
PUBLIC HEALTH RESEARCH

Identifying and Ranking Factors Influencing Job Stress Among Health, Safety and Environment (HSE) Employees in Phase 14 of South Pars: A Cross Sectional Study in South of Iran

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ABSTRACT

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Introduction	The present paper aims at identifying and ranking the factors affecting job stress of HSE employees in the phase 14 of the South Pars (a petroleum company in south of Iran).
Methods	In this cross sectional study, all HSE employees in one of the phases in south pars of Iran (the phase 14) including 150 employees were investigated in 2015. The data were collected using a questionnaire and measuring some environmental and occupational factors such as sound and chemical pollution.
Results	The validity of the questionnaire was approved by opinion of the 10 expert persons in this field (Content Validity Index .85%) and the reliability of the questionnaire was approved by Cronbach Alpha equal to 0.70. At present study the one sample T test indicated that the environmental and managerial factors affect job stress of the HSE employees. Among the environmental factors, long working hours, poisonous materials risks, air pollution, heat and moisture and air pollution mostly affect job stress, respectively. On the other hand among the managerial factors, job security, lack of meritocracy, not in time payment and prejudice in salary affect job stress the most, respectively.
Conclusions	As the results of this study, respect to environmental and occupational factors according to employees' viewpoint in each industry is too important.
Keywords	Stress – job stress – environmental factors – managerial factors.

INTRODUCTION

Job stress is a mixture of stress factors of workplace, individual characteristics, and stress factors outside organization. These stress factors can lead to symptoms of disease at workplace.¹ Job stress is considered a risk factor for mental health problems including depression and anxiety.² In a study entitled assessing the relationship between job stress and unsafe practices in an automobile industry it was concluded that there is a positive and significant relationship between job stress and unsafe practices, and also job stress and unsafe practices had positive and significant relationship with accidents at workplace. Also statistical results indicated that one percent increase of unsafe actions has more impact than one score increase of job stress.^{1,2}

In a study on job stress among staffs of a tire factory, it was concluded that over half of staffs have job stress. It was indicated that there is a significance relationship between a good income and enough sleep, and stress level. But there is no significant relationship between age, marital status, educations, work experience, and exercise and job stress.⁴ In a study called "emotional rescue" the role of emotional intelligence and emotional work in nurses' welfare and job stress by using method of modeling structural equations it was found that emotional work and emotional intelligence affects welfare and perceived job stress. In addition, emotional intelligence has a mediating role in experiment of job stress. Sample of the study consists of 312 Australian nurses.⁵ An investigation with the aim of studying individual features in job involvement and job stress was done on a sample of Swiss and foreign workers. Statistical sample included 618 people. The results showed that interactive impact between age and nationality in relation to job involvement and job stress was general. Levels of job involvement and job stress increased with increasing age of Swiss workers, while it was reverse among foreign workers. In addition, job involvement has negative relationship with anger and positive relationship with the other four personality traits. Eventually, it was determined that job stress has positive relationship with anger and self-awareness and a negative relationship with extroversion. However, intensity of these relationships regarding nationality, age, gender, educations and workers 'income was fluctuated.⁶ Other researchers have studied job satisfaction and job stress in high education institutions in 19 different countries. According to results of this research strong market-oriented countries are in group of high job stress and European countries are in high job satisfaction. Findings also indicate that market-orientation managerial reforms are the most important source of academic stress. In the meantime regarding regression results it was found that new public management which is measured by

performance-based management, is the most important source of Academic stress.⁷

Job stress cause employees' job dissatisfaction and as a result, unwillingness to work and frequent absences, which lead to decreased performance and consequently low productivity in organizations and companies. This has great financial damage.⁸ With regard to mechanical life and industrialization of today's world and also with respect to this issue that a large part of the society activists are located in key and sensitive positions like employees and workers, in this study we decided to identify and rank factors influencing job stress among HSE of employees in phase 14 of the South Pars. However, the companies that are similar to job conditions in south of Iran, could be utilized the results of present study.

