Research Article

An enquiry into the safety culture of workers in Gonabad stonecutting industry and its relation with workers' demographic characteristics in 2014

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Abstract

Background: The safety culture in an organization reflects the overall attitude of the organization towards safety. Positive safety culture is a factor that commits all workers to play a part in their own safety and that of other coworkers. This study explores the safety culture among the workers of a stonecutting industry and its relation with workers' demographic characteristics.

Methods: This study is a cross-sectional research carried out on 111 workers of the stonecutting industry of Gonabad city in 2014. Sampling was through census, and the data were collected using the safety culture standard questionnaire. Data were analyzed by SPSS software version 18 using the statistical test of Chi-square.

Results: The mean and the standard deviation of the workers' safety culture score were 241.79 ± 11.35. Overall, 30% of the workers had a positive safety culture and 70% of them had a negative safety culture. Positive and negative safety cultures had a statistically significant relationship with work experience (P < 0.001). positive and negative safety cultures did not correlate significantly with age, education and occupational groups (P > 0.05).

Conclusions: Although the stonecutting industry has a positive safety culture, it seems necessary to continuously hold the training and monitoring programs related to safety precautions, especially in workers with higher work experience.

Keywords: Safety Culture; Stonecutting Industry; Demographic Characteristics; Safety Culture Questionnaire

1. Introduction

According to the Advisory Committee on Safety of Nuclear Installations, the safety culture is the outcome of values, attitudes, perceptions, qualifications and examples of individual and group behaviors that determine an organization's commitment to safety and lifestyle as well as the effectiveness of its management of safety and health (1). The development of industries in the 21st century in Iran caused the industrial sectors to play an important part in the economic growth. Unfortunately, however, economic growth has been accompanied by high costs of occupational illnesses, disabilities, and even deaths in manufacturing sectors. According to the ILO, some 129 million work-related accidents occur every year, causing deaths of 219,000 people and injuries to millions (2). In 2004, about 4.1 million occupational illnesses and accidents occurred in the United States, indicating that for every 100 full-time

workers, 4.4 accidents occur (**3**). According to the studies performed in Iran, there were 159,000 recorded accidents in 2003, including 1142 deaths (**4**).

The question of "Why accidents happen" may seem simple at the first glance; however, the answer to this question is partly complicated. Views are considerably different about this question and the causes of accidents, which could in turn influence the nature of interventions to improve safety. Evidence suggests that while safety culture is not the only determinant of safety in an organization, it plays an important role in encouraging workers and employees to act in a safe way (**5**). Research into the causes of accidents indicates that 85% of the accidents are caused by unsafe acts and that any serious incident has been reported following 331 unsafe acts. Furthermore, other safety and health studies have shown that the underlying causes of 85 to 98% of occupational accidents – that occur due to unsafe behavior – are attitudinal, behavioral, and cultural (**6**). A review of studies about the knowledge and safe behaviors of workers in Iran shows that a huge number of workers are exposed to the dangers due to unsafe behaviors in the workplace, which shows the necessity of improving the safe behaviors of workers (**7**).

Safety climate focuses on the workers' perceptions of the work environment and the level of interest of the management in safety. It is a distinct yet dependent concept from safety culture, which can be considered as the external layer of safety culture. However, the boundary between these two concepts, i.e., the safety culture and the safety climate, is not clear and many scholars have used these two concepts in the same way (**8**). In the study by Asghari et al. on the workers of a steel rolling and steel parts factory, it was found that the studied employees had relatively good knowledge and attitude about safety (**4**). The results of a study performed on the different groups of workers from 21 places in China showed that the general climate of the organization had a significant impact on the safety climate; it also showed that safety policies and programs had the most relevance to the safety climate (**9**).

Melia et al. (2008) investigated the four important factors of the safety, i.e., organization, supervisor, colleagues and workers, among construction workers and found that the organizational safety response and the safety response of supervisors as well as the safety response of colleagues and that of workers were significantly related (**10**). The results of the study by Maleki et al. (2015)

showed that the safety culture of dam-building workers was affected by the accident history and that it was significant by the percentage of the accidents occurred (**11**). The study of Ebrahimzade et al. on steel industry workers using the safety culture questionnaire, showed that in order to meet the demands of the system in terms of safety, an appropriate structure should be planned and, in order to accommodate the individuals in the desired structural framework, the change of culture and the change of behavior should be made at the same time (**12**). Although many studies have been carried out in the field of assessing the safety culture in different working environments in Iran, few studies have been conducted in the technical services industry, especially in the stonecutting industry. Most of the Iranian industries are small industries and about half of the workforce is employed in these workshops. In Gonabad city, however, despite having a large number of stone mines, no study has been performed so far. Considering the importance of maintaining and improving workers' health conditions, this study was conducted to evaluate the safety culture in Gonabad stonecutting industry and its relation with some demographic characteristics of workers.

