

Job Stress and Safety Climate in Cancer Treatment Centers: Upgraded Model for Dimensions

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Background: Stress has always been with human despite all the progress in science and technology. Stressful conditions reduce concentration and lead to the lack of focus. This can increase human errors and bring about catastrophe. The aim of this study is to present a model to increase safety climate by controlling job stress among the personnel of Iran's medical centers.

Methods: In this study, 680 personnel of Iran's hospitals were chosen in random. Demographic, job stress (35 questions) and safety climate (37 questions) questionnaires were filled. The data were inserted in SPSS 20 software. Descriptive statistics method and Pearson's correlation coefficient were used to describe the data and evaluate the relation between the variables, respectively.

Results: The scores of safety climate and job stress were 3.40 and 3.21, respectively which imply that they are suitable. The overall fitness of the model was acceptable. In this model, $\chi^2 = 6366.17$, $df = 2452$, $\chi^2/df = 2.596$, $RMSEA = 0.054$ (90% CI = 0.000–0.084), $NFI = 0.901$, $GFI = 0.913$, and $CFI = 0.856$. In the regression analysis, there were positive significant relationships between job stress and safety climate, job stress and any of its components, and safety climate and any of the components.

Conclusion: Job stress is directly related to safety climate. Since in this study job stress was in a suitable level, it influenced the safety climate. If job stress is high, then it can affect safety climate in a negative way. We suggest that further studies be done regarding this subject.

Introduction

In all organizations, especially the ones that offer people emergency services, an environment should be created in which no harm or damage threatens the employees. So, the safety of the hospitals as the most important organization offering medical services requires special attention. A hospital needs to be a safe place for patients and the personnel [1,3]. Safety climate is defined as a mental understanding of the personnel about organizational policies [4]. Recent studies indicate that there are significant relationships between safety climate and job stress [5]. But few studies have been done in this regard [6]. Stress has always been with human regardless of all the improvements in science and technology. No human has ever been able to free himself from stress.

Organizations also have paid much attention to studying, controlling and reducing the effects of stress in work places to improve the efficiency of the employees [7]. So far more than 100 thousand articles and books have been published about stress control and management and countries devote over 3 percent of their budgets to prevent stress. These indicate the importance of stress.

Safety climate

Safety climate is widely considered as a criterion for assessment of safety level in work places [8]. It presents an overall image of the safety situation of an organization [9]. Safety climate is multi-dimensional, but there is no consensus over the aspects of the safety climate [8, 10]. Safety climate is defined as the common image workers have in mind about policies, processes, actions, and priorities in workplace [11,12]. This was first measured by Zohar et al. [12]. It is a measurement of the current state of the organization and it is relatively unstable based on time and place and changes due to circumstances [13]. So, safety climate is highly under the influence of organizational and personal elements. It might affect safety behaviors of the personnel [14]. Researchers also found out that the attitude of the workers regarding safety makes them search for safer environments, which in turn reduces unsafe behaviors and consequently improves safety situation [15,16]. Safety climate is defined as a psychological fundamental procedure in which workers share the quality of workplace [17]. Safety climate indicated that at the moment safety policies are in action and it can have a direct effect on safety behaviors of the workers. It can also predict future events [18,19]. Many researches on the other hand indicate that there is a robust connection between job accidents and the elements related to safety behaviors like job stress [20, 21]. Stress is one of the subjects that need to be addressed in the area of safety management and organizational behavior [7].

Job stress

Job stress is an important subject in the 21st century. It is proven to have effects on family, job and life quality [22]. If it not managed properly it affects the performance and health of the workers [10, 23]. Job stress can be defined as harmful physical and emotional reactions; they occur when work job circumstances are not compatible with capabilities, resources and the workers' needs [22]. On the other hand, the personnel in organizations, and especially medical ones experience a high level of stress and psychological tension [24]. Job stress influences the health of people especially in cognitive, psychological, physiological and behavioral aspects. Also, in highly stressful situations, concentration decreases and ignorance increases [25]. This increases human error and leads to accidents [17]. These accidents include all types of mistakes and accidents in the hospitals [25]. Teachers, medical personnel, nurses and social workers, and emergency services are among the most stressed workers [24]. Nurses experience higher stress in comparison with other jobs [25, 27]. The American National Association of Safety and Hygiene placed nursing at the top of 40 most stressful professions [28]. It is reported that 93% of the nurses are under constant stressful situations [29]. So, they probably suffer from cognitive impairment that may lead to safety accidents for the patients [25]. According to NIOSH, stress and psychological disorders are among the 10 major job damages in the US [30]. Every year about 1.1 million people lose their lives because of job stress and stress-related illnesses [7]. According to recent studies, counts for 50 to 60 percent of the lost days [31]. The Safety and Hygiene Bureau states (2004) that stress-related cost of society in England is £3.7 billion annually and job stress cost is about £381 million annually [32]. Stress also can lead to other behaviors like smoking and drinking [26]. Stress occurs when a human body is in an environment that is under constant change. Such changes leave physical and emotional effects and may provoke positive or negative feelings [33]. Job stress may vary from little to much, based on design, organization, job management, and social structure of the workplace [34,35]. Stressful circumstances are divided into intra- and extra-organizational groups [29]. Though there is generally a negative image regarding stress in the mind of people, human needs a balanced degree of stress to be able to operate efficiently. Without stress, people do not tend to

