	13.4	11.3	73.2	2.1	3.65±1.43					
I know the proper channels to direct questions regarding patient safety in this office.	10.3	15.5	71.1	3.1	3.68±1.41					
I receive appropriate feedback about my performance.	18.6	15.5	64.9	1	3.59±1.32					
I would feel safe being treated here as a patient.	19.6	11.3	67	2.1	3.54±1.33					
In this office, it is difficult to discuss errors.*	12.3	17.5	68.1	2.1	3.7±1.37					
Job satisfaction										
This office is a good place to work.	19.8	24.5	52.6	3.1	2.89±1.09	3.5±0.32	5.2	48.9	0-100	68.27±24.53
I am proud to work at this office.	11.4	26.8	58.7	3.1	3.58±1.29					
Working in this office is like being part of a large family.	11.4	22.7	62.8	3.1	3.62±1.32					
Morale in this office is high	16.4	16.5	65	2.1	3.63±1.33					
I like my job.	12.4	18.5	68.1	1	3.81±1.4					
Stress recognition										
When my workload becomes excessive, my performance is impaired.	16.5	12.4	70.1	1	3.87±1.45	3.81±0.07	0	58.6	71.22(22.67)	71.22±22.67
I am more likely to make errors in tense or hostile situations.	15.5	15.5	68	1	3.71±1.37					
Fatigue impairs my performance during emergency situations (e.g. code or cardiac arrest).	16.5	15.5	67	1	3.77±1.39					
I am less effective at work when fatigued.	11.4	15.5	72.1	1	3.89±1.45					
Perception of management										
Senior management of this office is doing a good job.	10.4	21.6	64.9	3.1	3.68±1.35	3.38±0.38	5.2	38	61.82(23.09)	61.82±23.09
The management of this office supports my daily efforts.	23.7	25.8	49.5	1	3.3±1.17					
I am provided with adequate, timely information about events in the office that might affect my work.	11.3	16.5	70.1	2.1	3.75±1.4					
The levels of staffing in this office are sufficient to handle the number of patients.	44.3	11.3	43.4	1	2.8±0.98					
Working conditions										
This office does a good job of training new personnel.	9.4	11.3	78.3	1	3.83±1.51	3.57±0.3	3.1	42.6	12.5-100s	65.62±21.23
This office deals constructively with problem personnel	28.8	26.9	43.3	1	3.19±1.1					
All the necessary information for diagnostic and therapeutic decisions is routinely available to me.	21.6	25.8	50.5	2.1	3.37±1.18					
Trainees in my discipline are adequately supervised.	7.3	12.4	78.2	2.1	3.88±1.5					

**Reverse*

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Table 3. Inter-scale correlations of SAQ-A among nurses studied, 2014 (n=244)

Factors	Cronbach's Alpha	Correlations (Pearson's r)				
		1	2	3	4	5
Teamwork climate	0.859	1				
Safety climate	0.892	0.774**	1			
Job satisfaction	0.908	0.467**	0.701**	1		
Stress recognition	0.844	0.284**	0.297**	0.287**	1	
Perception of management	0.820	0.531**	0.649**	0.674**	0.367**	1
Working conditions	0.824	0.634**	0.709**	0.633**	0.216*	0.763**