2. Methods

This study was a cross-sectional analytical study. The research population consisted of all the workers of stonecutting industry in Gonabad city. The sampling method was in the format of complete census, so that all the 111 employees working in the 13 industries were included in the study. The tool for data collection was a two-part questionnaire: the first part was covered demographic characteristics including age, education, and work experience of workers; and the second part was the questionnaire of safety culture standard. The questionnaire had 75 items which assessed 10 basic elements of safety culture, including education and understanding of safety and health issues, work pressure for more production, the amount of the individuals' involvement in issues related to safety and health, accidents, incidents and pseudo-incidents, the level of organizational commitment / management commitment to safety and health, supervisors, direct authorities and production management, rules, instructions and procedures of safety and health, barriers to safe behaviors, workers' attitudes of the overall status of health and safety, violation and ignoring the regulations of safety, and health and communications. The method of scoring was

based on Likert scale, in which the studied workers expressed their opinions for each of the items as "I completely agree, I agree, no comment, I disagree, and I completely disagree".

The validity of safety culture questionnaire was determined to be 0.75 which was the same as that of the study by Jafari et al. The reliability coefficient of the questionnaire was calculated as 0.7 using Cronbach's alpha coefficient ([13]). Prior to administration of the questionnaires, the researchers provided the participants with the necessary information about the study. The right was reserved for the subjects not to participate in the study or to refuse to continue participation at any stage of it.

The completion of the safety culture questionnaire was performed in a semi-monitoring, self-report manner by a professional health expert because the nature of the items on the attitudes and accidents was such that if the respondent was asked orally or if he had to complete the questionnaire in the presence of others, he would most likely be unable to provide the correct answer to some of the items. Therefore, in this method, the questionnaires were given to the individuals and after they were completed by the individuals, they were collected, and if the respondents were faced with a vague item, they would ask the researcher. The questionnaire scoring was based on a 5-point Likert scale in which the workers expressed their opinions as "I completely agree, I agree, no comment, I disagree, and I completely disagree" for each of the items. On the Likert scale, the overall points of each questionnaire must be compared with the average scale. The following equation was used to evaluate the culture score:

$$\mu = \frac{5k + k}{2} = \frac{(5 \times 79) + 79}{2} = 237$$

in which K indicates the number of items used (79 items), and μ represents the mean safety culture score.

Based on the above equation, the minimum acceptable safety culture score (positive safety culture) was determined to be 237. Therefore, if the calculated safety culture score was equal to or greater than 237 for each respondent, the safety culture was considered positive and if it was less than 237, it was evaluated as negative. Then, the relationship between the participants' safety culture and age, education, work experience and different occupational groups was explored. The collected data were analyzed in SPSS (version 18) using chi-square test.

3. Results

The mean and the standard deviation of the workers' age was 32.29 ± 7.8 years, ranging from 20 to 46, and their work experience was 4.06 ± 2.1 years with a range of 1 to 8 years. In this study, all the participants were male. The mean and the standard deviation of the safety culture score of the studied workers was 241.79 ± 11.35. Also, 30 percent of the workers had a positive safety culture and 70 percent of them had a negative safety culture. Table 1 shows the frequency distribution of the safety culture in the studied workers in terms of age and work experience. 38% of the individuals who were between the ages of 30 and 40 had a positive safety culture, which indicated the highest frequency. The highest negative safety culture was among workers under 30 years of age (45%). In all age groups, the positive safety culture had more percentage, but statistical analysis showed no significant relationship between safety culture and age (P=0.56).

The analysis of the work experience of the individuals showed that the highest work experience was 8 years. Those workers with 5 to 10 years of work experience had a higher positive safety culture, and with the increase in work experience, the negative safety culture of workers decreased. There was a statistically significant relationship between positive and negative safety cultures and the work experience of the individuals (P < 0.001).

Table 2 presents the frequency distribution of safety culture in the studied workers in terms of educational level. 16.2% of the workers had high-school diploma (or higher education), and 83.8% of them were with less than high school diploma, who had the highest frequency. In all levels of education, the percentage of negative safety culture was higher than the positive safety culture; and those with an elementary level of education had the highest percentage of negative safety culture (57.5%). The statistical test showed that there was not a significant relationship between the positive and negative safety cultures and educational level (P=0.678).

Table 3 presents the frequency distribution of safety culture in the studied workers in terms of occupational group. The investigation of the safety culture among the occupational groups showed that the highest positive safety culture was related to the grinding group and the highest negative safety culture was related to the cutting group. There was no statistically significant relationship between

Table 1: Frequency distribution of safety culture in the studied workers based on age and work experience

Variable		safety culture			P-value
		positive	negative	total	
		Frequency (%)	Frequency (%)	Frequency (%)	
Age (years)	< 30	(35.48) 11	(45) 36	(42.4) 47	0.560
	30 to 40	(38.7) 12	(31.25) 25	(33.3) 37	
	≥ 40	(25.8) 8	(23.75) 19	(24.3) 27	
	total	(27.9) 31	(72.1) 80	(100) 111	
Work experience (years)	< 5	(19.35) 6	(80) 64	(63.05) 70	<0.001
	5 to 10	(80.64) 25	(20) 16	(36.95) 41	
	> 10	-	-	-	
	total	(27.9) 31	(72.1) 80	(100) 111	