make any effort to do anything. Some scholars believe that life without stress equals death. But too much stress leads to disorders and lack of efficiency [36,37,38]. Yet, job stress and its costs can be prevented [39]. This paper intends to offer a model to increase safety climate by controlling job stress among the personnel of Iran's hospitals.

Materials and methods

Design

In this study, a descriptive analysis was performed on the personnel of Iran's hospitals. The main variables, here, job stress and safety climate; and personal and professional characteristics are considered as background variables.

Data gathering tools

Data gathering tools consisted of three questionnaires as follows:

A. Demographic information questionnaire: This part consisted of 9 questions including age, gender, marital status, education, major, job title, experience in the field, experience in the unit, and salary.

B. Job stress questionnaire: Job stress questionnaire included 35 questions, consisting of 5 alternative Likert scale (never, rarely, sometimes, often and always). Question scores indicate the measured amount for every item ranging from 1 to 5 in which 1 is unfavorable and 5 is the favorable state. This questionnaire includes 6 aspects of demand (8 questions), control (6 questions), support (9 questions), connection (4 questions), role (5 questions) and change (3 questions). Azad et al. studied the reliability and validity of the questionnaire for 749 military personnel of Iran. In their research the samples answered to HSE and GHQ questionnaire. Correlation coefficient of HSE and GHQ equaled $r=-0.48$. The results also indicate a strong correlation between the extracted elements from factor analysis and the aspects of the questionnaire. Validity of the questionnaire was 0.78 and .65 using Cronbach alpha and splitting methods. Finally, the questionnaire was proved to be a reliable and credible one for studying job stress [40].

C. Safety climate questionnaire: This questionnaire consisted of 37 questions in form of Likert scale with 5 alternatives (quite disagree, disagree, no idea, agree and quite agree). Question scores indicate the measured amount for every item ranging from 1 to 5 in which 1 is unfavorable and 5 is the favorable state. This questionnaire includes 8 aspects of management commitment for safety and priority of safety matters (10 questions), the knowledge of the workers and following safety rules (7 questions), the attitude of the workers regarding safety (4 questions), cooperation of the workers and commitment to following safety (5 questions), safety of workplace (4 questions), priority of safety over products (2 questions), and neglecting dangers (2 questions). Zeidi et al. in a study through exploratory factor analysis showed that the 8 aspects of the questionnaire are able to explain 68.42 percent of the overall variance and Cronbach alpha coefficient for all the aspects and the whole of the tool was approved [41].

Sampling method

The studied population here was all the personnel of Iran's hospitals. The logic here was selecting 10 sampled for every variable according to James Stevens' proposal. He assumes that 10 to 15 items are required for each predictor variable, multiple regression analysis with the standard method of the least standard squares, as well as verifiable factor analysis models and structural equations [42,43]. Based on this 720 people were selected according to simple random sampling.

Finally, 680 questionnaires were filled and analyzed.

Data gathering method

The criteria for the participants entering the research were being volunteers and honesty. Then, they were assured that their answers were confidential and the data would be collected, evaluated and reported regardless of the names. Data gathering method was interview by the research team.

Conceptual Model

The aim of this study was evaluating the interaction between job stress and safety climate in Iran’s hospitals. This model allows to study outside hidden variables (independent) and inside hidden variable simultaneously. The primary model and conceptual models are presented in (Fig. 1).

Fig. 1 Conceptual model between job stress and safety climate.