Due to bad weather conditions also harsh working conditions in south parts of Iran, it is necessary to pay attention to employees more than ever. Because in case the organization can't attract people's satisfaction while getting the experiencing discomfort caused by work labor in poor environmental conditions, burnout will happen definitely. Generally it is hypostasized at present study that environmental factors and stressors affect the workers differently, and these factors should be prioritized. Therefore, companies' managers in different phases of petroleum companies (that South Pars in Asaloyeh is one of them) should identify and considered stressor in workplace and try to improve job conditions and atmosphere. This study was carried out to identify and ranking the factors related to the job stress among HSE employees based on their viewpoints with the aim of reducing the job stress in workplace. The result of this study is important for the managers and could be applied for them in recognition of stressors in work place and finally decision making in reduce or removing these stress factors. Therefore, respecting the managers in petroleum companies to the results of this study can improve productivity and efficiency of employees and eventually company's performance.

METHODOLOGY

In this cross sectional study, all HSE employees in one of the phases in south pars of Iran (the phase 14) including 150 employees were investigated in 2015. This phase is one of many petroleum companies that are located in Asaloyeh province in south of Iran. Thousands of employees and workers are employed in these petroleum companies that all employees in one of them were selected to investigation in this study. There were no inclusion and exclusion criteria in this study. All employees in one phase of a petroleum company in south of Iran were investigated numerously. The data were collected using a questionnaire and measuring some environmental and occupational factors such as sound and chemical pollution.

In this study some factors influencing job stress including heat and moisture, air pollution, poisonous materials risk, chemical materials and electromagnetic waves derived from magnetic equipment, noise pollution, work shift, long working hours and overtime working were identified and considered by reviewing of the literature and interview with employees. In the next stage, a structured questionnaire was designed based on these stress factors with 5-point Likert scale with scores from 1 to 5 (including too little importance, low importance, importance, high importance, too much Importance). In this study the employees were asked to response the questions that each of these stress factors to what extent impose stress based on Likert scale. Moreover, some demographic variables containing age, educations, work history and amount of income were studied too. Validity of questioner was confirmed by the supervisor. The validity of the questionnaire was approved by opinion of the 10 expert persons in this field with total Content Validity Index equal to 0.85. The reliability of the questionnaire was approved by Cronbach Alpha equal to 0.70. All employees responded to the questionnaire.

After recognizing final factors influencing HSE employees' job stress, the employees were asked to choose the importance of each stressors (1 to 9, from importance too much importance). The pair wise computations in sub-indices was done via Excel software.

Also in order to compare staffs' opinions with real conditions of work workplace, sound pressure was measured base on engineering principles level by using sound level meter of England cell 450, in height of 150 cm and infrared ray. Chemical pollutant of workplace (gas, Toluene, and xylene) were measured by using SKC sampling pump with 0/2 dbi lit/min and carbon absorber pipes and gas chromatograph with flame ionization detector (FID). This study was approved in ethical committee of Islamic Azad university of Zahedan, in south of Iran and all participants took part in the study with informed consent.

The data were described using descriptive statistics and the hierarchical analysis was used for investigating research hypotheses and analyzing the data. The one sample T-test was used to analyze the

data. This study has been conducted in a point of the time and investigated the employees' viewpoints based on their scores in different factors with a test value (equal to 3). Since it supposed that mean scores difference with 3 (the moderate score) in each environmental or managerial factors, means that those factors affect the job condition of the employees, therefore for each employees indicate the effect of factors on employees' job condition, so, the mean scores for each item were compared with test value equal to 3 using one sample t test. The normality of data and scores was studied through Kolomogrov-Smirnov for environmental and managerial factor. The significant level was set as 5%.

RESULTS

In this study 150 employees were studied. All of the participants were male. Regarding age distribution, about 20 percent of them were between 20-25, 16 percent between 26-30, 28 percent between 31-35 and 36 percent were over 36 years old. In terms of educational level about 50.7 percent of the employees were in bachelor degree and 8.7 percent in Master of Science degree. The rest of them had not academic education. The work history of 50.7 percent of the subjects was less than 5 years. Also 69 percent of the employees were married and any of them had been divorced.

