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Investigation of the relationship between the safety climate and occupational fatigue among the nurses of educational hospitals in Zabol

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Abstract:

INTRODUCTION: Some working and organizational conditions, such as psychological stress and shift work, are factors that threaten the health of staff working in health centers. These factors can cause fatigue in a long time. Fatigue reduces the ability to process information and decrease to respond to hazardous conditions and will affect the safety of the environment. Therefore, the purpose of this study was to determine the relationship between safety climate and occupational fatigue in nurses working in Zabol city.

METHODS: This cross-sectional study was performed on 143 nurses working in educational hospitals of Zabol in 2019. The proportional sampling method was used, and the Swedish Occupational Fatigue Questionnaire and the Nurses Safety Questionnaire were used for data collection. Data were analyzed using independent *t*-test, analysis of variance, Mann–Whitney, Kruskal–Wallis tests, and SPSS-21 software.

RESULTS: In the present study, 57.3% were women and 42.7% were men. The mean score of occupational fatigue was 85.09 ± 41.49 , and the mean score of safety climate was 67.15 ± 12.73 . There is a significant inverse relationship between occupational fatigue and safety climate. The comparison of safety climate and its subscales between occupational and demographic variables showed that the score of male supervisors' attitude was 01.36 ± 2.41 while the score of female supervisors' attitude was 8.88 ± 2.61 , and this difference was significant. Furthermore, cumulative burnout, the attitude of supervisors, and the safety climate were significantly different between different educational levels.

CONCLUSION: The results of this study showed that there is a relationship between occupational fatigue and safety climate. Issues related to safety and risk factors in hospitals due to the high risk of disease outbreak and mortality, in addition to being economical, are important in terms of the human aspect as well. In addition, the activity of nursing staff is more important compared to other groups because of providing health care and communicating with patients; thus, more education about the safety climate of the workplace environment in hospitals can reduce nurses' fatigue.

Keywords:

Burnout, fatigue, job satisfaction, nurse, safety

Introduction

The Texas Institute of Health has ranked hospitals as one of the five hazardous occupational environments.^[1] Some working and organizational conditions, such as

psychological stress and working in shifts, are factors that threaten the health of staff working in health centers.^[2] Nurses are among the occupational groups performing important activities in the hospital.^[3] Nursing is a kind of stressful job. Nurses

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are faced with different patients and sometimes with untreatable illnesses and are constantly exposed to severe psychological stress.^[4] These factors can cause fatigue in a long time and have adverse effects on their professional activities.^[5] The prevalence of fatigue reported by nurses was 19.9%, and two-thirds of nurses have such experiences in most cases.^[6] Possible consequences of fatigue in the real world are listed as follows: decreasing consciousness ability to process information, levels of immunity, levels of physical and mental health and increasing the reaction time, adverse effects on the safety, individuals functioning, and life quality disorder.^[7] Occupational fatigue is defined as a relatively constant feeling of lack of interest and difficulty in concentrating on ongoing activities. These feelings lead to a conscious effort to maintain or regain attention.^[8] Occupational fatigue has been identified as a risk factor for musculoskeletal disorders.^[9,10] Fatigue can reduce the ability to process hazardous information and respond to relevant conditions.^[11] In other words, fatigue is an effective factor in increasing the incidence of human error.^[12]

Studies have shown that 50%–90% of such accidents are caused by human error or unsafe behaviors.^[13,14] Accordingly, researchers have identified many organizational factors as determinants of safe/unsafe behaviors, which the safety climate is the most prominent factor.^[15] Safety climate is a term used to describe employees' shared insights on how to manage safety in the workplace and has established based on the situation, which refers to a perceived level of safety at a particular place and time. It is relatively unstable and is subject to changes in components of the current environment or conditions. The safety climate is a subset of the safety culture and is truly an exhibition of the safety culture in practice.^[16,17] The safety climate is a psychological phenomenon, and it examines the attitude of employees toward safety.

The importance of the safety climate is related to its ability to predict safe behavior^[18] so that a direct relationship between safety climate and safety performance of an organization or workplace has been reported. Two main factors of the safety subset, including the organization's attitude to safety and safety perception, are related to the number of accidents, and it is predicted that the number of accidents is reduced by increasing the safety climate of the organization.^[19] Nurses, compared to other staff, provide health care, so the errors in the duties of this group will lead to irreparable consequences because of their important role in improving patients.^[20] Therefore, in order to increase the effectiveness of organizations health, attention to the needs of nurses and supporting their mental and physical health is important.^[21] Most studies have shown the relationship between fatigue

caused by long working hours and errors recorded before surgery. Moreover, the relationship has been reported between occupational factors in the workplace with fatigue.^[22,23] The relationship between fatigue with factors such as shift work, long working hours, disruption of biological rhythms and inadequate rest and sleep, illness, reduced control over working conditions, lack of social support, and continued exposure to conflicting roles has been reported.^[24-27]

Therefore, due to the role of fatigue and its consequences on the occurrence of medication errors and the decrease in the quality of nursing care and the importance of safety climate in workplaces and the existence of limited safety climate studies related to the medical environment of Iran, the aim of the present study was to evaluate the relationship between these two variables, i.e., safety climate and occupational fatigue in nurses.