Data analysis

The gathered data were entered into SPSS 20 software. Descriptive statistics method was used to describe them. Also, Pearson’s correlation coefficient was used to evaluate the relation between the variables. Structural Equation Modeling, which is a type of multivariate analysis, was used to evaluate the relation between job stress and safety climate [3]. Structural equations model was created using AMOS 22 software. The fitness of the model was controlled by χ^2 and the root mean squares estimated error (RMSEA) was evaluated. The amount of χ^2 ration to a degree of freedom smaller than 3 ($\chi^2/df < 3$) was chosen as a criterion to fit the model. $RMSEA < 0.08$ was another criterion for the fitness of rhea model. Also, goodness of fit index (GFI), Comparative fit index, and normal fit index (NFI) were used.

Ethical considerations

Participants were informed about the nature of the study and were guaranteed confidentiality and anonymous presentation of the results. They were informed that their participation was voluntary, that they could withdraw from the study at any time. Written informed consent was obtained from all participants, to maintain anonymity and confidentiality during the entire process each consent was marked with a unique digit for each participant and the unique digit were kept during all stages of the research process.

Results

Sample characteristics

In the current study, among the 680 of the participants 422 were men (%62), 258 were women (%38), 145 (%21.3) were single, 535 (%78.7) were married, 104 (%15.3) worked in the operation room, 104 (%15.3) were anesthesiologists, 314 (%46) were nurses, and 158 (%24) had other positions. Also, majority of the participants (%24) aged 31- 35 and had %26.7 had 6-10 years of professional experience.

Variable	Group	Frequency	Percentage	Variable	Group	Frequency	Percentage
Sex	Male	422	62	Age	Under 30	150	22
	Female	258	38		Between 31 and 35	163	24
Work experience	Less than 5	177	26	Between 36 and 40	122	18	

	Between 6 and 10	182	26.7		Between 41 and 45	82	12
	Between 11 and 15	86	12.7		Between 46 and 50	86	12.7
	Between 16 and 20	100	14.7		Above 50	77	11.3
	Between 21 and 25	72	10.7	Positions	Operating room	104	15.3
	Between 26 and 30	50	7.3		Anesthesia	104	15.3
	Above 30	13	2		Nursing	314	46
marital status	Single	145	21.3		Others	158	23.3
	Marride	535	78.7				

Tab. 1 Demographic properties of participants

Correlation coefficient

Pearson’s correlation coefficient for the measured variables is presented in tab. 2 Job stress is directly related to the components of job stress (demand, control, support, communication, role, and change). Also, safety climate is directly related to the components of the safety climate (commitment, knowledge, attitude, participation, environmental safety, personal readiness, priorities, and ignorance). The mean of demand, control, support, communication, role and change, commitment, knowledge, attitude, participation, environmental safety, individual readiness, priority and ignore were 2.93, 3.16, 3.39, 2.59, 3.84, 3.25, 3.33, 3.67, 3.90, 3.65, 3.50, 2.77, 2.82, and 290 respectively. Also, the average safety climate and job stress were 3.40 and 3.21 respectively, both of which are appropriate.

In this study, gender ($p < 0.001$), marital statues ($p = 0.037$), education ($p = 0.008$), position ($p = 0.005$), job experience ($p = 0.045$), work experience in the unit ($p = 0.028$), and salary ($p = 0.031$) were all significant in job stress. Also, gender ($p = 0.003$), education ($p = 0.007$), and position ($p = 0.042$) were significant in safety climate.

	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Demand	2.93	.61	1															
2. Control	3.16	.59	.605*	1														
3. Support	3.39	.70	.627*	.618*	1													
4. Relationship	2.59	.84	.575*	.682*	.625*	1												
5. Role	3.84	.80	.612*	.678*	.683*	.453*	1											
6. Change	3.25	.78	.628*	.676*	.621*	.561*	.664*	1										
7. Commitment	3.33	.63	.632*	.519*	.615*	.546*	.670*	.637*	1									
8. Knowledge	3.67	.68	.629*	.607*	.697*	.509*	.540*	.665*	.683*	1								