Table 1 shows the results of employees' viewpoint regarding sound pressure level as a stressor in phase 14 of South Pars. Conducted evaluation shows that noise pollution of measurement devices is higher than level of care and limits which it seems that staffs' opinions were right in this case. It is similar to conducted evaluation. Conducted evaluation shows that in unites 101 and 107 as a sample, amount of infrared ray while working in the sun is higher than limit which it sounds that employee are right in this case and it is near to conducted evaluation. Regarding results of measurement amount of staffs' exposure to gas, toluene and xylene emissions are within limit, but employees announced that these amounts are higher than limits. Perhaps this difference in findings is mental problems.

Table 1 Results of Sound Measurement in Phase 14 of South Pars in South of Iran

Measuring device	(min)	LP dB (A)	Limit dB (A)	Level of care dB (A)	Final Status
Compactor	360	97.7	86.2	83.2	Higher than standard level
Generator 101	30	99.5	97.0	94.0	Higher than standard level
Impact	300	113.0	87.0	84.0	Higher than standard level
Grinding stone	240	99.0	88.0	85.0	Higher than standard level
Crane	480	91.6	85.0	82.0	Higher than standard level
Generator 107	30	100.8	97.0	94.0	Higher than standard level

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As the results of this study the environmental factors including heat and moisture, regional air pollution risk of chemical and poisonous materials, noise pollution, work shift, long working hours, and overtime had great importance on job stress, respectively, according to employee's view point. On the other hand, among managerial factors influencing job stress, the lack of job security, lack of meritocracy, prejudice in salary and not in time payment had great importance on job stress, respectively, according to employee's view point. It should be mentioned that the normality of data was approved in this study and parametric one-sample T test was used for analyzing the data.

In this study the average rating of environmental factors was more than 3. This issue showed the high importance of these factors in staffs' job stress. Average rating of heat and

moisture, regional air pollution, risk of poisonous and chemical materials, noise pollution and work shift bigger than 3 and the mean scores of these mentioned factors were significantly different with 3 at level of 0.05. Therefore, these sub factors had significance effect on job condition. Regarding table 2, the average rating of job security, prejudice in salary, not in time payment and lack of meritocracy is more than 3 and significantly different with 3 at level of 0.05. So these managerial sub-factors have significant impact on job stress (Table2).

The mean score of environmental factors influencing the job condition as a stressor was 4.35 and significantly different with 3 at level of 0.001 (Table2). On the other hand, the average rating of managerial factors on influencing HSE employees' job condition was 3.90 and significantly different with 3 at level of 0.001 (Table2).

Table 2 One-sample t-test for Recognizing Environmental and Managerial Factors Influencing Job Stress

		Moderate= 3(as test value)		
		T	Mean±SD	P
Environmental factors	Heat and moisture	32.45	4.41±1.2	0.0001
	Reginald air pollution	27.975	4.57±1.1	0.0001
	Risk of poisonous and chemical material	25.365	4.59±1.7	0.0001
	Noise pollution	4.662	3.36±1.1	0.0001
Managerial factors	Shift work long working hours and overtime work	47.718	4.84±1.5	0.0001
	Lack of job security	36.766	1.68±0.99	0.0001
	Prejudice in salary	3.18	0.33±0.021	0.002
	Not in time payment	8.83	0.63±0.023	0.0001
	Lack of meritocracy	9.993	0.84±0.043	0.0001

In order to study factors influencing HSE staffs' job stress, analytic hierarchy with the help of Excel software was used. First we ranked factors influencing job stress at two environmental and managerial levels and then we ranked environmental and managerial sub factors based on the presented results in table 2. For this purpose, three questionnaires in the form of pair-wise comparison based on the work time were designed and given to sample population. After data gathering information related to respondents' judgment, first geometric mean matrix of questions and then normalized and

local weight matrix was calculated. The results showed that factors influencing job stress have different ranks and priorities. Geometric mean of managerial factors was 7 and environmental factors were 0.142 and normalized matrix showed that the relative and final weight of environmental and managerial factors were 0.875 and 0.1245, respectively. Therefore, according to the viewpoints of the studied employees, the environmental factors are more important than managerial factors in creating job stress (Table 3).