Methods

This study was a descriptive-analytical and cross-sectional type study, which was performed on 143 nurses working in Zabol hospitals in 2019. The proportional sampling method was used in this study. Entering criteria were the satisfaction of people and having at least a bachelor's degree in nursing, and individuals could leave study if they did not wish to cooperate.

In order to collect the data, a three-part questionnaire was used. The first part of the questionnaire included demographic and occupational characteristics (age, gender, shift work, etc.).

Nurses Safety Climate: The Nurses Safety Climate Assessment Questionnaire was used to assess nurses' safety climate. This 22-item questionnaire investigates six factors of nurses safety climate, e.g., cumulative burnout (5 questions), training (5 questions), communication with physicians (3 questions), communication with nurses (3 questions), supervisors' attitude (3 questions), and reporting errors and errors (3 questions). The answers to the questions were designed based on a 5-point Likert scale (1 for strongly disagree, 2 for disagree, 3 for neither agree nor disagree, 4 for agree, and 5 for strongly agree). The average response to each factor is considered as the score of that factor, and according to the scale used, the score of each factor falls is between 1 and 5. Given that all the questions had positive aspects, higher scores of safety climate indicated better safety status.^[16] The Swedish Occupational Fatigue Inventory (SOFI) is a multidimensional tool designed to measure the quality and severity of perceived acute fatigue.^[18] This questionnaire has an 11-item Likert scale (0 = at all to 10 = strongly agree) and has five dimensions, i.e., lack of energy, physical effort, physical discomfort, lack of

motivation, and drowsiness, each of which consists of four questions. The scores on each dimension ranged from 0 to 40, with total occupational fatigue in the range of 0–200. The higher scores obtained for occupational fatigue and its dimensions indicate a higher level of occupational fatigue. The SOFI questionnaire was studied in several studies on different occupations and was identified as a reliable tool.^[7-19]

After collecting data, they were analyzed by SPSSr version 21.0 (SPSS Inc., Chicago, IL) was used to analyze collected data.using *t*-test, Mann–Whitney U, one-way analysis of variance (ANOVA), and Kruskal–Wallis tests. It should be noted that the information of the individuals was kept confidential by the researcher, and the anonymous and coded questionnaire was used. The code of ethics approved by the Zabol University of Medical Sciences was IR.ZBMU.REC.1398.153.

Results

Background characteristics

Out of the 143 participants, 57.3% were women and 42.7% were men. The mean age was 30.75 ± 6.77 . The average work experience was 62.39 ± 50.39 months. 68.5% had job satisfaction, and 31.5% were not satisfied with their job. Other background information of the participants is given in Table 1.

The mean score of occupational fatigue was 85.09 ± 41.49 based in result of Table 2. The mean score for the safety climate was 67.15 ± 12.73 . The comparison of safety climate and its subscales between occupational and demographic variables showed that the score of the attitude of male supervisors was 01.36 ± 2.41 , and it was obtained to be 8.88 ± 2.61 female supervisors, and

Table 1: Demographic characteristics of nurses

| Demographic character | Frequency (%) |
|-----------------------|---------------|
| Gender | |
| Women | 82 (57.3) |
| Men | 61 (42.7) |
| Marital status | |
| Single | 96 (67.1) |
| Married | 47 (32.9) |
| Educational level | |
| Bachelor degree | 128 (89.51) |
| Master degree | 15 (10.49) |
| Second job | |
| Yes | 26 (18.2) |
| No | 117 (81.8) |
| Shiftwork | |
| Morning | 30 (21) |
| Evening | 24 (16.8) |
| Night | 11 (7.7) |
| Rotational | 78 (54.5) |

this difference was significant. Furthermore, cumulative burnout, the attitude of supervisors, and the safety climate had a significant difference between different educational levels. The difference between reporting and safety climate was also significant for different shift groups. The score of the communication with nurses was 01.51 ± 2.37 among the participants who were satisfied by their job while it was 9.20 ± 2.82 among those who were not satisfied, which was significant at the error level of 5%. The difference between the scores of communication with physicians, communication with nurses, supervisors’ attitude and safety climate was significant between those who were satisfied with their colleagues and those who were not satisfied with their colleagues, so that those who were satisfied had higher scores. The difference between the scores of nursing training and safety climate was also significant between those who had a second job and those who did not have a second job.