nowledge			*	*	*	*	*	*	*									
9. Attitude	3.90	.86	.466*	.505*	.534*	.308*	.667*	.608*	.564*	.545*	1							
10. Partnership	3.65	.67	.613*	.654*	.646*	.458*	.652*	.583*	.651*	.630*	.648*	1						
11. Safety at work	3.50	.82	.556*	.563*	.540*	.423*	.491*	.465*	.527*	.551*	.498*	.668*	1					
12. Readiness	2.77	.74	.639*	.694*	.572*	.619*	.439*	.469*	.499*	.490*	.320*	.534*	.600*	1				
13. Priority	2.82	.89	.685*	.664*	.541*	.573*	.428*	.458*	.457*	.476*	.350*	.485*	.539*	.661*	1			
14. Ignore	2.90	.81	.621*	.565*	.498*	.496*	.378*	.393*	.427*	.442*	.386*	.496*	.547*	.602*	.664*	1		
15. Safety climate	3.40	.41	.572*	.618*	.381*	.622*	.377*	.712*	.872*	.695*	.744*	.640*	.537*	.621*	.676*	.657*	1	
16. Job Stress	3.21	.38	.605*	.421*	.609*	.692*	.485*	.390*	.463*	.681*	.588*	.605*	.599*	.604*	.665*	.590*	.675*	1
** Correlation is significant at the 0.01 level (2-tailed).																		

Tab. 2 Correlation Coefficient between Structural Equation Model Parameters

Structural equation modeling

Fig. 2 shows the coefficients of the standard estimation of the structural equation model. All paths are at a significant level. However, according to the values obtained for fitting indexes in Tab. 3: χ^2/df , GFI, CFI and NFI are not within the defined range. Therefore, it was concluded that fitting the model obtained at this stage does not indicate a good fit. So, the model was corrected for a better fitting. These modifications were implemented in the proposed model and the results of the fitting indexes improved (Fig. 3). Finally, the overall fitting of the model was acceptable. In this model: $\chi^2 = 6366.17$, $df = 2452$, $\chi^2/df = 2.596$, RMSEA = 0.054 (90% CI = 0.000-0.084), NFI = 0.901, GFI=0.913, and CFI=0.856.

Index	Limit	conceptual model	proposed model
χ^2/df	Less than 3	3.402	2.596
GFI	Higher than 9.0	.827	0.913
	Less than 08/0	.09	0.054
CFI	Higher than 9.0	.827	0.875

NFI	Higher than 9.0	.861	0.901
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Tab. 3 Comparison of fitness indices in conceptual model and proposed model

In the regression analysis, job stress with safety climate, job stress with any of its components and safety climate with any of its components had significant relationships (Tab. 4).

Fig. 2 shows the relationship between the components of the structural equations model. Job stress can be directly related to safety climate ($\beta=0.933$, $p<0.001$). It is also directly related to demand ($\beta=0.899$, $p<0.001$), control ($\beta=0.972$, $p<0.001$), support ($\beta=0.923$, $p<0.001$), communications ($\beta=0.740$, $p<0.001$), and role ($\beta=0.825$, $p<0.001$). Also, safety climate is directly related to commitment ($\beta=0.819$, $p<0.001$), knowledge ($\beta=0.893$, $p<0.001$), attitude ($\beta=0.697$, $p<0.001$), cooperation ($\beta=0.867$, $p<0.001$), safety of the environment ($\beta=0.850$, $p<0.001$), personal readiness ($\beta=0.853$, $p<0.001$), and priority ($\beta=0.866$, $p<0.001$).

Fig. 2 The paths between the components in the proposed model

Fig. 3 The paths between the components in the final model

Also, according to the structural equation model, standard and non-standard coefficients of the final model and the significance level between variables and factors affecting it are presented in the following table.

			Standardized Estimate	Nonstandardized Estimate	SE	CR	P-value
Job Stress	<-->	Safety Climate	.933	.500	.043	11.618	***
Control	-->	Job Stress	.972	1.261	.073	17.273	***
Relationships	-->	Job Stress	.740	1.015	.068	14.984	***
Role	-->	Job Stress	.825	1.064	.069	15.311	***
Knowledge	-->	Safety Climate	.893	.936	.063	14.955	***
Attitude	-->	Safety Climate	.697	.826	.058	14.347	***
Priority	-->	Safety Climate	.866	.964	.065	14.870	***
Change	-->	Job Stress	.890	1.000			
Demand	-->	Job Stress	.899	.903	.060	15.012	***
Commitment	-->	Safety Climate	.819	.613	.049	12.620	***
Support	-->	Job Stress	.923	1.017	.065	15.709	***
Avoid	-->	Safety Climate	.836	1.000			
Readiness	-->	Safety Climate	.853	.741	.056	13.283	***
Safety at Work	-->	Safety Climate	.850	.764	.055	13.789	***
Participation	-->	Safety Climate	.867	.655	.051	12.762	***
***.	Correlation is significant at the 0.001 level (2-tailed).						