*** Correlation is significant at the 0.01 level (2-tailed)*

** Correlation is significant at the 0.05 level (2-tailed)*

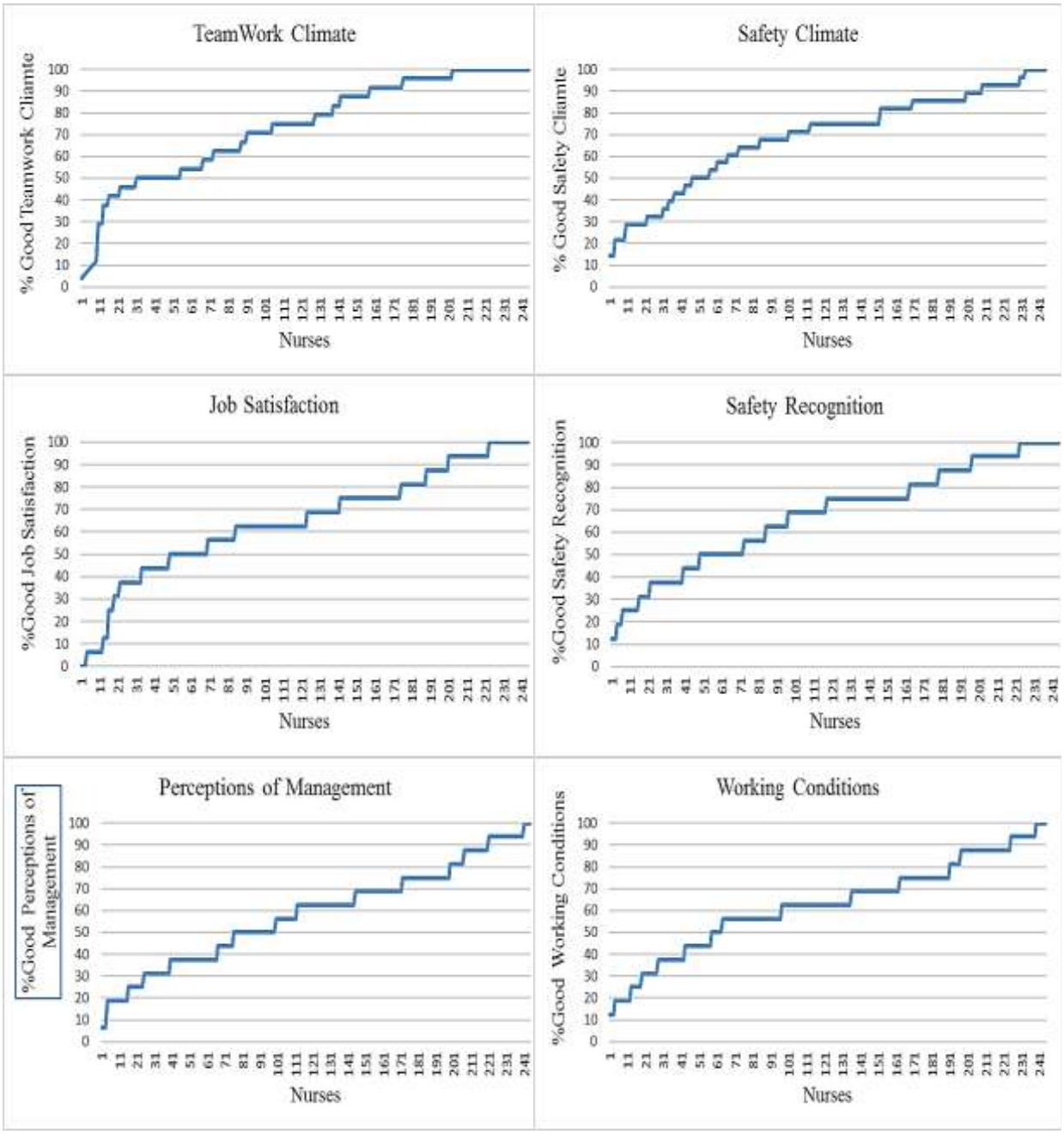

Fig.1. Distribution of percent of positive scores (%-positive) per dimension among nurses studied, 2014

Table 4. Frequency distribution of occupational accidents and relation with SAQ-A dimension among nurses studied, 2014

Type of event	Frequency of event						P Value (SAQ-A)*
	Not encountered		Encountered less than 3 times		Encountered more than 3 times		
	Number	Percent	Number	Percent	Number	Percent	
Cutting with sharp objects	65	26.80	123	50.52	55	22.68	0.008*
Needle sticks	75	30.93	116	47.42	53	21.65	0.31
Exposure to blood or other body fluids	86	35.05	68	27.84	91	37.11	0.001*
Breakage sample containers or slides	158	64.95	70	28.87	15	6.19	0.46
falling foreign object in the eyes	174	71.13	63	25.77	8	3.09	0.81
Chemical splash in the eyes	186	76.29	55	22.68	3	1.03	0.57
Fluid splash in the eyes	164	67.01	68	27.84	13	5.15	0.004*
Eye contact with disinfectants` vapors	189	77.32	33	13.40	23	9.28	0.06
Exposure to radiation	156	63.92	40	16.49	48	19.59	0.009*
Breathing disinfectants` vapors	176	72.16	30	12.37	38	15.46	0.001*
Breathing fumes of The emergence and stability drugs	189	77.32	35	14.43	20	8.25	0.19
Drug or chemical poisoning	214	87.63	25	10.31	5	2.06	0.05*
Poison with chemical solvent	219	89.69	20	8.25	5	2.06	0.72
Falling from height	186	76.29	50	20.62	8	3.09	0.48
Slide and trip	166	68.04	70	28.87	8	3.09	0.62
Injury from falling objects	164	67.01	73	29.90	8	3.09	0.58
Traumatic backache while changing patients` positions	86	35.05	106	43.30	53	21.65	0.02*
Assaulted or injured by the patient or other visitors	151	61.86	75	30.93	18	7.22	0.31

** P-Value <0.05*

DISCUSSION

The present study, which was conducted to determine the safety attitude and its relation with occupational accidents rate among hospital nurses, has valuable results for influenced factors prevention program in occupational accidents.