Based on the results, it was found that occupational fatigue and all its subscales had higher scores in the female group than in the male group. The score of physical efforts was 15.81 ± 9.95 for married participants and 12.16 ± 8.67 for single participants. Furthermore, the score of physical effort showed a significant difference between different shift groups. According to the results of the present study, the scores of occupational fatigue and their subscales were significantly higher for the participants who did not have job satisfaction and satisfaction with colleagues, compared to those who were satisfied. Finally, the difference between the scores of those who had a second job and those who had not the second job was significant for the lack of motivation variable.

Safety climate and occupational fatigue and its subscales between occupational and demographic variables are also examined, and the results are shown in Tables 3 and 4.

Multivariate ANOVA was performed to investigate the main purpose of the study. Pearson correlation test was used to determine the correlation between the dependent variables, which was obtained to be 0.29 and was significant at a 5% error level. Wilks’ lambda test was used to investigate the effects of the studied factors on response variables [Table 5].

The results of Wilks’ lambda test showed that among the variables of the study, gender had a significant effect on the composite variable (safety climate and job fatigue), which explained 87% of the variance of the composite dependent variable ($P < 0.001$, partial $\eta^2 = 0.87$). Marital status variable had a significant effect on two dependent variables (7%) ($P = 0.009$, partial $\eta^2 = 0.071$). Education level variable had a significant effect of about 4% on two

Table 2: Description of statistical indices for variables of safety climate and occupational fatigue

| Variable | Components | Mean | Median | Mode | SD | Minimum | Maximum |
|----------------------|------------------------------|-------|--------|------|-------|---------|---------|
| Occupational fatigue | Occupational fatigue | 85.09 | 83.0 | 83.0 | 41.49 | 14.0 | 200.0 |
| | Lack of energy | 20.17 | 19.0 | 19.0 | 9.65 | 2.0 | 40.0 |
| | Physical effort | 13.57 | 13.0 | 3.0 | 9.24 | 0.00 | 40.0 |
| | Physical discomfort | 15.73 | 14.0 | 6.0 | 9.97 | 0.00 | 40.0 |
| | Lack of motivation | 16.78 | 16.0 | 17.0 | 9.09 | 0.00 | 40.0 |
| | Drowsiness | 18.96 | 18.0 | 13.0 | 9.37 | 3.0 | 40.0 |
| Climate safety | Climate safety | 67.15 | 68.0 | 68.0 | 12.73 | 35.0 | 96.0 |
| | Cumulative burnout | 13.47 | 13.0 | 14.0 | 4.4 | 5.0 | 25.0 |
| | Nursing training | 15.07 | 15.0 | 13.0 | 4.54 | 5.0 | 25.0 |
| | Communication with physician | 8.76 | 9.0 | 7.0 | 2.54 | 3.0 | 15.0 |
| | Communication with nurses | 9.79 | 10.0 | 11.0 | 2.83 | 3.0 | 15.0 |
| | Supervisors' attitude | 9.73 | 10.0 | 11.0 | 2.59 | 4.0 | 15.0 |
| | Reporting | 10.31 | 11.0 | 12.0 | 2.39 | 4.0 | 15.0 |

SD: Standard deviation

Table 3: Relationship between safety climate and its subscales with occupational and demographic characteristics

| Demographic character | Significant | Supervisors' attitude | Significant | Reporting | Significant | Safety climate | Significant |
|------------------------------|-------------|-----------------------|-------------|------------|-------------|----------------|-------------|
| Gender | | | | | | | |
| Man | 0.18 | 10.36±2.41 | 0.001 | 10.57±2.15 | 0.13 | 68.54±12.49 | 0.13 |
| Woman | | 8.88±2.61 | | 9.97±2.66 | | 65.28±12.90 | |
| Marital status | | | | | | | |
| Single | 0.93 | 9.54±2.37 | 0.21 | 10.16±2.21 | 0.29 | 66.22±11.75 | 0.21 |
| Married | | 10.13±2.99 | | 10.62±2.74 | | 69.04±14.46 | |
| Educational level | | | | | | | |
| Bachelor | 0.35 | 9.75±2.54 | 0.04 | 10.29±2.38 | 0.13 | 66.69±12.64 | 0.034 |
| Master | | 7.00±2.16 | | 8.75±3.77 | | 63.00±12.93 | |
| Shift work | | | | | | | |
| Morning | 0.68 | 10.16±2.23 | 0.08 | 10.63±1.86 | <0.001 | 70.5±10.36 | 0.035 |
| Evening | | 10.62±2.55 | | 11.92±2.18 | | 71.83±16.52 | |
| Night | | 8.54±2.69 | | 10.72±1.84 | | 64.36±13.88 | |
| Rotation | | 9.46±2.66 | | 9.64±2.46 | | 64.81±11.57 | |
| Job satisfaction | | | | | | | |
| Yes | 0.03 | 9.95±2.63 | 0.14 | 10.20±2.51 | 0.42 | 67.82±12.79 | 0.35 |
| No | | 9.27±2.46 | | 10.55±2.13 | | 65.69±12.61 | |
| Satisfaction with colleagues | | | | | | | |
| Yes | 0.002 | 10.09±2.59 | 0.008 | 10.30±2.39 | 0.93 | 69.00±12.36 | 0.006* |
| No | | 8.83±2.39 | | 10.34±2.42 | | 62.54±12.59 | |
| Second job | | | | | | | |
| Yes | 0.35 | 10.57±2.53 | 0.07 | 10.92±2.29 | 0.15 | 72.61±12.7 | 0.01* |
| No | | 9.55±2.58 | | 10.18±2.4 | | 65.93±12.46 | |