Tab. 4 Regression weights in the parameters of the structural equation model in the final model

Discussion

In a study conducted by Chen et al., it was found out that promoting a positive safety climate and creating educational programs could improve the safety performance of an organization due to improved mental health of employees, especially after traumas [10]. Park et al. found out that safety accidents of the patients are under the influence of job transfer, cognitive impairment and job stress. They also suggest that reduction in job instability and a definition of job limits is required for the patients' safety [25]. In a study done by Zarei et al. in medical organizations of Iran they concluded that there is a significant relationship between safety climate, unit type, job satisfaction, job interests, and stress. The results of structural equation modeling support a negative correlation between job burnout and safety climate [44]. In this paper we concluded that the variables of gender, marital status, education, position, job title, work experience in the unit and salary had significant effects on job stress. Also, the variables of gender, education and position had significant effects on safety climate. In a study about the relationship between safety culture and occupational stress, Zamanian using independent t-test showed that there was a significant and negative relationship between these two variables [7]. Avram regards job satisfaction as a minor mediator between safety climate and organizational trust [45]. Elshaer et al., in a study about occupational stress and burnout syndrome among health care workers, express that since there is a high stress and burnout among health care workers, more support is needed in this regard [24]. Hoboubi in a study calls for of corrective actions for shift jobs. He states that supervisor needs to offer support for job stress reduction and job satisfaction and productivity increase [35]. Kim addresses the importance of safety climate and psychological elements like job stress of the workers [17]. Yau's findings indicate that nurses have a relatively high level of stress, and "work environment and resources" and "workload and time" are known as stressors [46]. Dollard states that the safety climate can reduce job stress as an organizational feature and a proper climate enables the personnel to do their job [47]. Su states that hospital managers can help reduce work-related stress and improve the flexibility of tension among the nurses [48]. A study by Berland shows that the demand of a work environment with less control and social support from the colleagues increases stress, which can often affect patient safety [49]. Unlike the previous studies, the stress level among the staff working in hospitals in Iran was at an acceptable level. Job stress had a significant and positive relationship with the safety climate. In a study conducted by Idris et al. with the aim of a conceptual differentiation and its impact on occupational and mental health demand among Australian and Malaysian communities, it was found that the level of cognitive safety climate was significantly lower than the physical safety climate in both countries. This is an evidence of global lack of attention to mental health in working environments [39]. Understanding the professional perceptions of the patient's immediate safety climate in emergency service can help improve healthcare, reduce side effects and improve patient care through assessment of safety culture [50]. Mosadeghrad found out that organizational policy has strong bonds with job stress of the personnel. So, policies and hospital strategies need to change for the stress to decrease [51]. McLinton presents three methods used by managers and policymakers that can reduce social and psychological risks and bring about positive changes to the safety climate [52]. In a study by Ray et al. with the aim of employment arrangements, occupational stress and quality of life related to health they concluded employment arrangement played as an important predictor of occupational stress. Compared to stress-free individuals, people affected by employment arrangement have more unhealthy days or more activity restrictions [53]. MohammadFam believes that for the adjustment or removal of identified factors effective in creating stress and reducing unsafe actions, investments and stress management programs are needed [54]. Clarke argued that psychological depression has important impacts on safety outcomes, such as accidents and injuries [55]. Siu concluded that the tension in Western culture is not only about the West, but it seems to be a global problem [56]. Several other studies have strongly supported the links between worker safety and occupational stress and safety behaviors [57].

Conclusion

According to previous studies, in order to perform optimal activities, humans need a decent level of stress because without stress people do not make the necessary effort to do things. According to some scientists, life without stress equals death [36,37,38]. In this study, due to the fact that stress is favorable, it has increased the safety climate for the hospital staff. However, excessive stress, leads to impairment in performance and reduction of staff productivity. In the high stress societies, the relationship between occupational stress and safety climate can be significant and negatively affected. An increased stress can lead to a reduction in the safety climate. So, more research is needed in this area.

Suggestions

A. One of the factors that may affect the results of this study is the sampling of all the staff working in the hospital. It is recommended that in future, studies focus on high stress societies, such as nurses.

B. Considering that with an increase in the level of awareness job stress decreases, it is recommended that hospital managers make appropriate training in problem solving and stress management.

C. To improve the level of patient safety in a hospital, job stress needs to be controlled and the climate and culture of safety should increase.

Conflicts of interest

All authors declare to have no financial or personal relationships that could inappropriately influence the research described.

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