Table 3 Geometric mean matrix of environmental and managerial factors

	Lack of job security	Lack of meritocracy	Not in time payment	Questioners at level of managerial sub factors
Lack of job security		1.93	3.27	2.18
Lack of meritocracy	0.51		1.63	2.59
Not in time payment	0.30	0.59		2.25

Questioners at level of managerial sub factors	0.44	0.37	0.44	
Total	2.26	3.89	6.34	8.03

Regarding normalized matrix at table 4 in terms of amount of importance and their impact on employees' job condition, and also with respect to obtained weights, it is obvious that among

managerial factors, lack of job security, lack of meritocracy, not in time payment and prejudice in salary gained ranks from 1 to 4, respectively.

Table 4 Normalized matrix (stage of rescaling at the level of managerial sub factors)

	Lack job security	Lack of meritocracy	Not in time payment	Noise pollution	Local weights	rank
Lack job security	0.44	0.49	0.51	0.27	0.10	1
Lack of meritocracy	0.22	0.25	0.25	0.32	0.26	2
Not in time payment	0.13	0.15	0.15	0.28	0.18	3
Prejudice in salary	0.19	0.09	0.06	0.12	0.12	4

After gathering data related to respondents' judgments first geometric mean matrix of questioners and then normalized and local weights matrix were calculated by use of Excel software.

environmental factors, the long working hours, risk of poisonous and chemical materials, regional air pollution, heat and moisture and noise pollution gained ranks from 1 to 5, respectively.

With respect to normalized matrix in terms of the importance and obtained weights regarding

Table 5 Normalized matrix (stage of rescaling at the level of environmental sub factors)

	Risk of poisonous chemical materials	Long working hours	regional air pollution	Heat and moisture	Local weights		
Risk of poisonous chemical materials	0.24	0.40	0.10	0.20	0.18	0.23	1
Long working hours	0.22	0.37	0.61	0.52	0.39	0.42	2
regional air pollution	0.34	0.09	0.15	0.16	0.18	0.18	3
heat and moisture	0.07	0.04	0.05	0.06	0.15	0.08	4
local weights	0.0	0.07	0.06	0.03	0.07	0.07	5

Table 6 has summarized the ranking factory and sub factors among participants in this study. Final weight in this table indicates order of importance of each managerial and environmental factor among 9 recognized managerial and environmental factors. It is worth to note that relative and final weights are the same at the level of factors and at the level of sub factors final weight of

sub factors is obtained from multiplication of relative weight of sub factors by relative weight of related factors. With respect to this matter that relative weights of environmental sub factors is more than environmental factors as a result final weights of environmental sub factors is more than environmental factors and they allocated ranks of 1 to 5 to these salary among 9 sub factors.

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Table 6 Relative and Final Weight and Priority of Factors and sub Factors Influencing Job Stress

	Scale name	Relative weight	Final weight	priority
Title of group	Managerial level	0.1245	0.1245	2
	Environmental level	0.875	0.875	1
Factor influencing job stress	Risk poisonous and chemical materials	0.23	0.201	2
	Long working hours	0.42	0.367	1
	Air pollution	0.18	0.157	3
	Heat and moisture	0.08	0.07	4
	Noise pollution	0.07	0.061	5
Managerial factors	Lack of job security	0.43	0.053	6

DISCUSSION AND CONCLUSION

This study showed that there are some environmental and managerial factors that influence the job condition of employees in petroleum companies. However, regarding gradual going of society toward modern life, one of the basic problems that human societies are faced with in recent decades is stress phenomenon and stressors.⁸ The aim of the present study was to identifying and ranking factors influencing job stress among employees' in one petroleum company in south of Iran. The main result of this research indicates stronger impact of environmental factor than managerial factors on work situation. On the other hand, most of sub factors of environmental and managerial stressors were identified as main effective factors on employees' job stress and work condition.