dependent variables ($P = 0.038$, partial $\eta^2 = 0.04$). The shiftwork variable had a significant effect of about 6% on the two dependent variables ($P = 0.009$, partial $\eta^2 = 0.06$). Job satisfaction had a significant effect of about 9% on the two dependent variables ($P = 0.002$, partial $\eta^2 = 0.09$). The satisfaction with colleague variable had a significant effect of about 6% on the two dependent variables ($P = 0.021$, partial $\eta^2 = 0.06$). The age variable also had a significant effect of about 6% on the two dependent variables ($P = 0.025$, partial $\eta^2 = 0.06$). Finally, the background variable had a significant effect of about 8% on the two dependent variables ($P = 0.005$, partial $\eta^2 = 0.08$).

Discussion

The purpose of this study was to investigate the relationship between safety climate and occupational fatigue in hospital nurses. The obtained results show a significant and inverse relationship between occupational fatigue and safety climate. In other words, with increasing safety climate, occupational fatigue decreases significantly. In the study conducted by Zarei *et al.*, the results showed that there is a qualitative correlation between job burnout and safety climate in nurses.^[28]

Table 4: Relationship between occupational fatigue and its subscales with occupational and demographic characteristics

| Variables | Lack of energy | Physical efforts | Physical discomfort | Significant | Physical discomfort | Significant | Lack of motivation | Significant | Drowsiness | Significant | Occupational fatigue | Significant |
|------------------------------|----------------|------------------|---------------------|-------------|---------------------|-------------|--------------------|-------------|--------------|-------------|----------------------|-------------|
| Gender | | | | | | | | | | | | |
| Man | 18.71±9.27 | 11.07±8.79 | 14.02±9.69 | 0.02 | 15.43±9.39 | 0.03 | 17.23±8.19 | 0.01 | 76.46±41.17 | 0.004* | 96.69±39.32 | |
| Women | 22.13±9.88 | 16.43±8.98 | 18.03±9.98 | <0.001 | 18.80±8.34 | | 21.29±9.53 | | | | | |
| Marital status | | | | | | | | | | | | |
| Single | 19.97±9.16 | 12.16±8.67 | 14.94±9.09 | 0.17 | 16.04±8.00 | 0.12 | 18.36±8.63 | 0.27 | 81.48±35.96 | 0.14 | 92.47±50.59 | |
| Married | 20.55±10.67 | 15.81±9.95 | 17.36±11.54 | 0.03 | 18.55±10.88 | | 20.19±10.72 | | | | | |
| Educational level | | | | | | | | | | | | |
| Bachelor degree | 20.09±9.75 | 13.00±9.2 | 15.43±9.97 | 0.39 | 16.63±9.01 | 0.30 | 18.81±9.43 | 0.77 | 83.96±41.24 | 0.46 | 93.75±61.19 | |
| Master degree | 22.0±12.44 | 16.5±13.3 | 18.5±12.39 | 0.22 | 16.25±11.02 | | 20.5±13.53 | | | | | |
| Shiftwork | | | | | | | | | | | | |
| Morning | 19.77±8.19 | 15.60±8.01 | 16.67±10.12 | 0.66 | 18.97±8.07 | 0.09 | 19.68±9.24 | 0.19 | 90.63±36.25 | 0.17 | 91.79±46.11 | |
| Evening | 21.95±11.46 | 16.21±10.37 | 17.37±11.6 | 0.04 | 17.58±9.11 | | 18.67±9.75 | | | | | |
| Night | 25.09±9.55 | 15.45±4.5 | 16.18±7.37 | | 20.91±7.94 | | 24.45±7.78 | | 102.09±25.25 | | 78.50±43.01 | |
| Rotational | 19.08±4.46 | 11.32±9.43 | 14.81±9.79 | | 15.27±9.38 | | 18.02±9.39 | | | | | |
| Job satisfaction | | | | | | | | | | | | |
| Yes | 18.42±8.56 | 11.54±8.51 | 13.33±9.0 | <0.001 | 15.61±8.65 | 0.01 | 17.65±8.79 | 0.01 | 76.55±37.23 | <0.001* | 103.69±44.52 | |
| No | 23.98±10.83 | 17.31±9.62 | 20.98±10.11 | | 19.60±9.50 | | 21.82±10.05 | | | | | |
| Satisfaction with colleagues | | | | | | | | | | | | |
| Yes | 18.82±8.99 | 12.36±8.55 | 14.22±9.09 | 0.004 | 16.00±8.67 | 0.07 | 17.80±8.86 | 0.02 | 79.21±38.93 | 0.007 | 99.71±45.63 | |
| No | 23.51±10.49 | 15.83±10.47 | 19.49±11.18 | 0.04 | 19.02±9.84 | | 21.85±10.09 | | | | | |
| Second job | | | | | | | | | | | | |
| Yes | 18.46±9.65 | 12.56±9.68 | 12.27±9.91 | 0.16 | 13.35±9.27 | 0.03 | 16.50±10.11 | 0.14 | 74.23±41.35 | 0.14 | 87.50±41.31 | |
| No | 20.55±9.65 | 13.51±9.17 | 16.28±9.96 | 0.67 | 17.65±8.90 | | 19.52±9.16 | | | | | |