Table 2: Frequency distribution of safety culture in the studied workers based on level of education

Education	safety culture			P-value
	positive	negative	total	
	Frequency (%)	Frequency (%)	Frequency (%)	
Primary	(48.4) 15	(57.5) 46	(54.95) 61	0.678
Secondary	(32.3) 10	(26.2) 21	(27.92) 31	
High school diploma (or higher)	(19.3) 6	(16.3) 13	(16.2) 18	
Total	(27.9) 31	(72.1) 80	(100) 111	

Table 3: Frequency distribution of safety culture in the studied workers based on occupational group

Occupational group	safety culture			P-value
	Positive	negative	total	
	Frequency (%)	Frequency (%)	Frequency (%)	
cutting	(16.1) 15	(32.5) 26	(27.92) 31	0.089
milling	(32.3) 10	(28.8) 23	(29.72) 33	
grinding	(38.7) 12	(18.7) 15	(24.32) 27	
cross-cutting	(12.9) 4	(18) 20	(21.62) 24	
total	(27.9) 31	(72.1) 80	(100) 111	

the positive and negative safety cultures and the occupational group (P=0.089).

4. Discussion

The cultural safety of an organization reflects the overall attitude of the organization towards safety. A desirable safety culture commits all the staff, including the managing director and simple workers, to having a major stake in their own safety and the safety of other co-workers (**14**). The evaluation of safety culture is a medium by which the entire organization is examined. In sum, the evaluation of safety culture can act as a catalyst for change (**15**).

The overall score of safety culture is the sum of the scores received for all items. According to the findings of this study, the average point of safety culture was 241. The fact that the minimum point of positive safety culture was 237 shows that the stonecutting industry had a positive safety culture, which can be due to the safety training that has been provided by the employer or health services center for the workers of this industry. However, in the study by Jafari et al. which was performed on the textile workers in Yazd city, the safety culture score was 225, the reason of which was the number of the items of the questionnaires (there were 81 items: 75 items for the standard of safety culture; and 6 items about accidents) (**16**) which were different from the items of the questionnaire of the present study.

The results of the present study showed that there was no significant relationship between safety culture and age (Table 1). These results are consistent with the results of the study by Nodoshan et al. which showed that there was no significant relationship between safety culture and age (p=0.560) (**18**).

The results of the present study also indicated that with the increase in the level of education, the amount of negative safety culture decreased (Table 2). Higher education increases the possibility of positive safety culture by improving the awareness and attitude of the individuals, which is consistent with the results of the study of Jafari et al. ([16]); however, the statistical analysis showed no significant relationship between these two variables (p=0.678).

With the increase in work experience, the positive safety culture decreased and the negative safety culture increased (Table 3), which can be attributed to the false pride that individuals develop after gaining work experience. The results of statistical analysis showed that there was a significant relationship between safety culture and work experience (P <0.001). In the study of Lee et al., a meaningful relationship was found between safety culture and work experience, which is consistent with the results of the present study ([17]).

The results of the present study also showed that the cutting occupational group – in which the probability of accidents is very high and the amount of noise pollution is more than the limit – had the highest amount of negative safety culture. However, the grinding occupational group – in which the probability of accidents is the lowest – had higher level of positive safety culture than other occupational groups (Table 4); however, the statistical analysis showed no significant relationship between occupational groups and safety culture (p=0.089). Along with the issue of 'safety culture', attention should be paid to behavioral change, or else the organization has to pay for the wrong safety culture for a long time ([18]). Researchers believe that behaviors derive from the structure in which one is located. Therefore, the creation of a proper structure, in addition to creating a suitable culture, requires other arrangements that speed up the creation of the given culture ([19]).

This study was conducted on workers of a kind of industry within one city in a cross-sectional manner, and the data were collected using a questionnaire. Due to the dispersion of stonecutting workshops across the city, educational intervention was not possible, which could be considered a limitation of the present study. Future studies can examine the safety culture with educational interventions. Influential variables such as family issues, financial status, living environment, managerial support and job security can also be examined.

5. Conclusion

One of the important ways to prevent work-related accidents is to create and improve the safety culture. According to the results of this study, as work experience increased, the level of safety culture decreased significantly. Employers and senior managers in industries and organizations have a major role in the development of certain cultures. Accordingly, safer executive positions as well as higher education and knowledge about occupational hazards result in high safety culture scores among the workers with higher education levels. Based on the results of this study, efforts should be made by the relevant managers to improve the level of safety of the work environment. The improvement of the safety culture is the most effective approach in this regard. By enhancing the level of safety culture, unsafe behaviors of the staff reduces, eventually resulting in significantly reduced occupational accidents.

6. Acknowledgements

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