Total score of teamwork climate was highest (3.92±0.15) and the total score of perception of management was lowest (3.38±0.38). The results were consistent with published researches [21,45,49] and indicate that teamwork climate can have high portion in safety attitude.

In this study, the Cronbach's alpha values for six factors varied from 0.82 to 0.908. In other SAQ validation studies, the Cronbach's alpha values at the scale level were reported 0.59-0.89 [28-29,50-53]. SAQ showed good internal consistency at the scale and instrument level. The highest Cronbach's alpha was related to job satisfaction scale. This result was similar to study of Zimmermann et al.[29] ($\alpha = 0.79$) and Nordén-Hägg et al. [49] ($\alpha = 0.89$). The poor correlations between the stress recognition scale and all other was revealed, which indicates that this scale is different from the other scales. Kristensen et al's study revealed negative correlations between stress recognition scale and all other scales which were done on staff members of five somatic and one psychiatric hospitals [54]. The negative correlations was approved by Nordén-Hägg et al [49]. Items in the stress recognition scale distinct from all other items. On the other hand, significant strong positive relationships were found among all other scales. This may be due to that stress recognition scale is not reflective of safety attitude in the same way as the other scales and items in the stress recognition scale are different from all other items [50]. The same scales correlation has been found in other SAQ validation studies [28, 50-51]. Total SAQ has a high Cronbach's alpha coefficient and when the different items were removed, it was changed minimally. The Cronbach's alpha for all scales was calculated more than 0.8.

The interpret and assess of %-positive attitude are easy in terms of the need for improvement among managers; for example, when the staff reported positive attitude is 45% and according to the rules, less than 60% of staff reporting positive attitudes in any SAQ dimension would indicate a need for improvement [48].

Across the entire sample, %-positive attitude ranged from 38% for perception of unit management, to 58.9% for teamwork climate. Lower perception of unit management was same with Kristiansen et al study [54], but in Nordén et al study, less positive score was reported for team climate scale and in two scales (Working Conditions and Perceptions of Management), the %-positive attitude were under 60% which was done in pharmacies [49]. In Kristiansen et al study, the scales include teamwork climate, job satisfaction and working conditions were upper

60% positive which was done among 1263 staff members of somatic and psychiatric hospitals [54]. The results showed that the mean scores of nurses' safety attitudes in all scales, according to the point that 60% of staff who reported positive attitudes in any SAQ dimensions, are low. In contrast, the study by Relihan et al. in Ireland also showed that the attitude of health employees in all aspects was at a high level in an acute medical admissions unit [21]. Modak et al were reported that just safety climate has %-positive more than 60% whereas the %-positive attitude in five other scales was under 60% among nurses [45].

Based on the results, all 18 types of occupational accidents occurred at least once during the study. Gokhman et al. in a study on patients referred to medical emergencies, observed 296 errors, among which 196 and 100 ones related to improper sterilization techniques and medication errors, error and operational techniques and drug preparation errors respectively [55].

The highest frequency of incidents was related to Cutting with sharp objects, Needle sticks and Exposure to blood or other body fluids respectively. Joyani in a similar study in hospitals of Tehran University of Medical Sciences reported of the highest frequency of exposure for cutting with sharp objects [47]. As in most parts of the hospital especially nursing unit, surgery, laboratory and so on, staff highly deals with sharp objects, having high exposure to this incident is expected.

The lowest frequency in this study was related to poison with chemical solvents. The results by Masror and colleagues also showed that the most common patient safety incidents were cases such as medication errors, skin and neuromuscular injuries and post-surgery complications. The lowest frequency was related to the patient's death due to an error and leaving objects in patient's body [56]. Other study showed that, patient falling from height and pressure sores were the most common reported accidents respectively [57]. Wolf et al. stated drug dose determination error as the most frequent medical errors [58] that is inconsistent with the results of the present study. The frequency differences of some incidents compared with the present study is related to the differences between studied safety accidents based on the types of studied centers; for example, in elderly care centers, it can be expected that pressure sores, falling or fractures is high, while in hospital centers the incidence of events is different. The accidents were influenced by many environmental, temporal and managing factors which affected the results of studies. Therefore, each of these factors can be a cause for inconsistent result as compared to other studies. Another limitation of this study was about forgetting the occurred accidents as well as fears for reporting them by nurses which causes bias in reports.

CONCLUSION

As mentioned above, the accidents frequency can affect by safety attitude. In this regard, improving factors influencing the safety attitude in nurses is vital and can introduce as an indirect way for accident prevention. With regard to the relationship between safety attitude and occupational accidents, increased awareness of managers as well as employees on safety knowledge, improved incentive system, collaborative management, employee safety and dealing with occupational stress and finding the affective causes of patient safety can develop employees' attitude to safety.

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