Table 5: Investigation of the significant effect of research variables using multivariate test

| Variable | Effect size | F | P | Partial η^2 |
|------------------------------|-------------|--------|--------|------------------|
| Gender | 0.02 | 446.81 | >0.001 | 87 |
| Marital status | 0.929 | 4.93 | 9 | 71 |
| Educational level | 0.925 | 2.58 | 38 | 4 |
| Shift work | 0.877 | 2.91 | 9 | 6 |
| Job satisfaction | 0.908 | 6.53 | 2 | 9 |
| Satisfaction with colleagues | 0.942 | 3.97 | 0.021 | 0.06 |
| Second job | 0.959 | 2.79 | 0.065 | 0.041 |
| Age | 0.944 | 3.79 | 0.025 | 0.06 |
| Work experience | 0.922 | 5.49 | 0.05 | 0.08 |

In our study, no significant difference was found between gender and safety climate, which was consistent with the studies of Raftopoulos *et al.*^[29] and Kalte *et al.*,^[30] but it was not agreed with the study of Wu *et al.*,^[31] which can be partly related to the gender distribution of the participants. In the study of Sarsangi *et al.*, there was no significant relationship between age with work experience and weekly work hours with safety climate and its structural factors,^[1] which was not consistent with Raftopoulos *et al.*^[32] In studies conducted by Mohammadi Zeidi and Faghih, there was no significant relationship between safety climate and age groups, which was inconsistent with the findings of the present study. However, Vinodkumar *et al.* found an effective relationship between age variable and safety climate dimensions,^[33] which was consistent with the findings of the present study; this may imply that increasing age leads to cautious of the staff during work in the hospital, which leads to increasing the social and occupational experiences and decreasing their risk-taking rate.

In the present study, there was a significant relationship between work experience and safety climate, whereas in the studies of Sarsangi and Raftopoulos, there was no significant relationship between safety climate and work experience; this difference can be attributed to the statistical population under study and the type of organization in which employees were working. So that, in the study of Haj Aghazadeh, 83% of the studied population had the work experience <10 years, and the study population was made up of workers. Lack of safety training courses for the people can lead to lack of difference in average safety climate scores between groups with different work experiences.^[32,35]

The results of this study showed that there was no significant relationship between marital status and safety climate, which was in agreement with the findings of Mohammadi Ziedi. This means that the marital status of the participants has no effect on the safety climate of the participant in the workplace. There was no statistically significant relationship between marital status and fatigue dimensions in Karimi *et al.* However, Winwood

et al. showed that perceived fatigue level was lower in married people.^[33] Souri *et al.* observed that the score of fatigue, physical activity, and occupational stress was higher among the married participants compared to single participants.^[36] Reviewing the analysis results of safety climate factors showed that nursing education was the most prevalent factor, indicating that education is one of the most important factors influencing safety climate that has been widely and extensively investigated by other researchers.^[34] If training in safety issues is held in the form of targeted courses, it can improve the safety climate of nurses by affecting other aspects of safety climate. Reporting the errors and mistakes is also another factor affecting the safety climate.^[1] If nurses are aware of errors and mistakes affecting safety in the workplace and can identify risky situations, the possibility of unsafe practices will be reduced by them.