The factors including heat and moisture, regional air pollution, risk of poisonous and chemical materials, noise pollution, work shift, and long working hours were identified as most important factors the influence the job condition in petroleum companies. This result is somewhat in concordance with previous studies in different companies in Iran and around the world.^{9,10} This study showed that according to employees' viewpoint the most important effective environmental factor on job stress is heat and moisture. This could be due to the fact that most HSE employees in phase 14 of South Pars are not native and they didn't accustomed to heat and moisture, so tolerating heat and moisture was difficult for them.

Furthermore, this study showed that among 24 studied managerial factors, only 4 factors including lack of job security, prejudice in salary, not in time payment and lack of meritocracy were recognized as effective managerial factors on HSE employees job stress of phas14 South Pars in Iran. This result is in parallel with previous study in Iran.¹⁰

After identifying the influence of 5 environmental sub factors on employees' job condition, the mean scores (ratings) of these 5 sub factors was considered to assessment the mentioned

factors quantitatively. The results of related statistical test showed that the means scores in 7 environmental sub factors (including heat and moisture, regional air pollution, risk of poisoned and chemical materials, noise pollution, work shift and long working hours) affected HSE employees' job stress in phase 14 South Pars, so that the mean score in all sub-factors are significantly different from 3. As we know there was no similar study to compare our quantitative results. In a previous study in study in Iran,¹¹ six environmental sub factors including poisonous and chemical materials, work shift, long working hours, heat and moisture, monotony of working conditions, noise pollution, and regional air pollution were identified as effective environmental factors an HSE employees' job stress. However, in the present study monotony of working conditions didn't had high impact on job stress based on employees' viewpoint. However, the results of this study more or less is consistent with the findings of previous study in Iran.¹¹

A previous study¹² with design of case-control study that considered relationship between job stress and working accidents, indicated that time pressure can be included among environmental factors (work shift and long working hours). On the other hand another study² also showed that the factors including noise, quivering and light are physical factors that influence the job situation of employees. The findings of both mentioned studies are consistent with the results of present study.

On the other hand, the result of this study in concordance with the results of study in Taiwan¹³ that reported the problems related to work hours as one of the job stress factors among employees. With respect to impact of environmental factors on HSE employees' job stress, managers and administrators of active companies in phase 14 of south pars while working in this phase should try to reduce these environmental factors on employees. In this context it is valuable to use experiments of experienced companies in order to reduce environmental factors on employees.

As stated earlier the environmental factors including lack of job security, prejudice in salary, nor in time payment, lack of meritocracy affect the

HSE employees' job situation in phase 14 of South Pars. This result is almost consistent with the finding of previous study in Taiwan.¹³ In the study in Taiwan¹³ lack of correct assessment of employees and prejudice in bonuses, lack of coordination of organizational position with educational degree, weak relations of administration, lack of career advancement, appointment and promotion based on relations not rules and improper transfer of labor force to refineries under launching were recognized as effective managerial factors on employees job stress.

A previous study in Iran¹¹ has shown that the way of payment and way of assessing employees influence the employees' job condition that in parallel with the results of present study. In environment of North Sea oil and gas industry, they concluded that factor of lack of job security was effective on employees job stress. As the result of analytic hierarchy for pair-wised comparison among effective factors and sub factors in this study, these factors and sub-factory have different weights and priorities.

Totally this study showed that the environmental factors have more effect than managerial factors on job condition and cause to stress among employees. Among environmental sub factor, it was recognized that long working hours, risk of poisonous and chemical materials, regional air pollution, heat and moisture and noise pollution with regard to obtained weights have gained rank, of 1 to 5 respectively in terms of important and effectiveness on employees job stress. Among managerial sub factors it was also recognized that lack of job security lack of meritocracy, not in time payment, and prejudice in salary gained ranks of 1 to 4 respectively in terms of importance and effectiveness on employees' job stress with respect to obtained weights.

In general, this study showed that, respect to the needs of employees and finding the stressor based on their opinion is too important. However, solving the problems of employees based on their opinion is very effective and applicable. The results of this study can generalized to similar companies with similar condition around the world. It should be mentioned that the environmental and management problems could affect the job condition and can cause to stress among employees and finally influence the production and efficacy of the companies. However, this study was a cross sectional study about the opinion of a group of employees in a company. Therefore, we think there is no selection or information bias at present study.

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