Furthermore, based on the results, the communication between nurses had the highest levels, which difference in levels of factors may be due to difference in working conditions in the hospital, so that in some hospitals, there is usually an intimate atmosphere between nurses and they negotiate about all issues and participants together. The lowest rank among safety climate factors was related to communication with physicians, which was not consistent with the studies conducted by Sarsangi^[35] and Ballangrud *et al.*^[36] To rationalize this, it should be said that there is still no good and intimate relationship between nurses and physicians in the studied hospitals. It should also be noted that in these studies, reporting among nurses was reported as the least factor, which seems that there is no efficient and systematic system for recording and reporting errors and mistakes that could lead to harm and injury to nurses or patients. The results of this study showed that 85.09% of nurses reported occupational fatigue while Saki *et al.*^[37] reported 47.61% of fatigue, which indicates the high level of occupational fatigue among nurses in the present study. High workload, shift work, stress, and shortage of staff in hospital wards can be some of the reasons for the high level of occupational fatigue in nurses in this study.

Investigation of the factors of occupational fatigue showed that the highest rate was related to the lack of energy among nurses and the lowest was related to the factor of physical effort. Therefore, the energy factor in nurses' occupational fatigue is very important. Findings showed that there was no significant relationship between age and job fatigue. Most previous studies have expressed that occupational fatigue is higher among the employees over 40 years of age.^[38] Some studies have reported age <49 years as a predictor of fatigue.^[12] In the study of Saremi *et al.* who worked on nurses' fatigue, the results showed that age was negatively correlated with

general fatigue and mental fatigue, so that by increasing the age, levels of both general and mental fatigue were decreased. In other words, general and mental fatigue is greater among younger nurses compared to their older colleagues. Furthermore, in this study, a significant correlation was observed between work experience and mental fatigue.^[12]

According to the findings of our study, there is a significant relationship between occupational fatigue and education level. The results of the study by Ricci *et al.* show that the perception of fatigue is higher in people who do not have a university education level.^[39] In the study of Azad *et al.*,^[32] fatigue was reported at high level; in their study, the steel industry workers were surveyed, which their educational level was different from the educational level of the statistical population of the present study. In general, nurses with higher educational levels have less workload, less shift work, and have less fatigue compared to their colleagues with a lower educational level.

The findings of our study showed that there was a significant relationship between work experience and occupational fatigue, which is in accordance with the study by Eriksen *et al.*^[40] This relationship implies that by increasing the work experience, their age naturally increases and they will have not enough mobility and energy for physical activities; thus, their occupational fatigue will be higher compared to their colleagues with lower work experience.

In the present study, there was a significant relationship between occupational fatigue and gender. Furthermore, occupational fatigue was higher in women than in men; one of the reasons for this event is the higher number of women participating in the study than men. It should be noted that women nurses, in addition to working in the hospital, should also be involved in housekeeping; this will naturally affect their level of occupational fatigue. Karimi *et al.*^[9] studied occupational fatigue in truck drivers and observed that there was a significant difference between the dimensions of physical effort, drowsiness, and lack of motivation, which was in line with our results.

In the present study, there was a significant relationship between the gender and dimensions of physical effort and occupational fatigue. However, in the study of Karimi *et al.*,^[9] there was no significant difference between age groups, marital status, driving history, and educational group; in terms of the studied variables, there was a similarity, except for educational group. This difference between the study group in the present study and the study conducted by Karimi is related to the difference in the statistical population of the two studies.

The findings also showed a significant relationship between job fatigue and job satisfaction. Job satisfaction can result in motivation in people and can reduce fatigue. It should be noted that attention to factors of job satisfaction can greatly reduce job fatigue in nurses. However, it is important to note that nurses' job satisfaction is different in different health centers, and research findings are not easily generalizable to other centers because the differences in leadership styles, communication, promotion systems, and other components can influence nurses' perceptions and job satisfaction with their jobs. In a study conducted by Saremi *et al.*, a significant relationship between nurses' mental fatigue and medical error severity has been reported, and these errors not only included occupational and safety aspects of the patient but may also threaten the health and safety outside the work environment as the driving accidents. In other words, fatigue can be cited as a potential factor that increases the potential for human error. Some studies have identified shift work as a predictor of sleep disturbance and long working hours as a predictor of fatigue.^[23] According to the results of studies, the possible consequences of fatigue in the real world can be as follows: decreasing the levels of immunity, decreasing the levels of physical and mental health, and negative effects on immunity and performance of individuals.^[7] A study by Muecke *et al.* showed evidence of the effect of fatigue on nurses' performance and its negative consequences on patient safety.^[22]

Therefore, it is recommended that training in safety issues and conducting specialized safety classes, as well as creating a climate of cooperation and negotiation among physicians, can help the identification of errors and mistakes in the accident. Managing work-rest time and considering time enough for interviewers can play a significant role in their attitudes toward the safety climate.^[1]

Given that the present study was a cross-sectional study, one of the limitations of this study is that the researcher has always been concerned about the loss of research samples. Lack of consideration of the interaction between the subfactors of fatigue and safety climate was one of the weaknesses of this study.

Conclusion

The results of this study showed that there is a relationship between occupational fatigue and safety climate. Issues related to safety and risk factors in hospitals due to high risk of outbreak and mortality are not only economically significant but also are important in terms of the human aspect. Furthermore, the activity of nursing staff is more important than other groups because of providing health

care and more communicating with patients. Therefore, more education about the safety climate of the workplace environment in hospitals can somewhat reduce nurses' fatigue.

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Gap of knowledge

It is suggested that by applying the dependent variables in the study, and using conceptual models in the field of relationship between general health and quality of life, comprehensive relationships between research variables should be examined.

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Conflicts of interest

There are no conflicts of interest.

References

- Harrington J. Occupational Health: Recognising and Preventing Work Related Disease and Injury. Occup Environ Med: BMJ Publishing Group Ltd; 2000.
- Poursadeqiyani M, Foladi Sh, Khammar A, Nabi Amjad R, Marioryad H, Hosseini Ghosheh N, *et al.* A survey on the relationship between the status of occupational health management and job satisfaction among staff of rehabilitation Centers in Tehran: A cross-sectional study. Jrehab 2019;20:242-55.
- Gershon RR, Stone PW, Zeltser M, Faucett J, MacDavitt K, Chou SS. Organizational climate and nurse health outcomes in the United States: A systematic review. Ind Health 2007;45:622-36.
- Rassouli M, Zandiye S, Noorian M, Zayeri F. Fatigue and its related factors in pediatric and adult oncology nurses. Iran J Nurs 2011;24:37-47.
- Khammar A, Poursadeghiyan M, Marioryad H, Amjad RN, Alimohammadi M, Khandan M. Patient Safety climate and its affecting factors among rehabilitation health care staff of hospitals and rehabilitation Centers in Iran-Tehran. Int Railway J 2019;17:39-48.
- Raftopoulos V, Charalambous A, Talias M. The factors associated with the burnout syndrome and fatigue in Cypriot nurses: A census report. BMC Public Health 2012;12:457.
- Sultanian A, Torghabe MM, Garkaz A, Mahdavi N. Persian version of Swedish occupational fatigue inventory (P-SOFI): Validity and reliability. Iran Occup Health 2014;11:34-43.
- Yarmohammadi H, Poursadeghiyan M, Rahmani N, Yarmohammadi S, Omidiandost A, Eskandari S. Work-related fatigue and the effective factors in the Iranian nurses. Arch Hyg Sci 2018;7:32-8.
- Karimi A, Honarbaksh M. Dimensions of occupational fatigue in heavy vehicle drivers. J Mazandaran Univ Med Sci 2016;26:156-66.
- Abbe OO, Harvey CM, Ikuma LH, Aghazadeh F. Modeling the relationship between occupational stressors, psychosocial/physical symptoms and injuries in the construction industry. Int J Ind Ergon 2011;41:106-17.
- Swaen GM, Van Amelsvoort LG, Bültmann U, Kant IJ. Fatigue as a risk factor for being injured in an occupational accident: Results from the maastricht cohort study. Occup Environ Med 2003;60 Suppl 1:i88-92.
- Saremi M, Fallah MR. Subjective fatigue and medical errors among nurses in an Educational Hospital. Iran Occup Health 2013;10:1-8.
- Ford MT, Tetrick LE. Safety motivation and human resource management in North America. Int J Hum Resour Manage 2008;19:1472-85.
- Hofmann DA, Jacobs R, Landy F. High reliability process industries: Individual, micro, and macro organizational influences on safety performance. J Saf Res 1995;26:131-49.
- Buck MA. Proactive Personality and Big Five Traits in Supervisors and Workgroup Members: Effects on Safety Climate and Safety Motivation: Portland State University; 2011.
- Zohar D. Thirty years of safety climate research: Reflections and future directions. Accid Anal Prev 2010;42:1517-22.
- Khammar A, Hosseinighosheh S, Abdolshahi A, Ahagh MH, Poursadeqiyani M. Forecast of the future trend of accidents in an electricity distribution company of Iran: A time series analysis. Iran J Public Health 2019;48:2315-7.
- Mortazavi S, Asilian H, Avestakhan M. Relationship between safety climate factors and the risk of dangerous situations in height among construction workers. Iran Occup Health J 2011;8:51-60.
- Karsh BT, Waterson P, Holden RJ. Crossing levels in systems ergonomics: A framework to support 'mesoergonomic' inquiry. Appl Ergon 2014;45:45-54.
- Sadeghi A, Shadi M, Moghimbaegi A. Relationship between Nurses' job satisfaction and burnout. Sci J Hamadan Nurs Midwifery Fac 2016;24:238-46.
- Habibi H, Mooghali A, Lankarani KB, Habibi F. Relationship between nurses' job satisfaction and burnout with patients satisfaction in Shiraz, 2012. J Hayat 2014;20:30-42.
- Warren A, Tart RC. Fatigue and charting errors: The benefit of a reduced call schedule. AORN J 2008;88:88-95.
- Souzani A, Bagheri H, Pourheydari M. Survey nurse's view about factors affects medication errors in different care units of Imam Hossein hospital in Shahroud. Knowl Health 2007;2:8-13.
- Jansen PG, Kerkstra A, Abu-Saad HH, van der Zee J. The effects of job characteristics and individual characteristics on job satisfaction and burnout in community nursing. Int J Nurs Stud 1996;33:407-21.
- Bültmann U, Kant I, Kasl SV, Beurskens AJ, van den Brandt PA. Fatigue and psychological distress in the working population: Psychometrics, prevalence, and correlates. J Psychosom Res 2002;52:445-52.
- MacDonald LA, Deddens JA, Grajewski BA, Whelan EA, Hurrell JJ. Job stress among female flight attendants. J Occup Environ Med 2003;45:703-14.
- van der Ploeg E, Kleber RJ. Acute and chronic job stressors among ambulance personnel: Predictors of health symptoms. Occup Environ Med 2003;60 Suppl 1:i40-6.
- Zarei E, Khakzad N, Reniers G, Akbari R. On the relationship between safety climate and occupational burnout in healthcare organizations. Saf Sci 2016;89:1-10.
- Raftopoulos V, Pavlakis A. Safety climate in 5 intensive care units: A nationwide hospital survey using the Greek-Cypriot version of the safety attitudes questionnaire. J Crit Care 2013;28:51-61.
- Kalte H.O, Mirzaei M.A, Faghih M.A, Assodallahi B, Hamamizadeh E. Assessment of safety climate and effect of related factors among staff of a dairy company in 2016. Hozan J Environ Sci 2016;1:22-32.
- Wu TC, Liu CW, Lu MC. Safety climate in university and college

- laboratories: Impact of organizational and individual factors. *J Safety Res* 2007;38:91-102.
32. Mallat J, Pepy F, Lemyze M, Barrailler S, Gasan G, Tronchon L, *et al.* Extravascular lung water indexed or not to predicted body weight is a predictor of mortality in septic shock patients. *J Crit Care* 2012;27:376-83.
 33. Vinodkumar M, Bhasi M. Safety climate factors and its relationship with accidents and personal attributes in the chemical industry. *Saf Sci* 2009;47:659-67.
 34. Evans B, Glendon AI, Creed PA. Development and initial validation of an Aviation Safety Climate Scale. *J Safety Res* 2007;38:675-82.
 35. Sarsangi V, Khalevandi A, Zarei E, Mehrizi EA, Abadi MS, Honarjoo F. Attitude of the Nurses of Kashan Educational Hospitals toward Workplace Safety climate in 2014. *Community Health J* 2017;8:18-27.
 36. Ballangrud R, Hedelin B, Hall-Lord ML. Nurses' perceptions of patient safety climate in intensive care units: A cross-sectional study. *Intensive Crit Care Nurs* 2012;28:344-54.
 37. Saki K, Khezri-Azar J, Mohebbi I. Nursing errors and its relationship with fatigue among nurses of the emergency ward. *J Urmia Nurs Midwifery Fac* 2016;13:835-42.
 38. Barnett RC, Brennan RT, Gareis KC. A closer look at the measurement of burnout 1. *J Appl Biobehav Res* 1999;4:65-78.
 39. Ricci JA, Chee E, Lorandeanu AL, Berger J. Fatigue in the U.S. workforce: Prevalence and implications for lost productive work time. *J Occup Environ Med* 2007;49:1-0.
 40. Eriksen W, Tambs K, Knardahl S. Work factors and psychological distress in nurses' aides: A prospective cohort study. *BMC Public Health* 2006;6:290.